

**IBM**<sup>®</sup>

**Customer Engineering  
Universal Reference Manual**

**IBM** *Selectric* I/O

**Keyboardless Printer**

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## GENERAL PROCEDURE

Power clean the printer with the covers removed. Clean the feed rolls, platen, and deflector. Unless otherwise stated, all parts of the printer should be inspected and lubricated once every three months. NOTE: Lubrication must be applied judiciously to eliminate excessive quantities and prevent migration or spin-off into electrical contacts.

## LUBRICATION

Figures 1 through 7 show the points that require lubrication. The number references require IBM #10. The letter references require IBM #23. Points that do not require lubrication every three months are identified with the required frequency in the reference list. A rule of thumb should be "All bearing areas having a sliding motion use IBM #23 and all bearing areas having rotational motion use IBM #10 unless otherwise specified".

Machines with power on 24 hours daily require more frequent lubrication than machines used for single-shift operation. The following areas are primarily affected by idling time, since only the operational shaft is driven:

1. Motor and motor pulley
2. Cycle-clutch spring and arbor
3. Driven-pulley hub and bearing
4. Operational cam bearings
5. Right-hand operational shaft and shift cam bearing
6. Shift-clutch spring and arbor.

Since these machines are hot 24 hours daily, some lubricant evaporation can be expected in areas not driven during idling, however, they are not nearly so affected as items 1 through 6. Where power is on 24 hours daily, we recommend lubricating these items every six weeks.

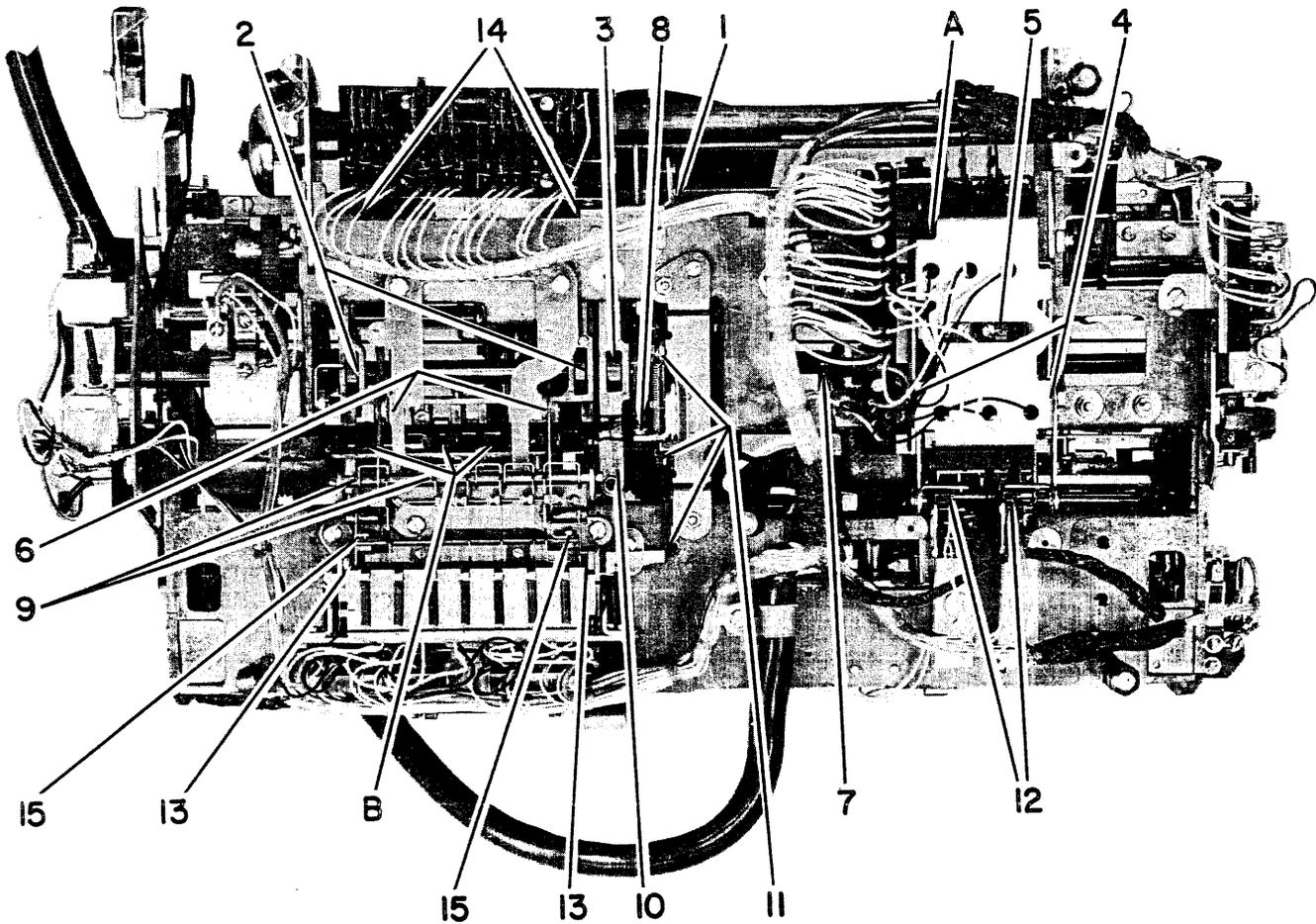


FIGURE 1. Bottom View Of The Printer

IBM #10

- 1. Cycle-clutch pawl
- 2. Selector bail roller pivots
- 3. Negative-five bail roller pivot
- 4. Actuating-arm pivots
- 5. Operational pull links
- 6. Pusher bail-arm pivots
- 7. Carrier-return actuating-arm pivot
- 8. Rotate-link pivots
- 9. Pusher-arm pivots
- 10. Negative-five link bearing

- 11. Cycle-clutch trip pivots
- 12. Switch or contact latch pivots
- 13. Cycle-clutch trip-bail pivot points
- 14. Selector-latch bail pivots
- 15. Pusher bail pivots

IBM #23

- A. Operational-arm pivots
- B. Selector-latch surfaces

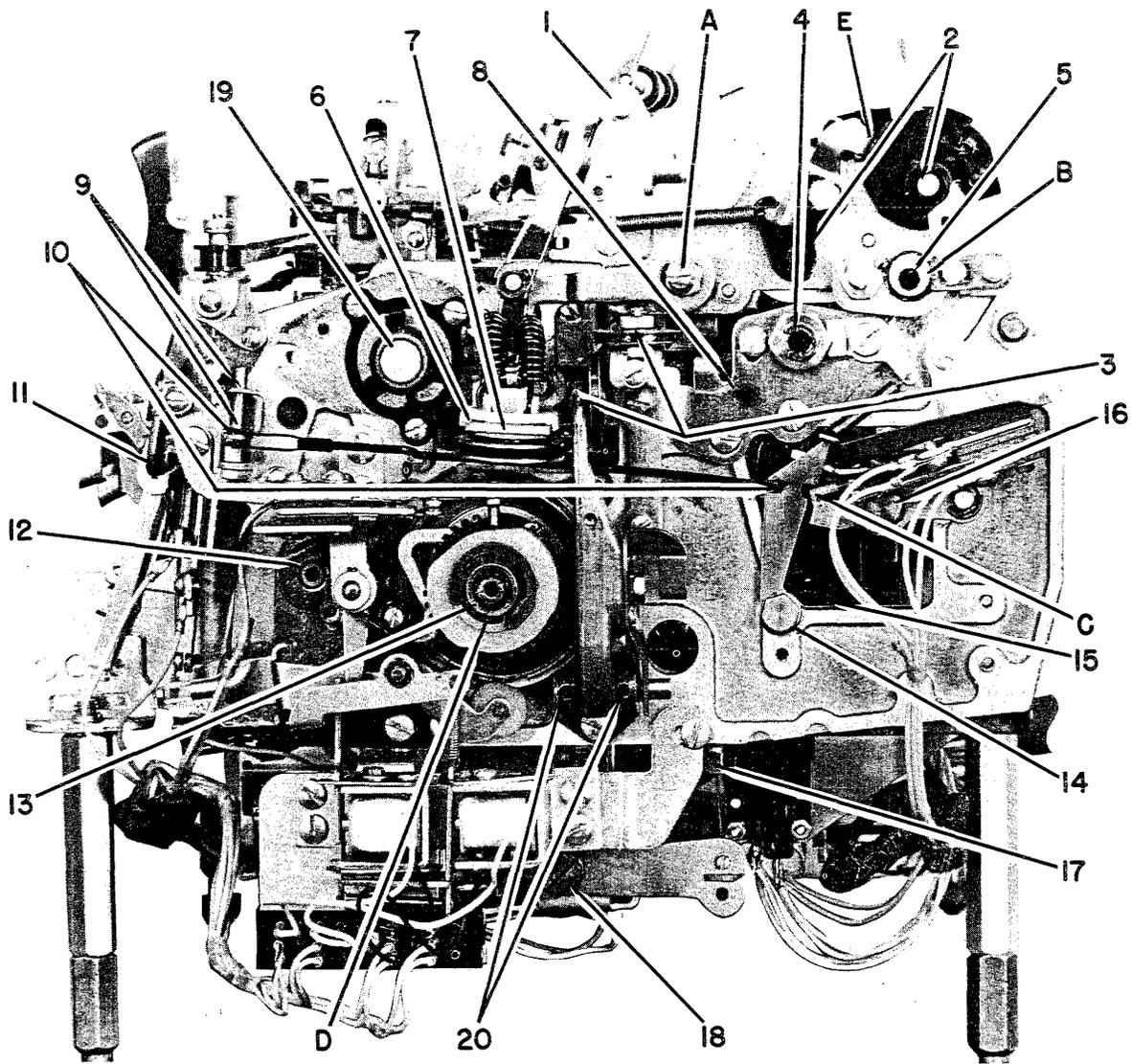


FIGURE 2. Right Side Of The Printer

IBM #10

1. Platen-release pivot
2. Paper-release-lever pivots
3. Rotate and tilt pulley bearings
4. Tab-rack support bearing
5. Copy-control eccentric pivot
6. Pulley-assembly pivots
7. Right-hand cord-pulley bearing
8. Escapement torque-bar pivot
9. Carrier-return unlatching-bellcrank pivot
10. Carrier-return unlatching-link pivot
11. Bellringer bail pivot
12. Filter-shaft bearing
13. Operational-shaft bearing
14. Carrier-return latch-keeper pivot

15. Index-link pivot
16. Carrier-return-link pivots
17. Operational-contact link-rod pivots
18. Contact-bail pivots
19. RH print shaft bearing
20. Shift arm

IBM #23

- A. Guide-bracket sliding surface
- B. Copy-control eccentric surface
- C. Carrier-return latch keeper
- D. Shift clutch spring and arbor
- E. Paper release lever

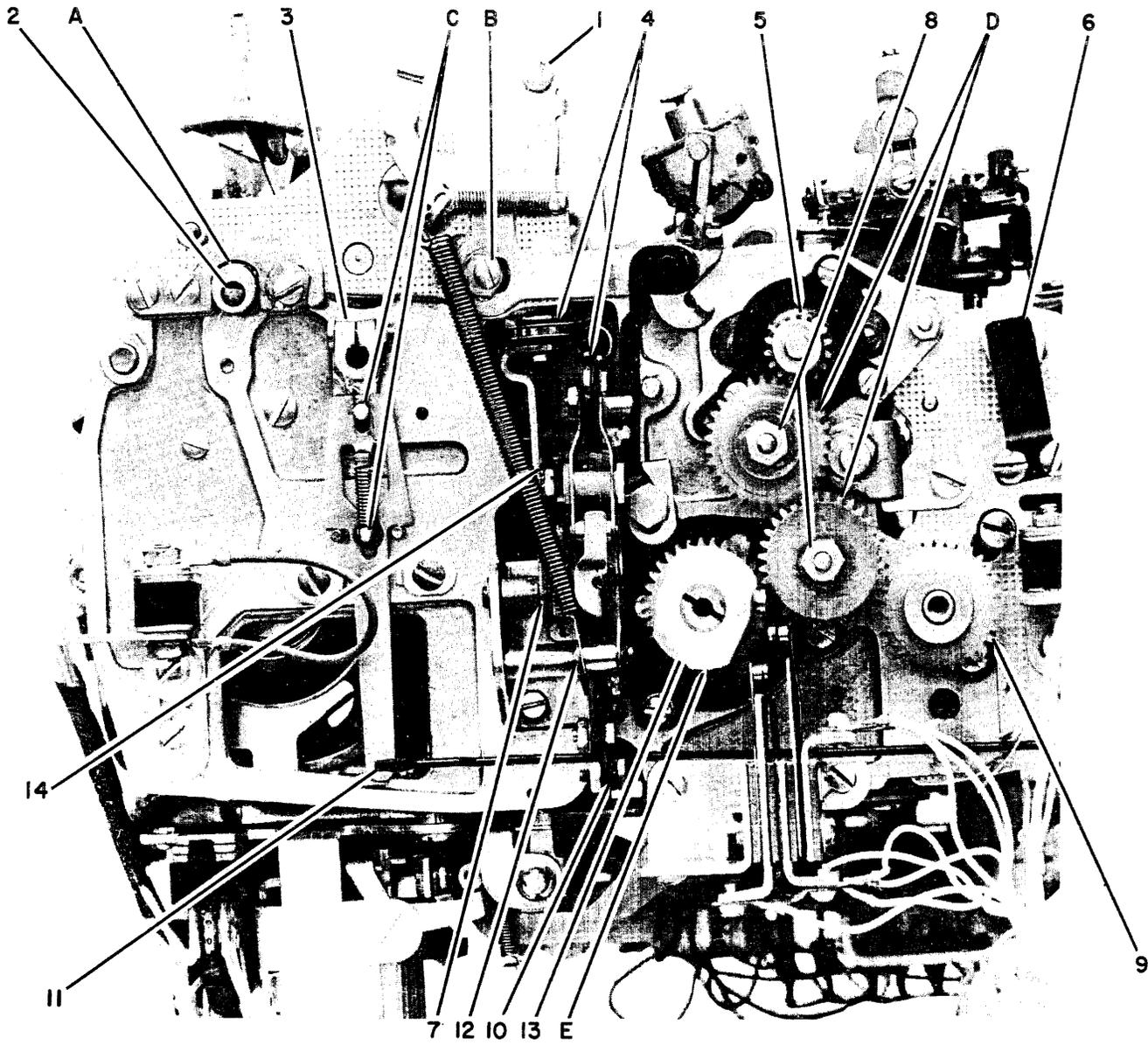


FIGURE 3. Left Side Of The Printer

IBM #10

- 1. Platen-release pivot
- 2. Copy-control eccentric pivot
- 3. Tab-rack support bushing
- 4. Rotate and tilt pulley bearings
- 5. Print-shaft bearing
- 6. Left-hand margin-rack bushing
- 7. Tilt-arm pivot
- 8. Idler-gear bearings (lightly)
- 9. Filter-shaft bearing
- 10. Rotate link
- 11. Tab set/clear link pivots

- 12. Wear-compensator pivots
- 13. Cycle-shaft bearing
- 14. Tilt link

IBM #23

- A. Copy-control eccentric surface
- B. Guide-bracket sliding surface
- C. Tab set/clear bellcrank
- D. Idler gear teeth
- E. C1 and C2 cam surfaces

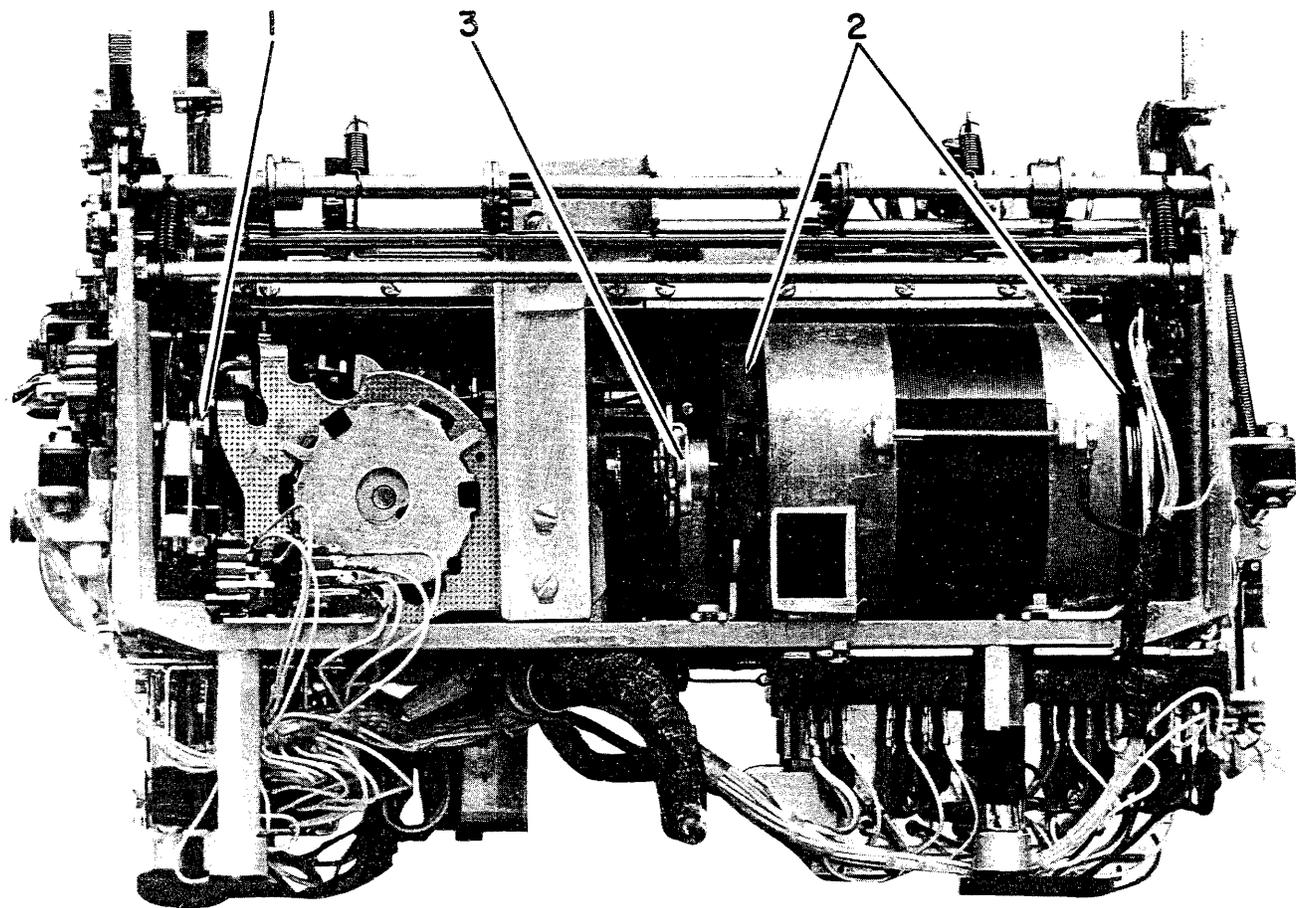


FIGURE 4. Back Of The Printer

IBM #10

1. Index-control lever (old style)
2. Motor bearings  
All pivots and bearings in operational unit
3. Motor pulley and clutch assembly

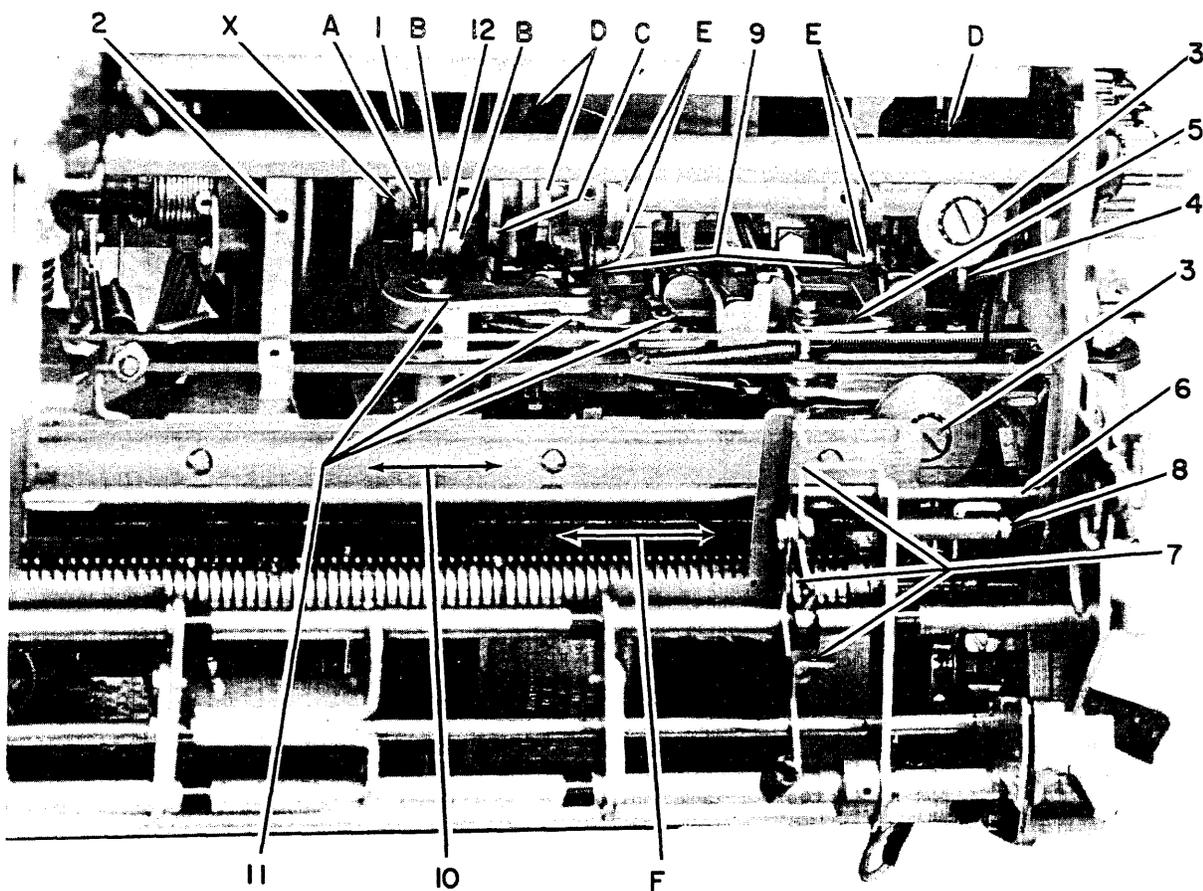


FIGURE 5. Differential Mechanism

(Fig. 5. Differential Mechanism)

IBM #10

1. Cycle-clutch latch pivot
2. Center bearing - #9
3. Carrier-return pulleys
4. Cycle-clutch check-latch pivot
5. Check-selector latch pivot
6. Tab-torque-bar pivot
7. Feed roll bearings
8. Escapement-torque-bar pivot
9. Latch pusher roller and pivot studs

10. Surface of the escapement rack
11. All selector latch and differential mechanism pivots
12. Restore roller pivot

IBM #23

- A. Cycle-clutch sleeve surface
- B. Cycle-clutch restoring cam and roller
- C. Negative-five cam surface
- D. Selector-cam surface and roller
- E. Pusher bail cam surface and arm rollers
- F. Torque bars (light film)
- X. Cycle clutch (inside)

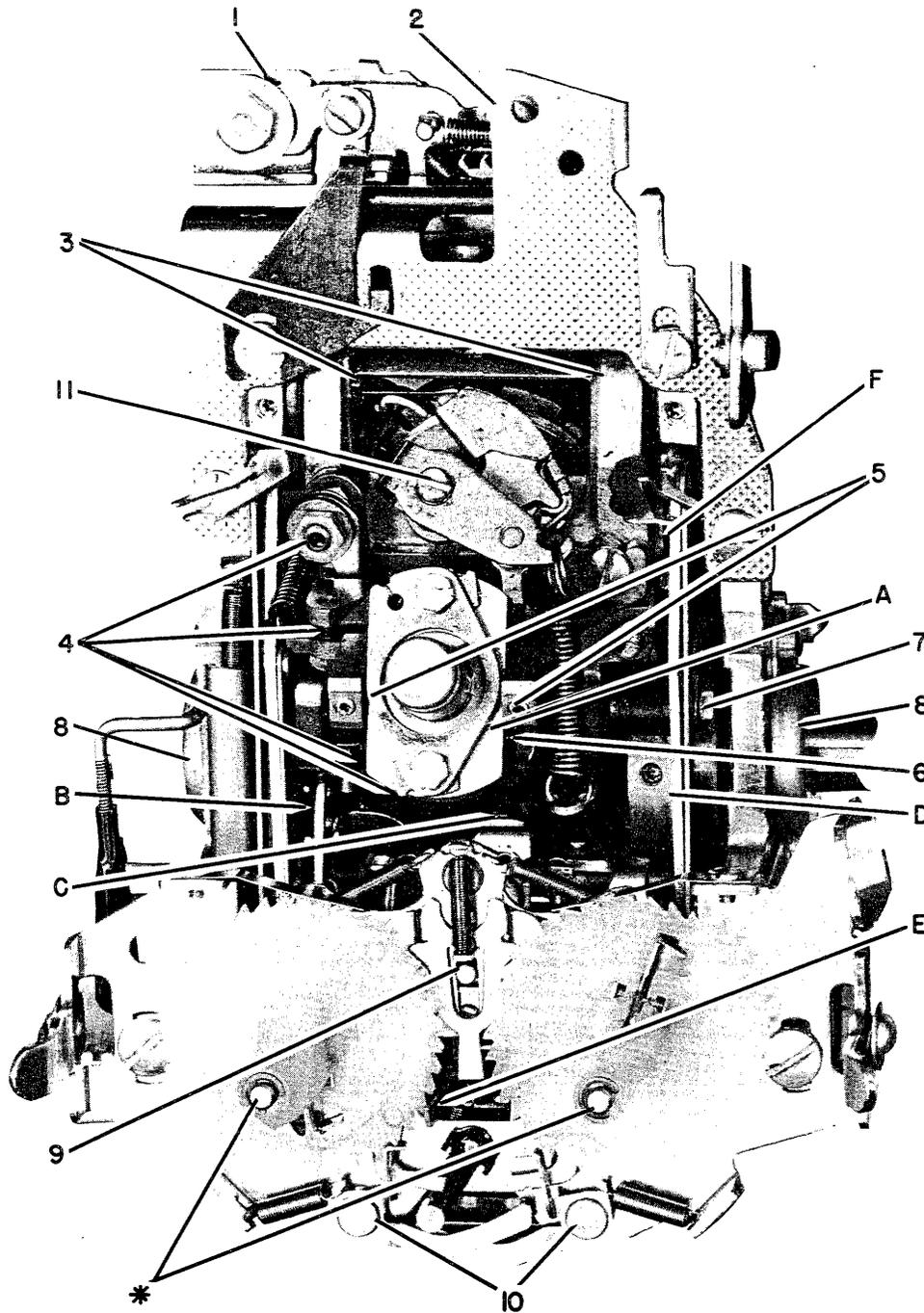


FIGURE 6. Carrier Mechanism

(Fig. 6. Carrier Mechanism)

\* Keep cartridge and spindles free of all lubricants

IBM #10

- 1. Tab-lever pivot
- 2. Tab-lever latch pivot
- 3. Rocker pivots
- 4. Detent pivots
- 5. Tilt-ring pivots
- 6. Lower ball socket
- 7. Print-cam roller bearing
- 8. Print-shaft wipers

- 9. Interposer-lever sliding surface
- 10. Detent-lever bearings
- 11. Tilt bellcrank pivot

IBM #23

- A. Tilt ring and ball joint
- B. Ribbon-lift cam surface
- C. Ribbon-feed and detent cam surface
- D. Print-cam surface
- E. Ribbon-feed pawl
- F. Velocity control plate pin

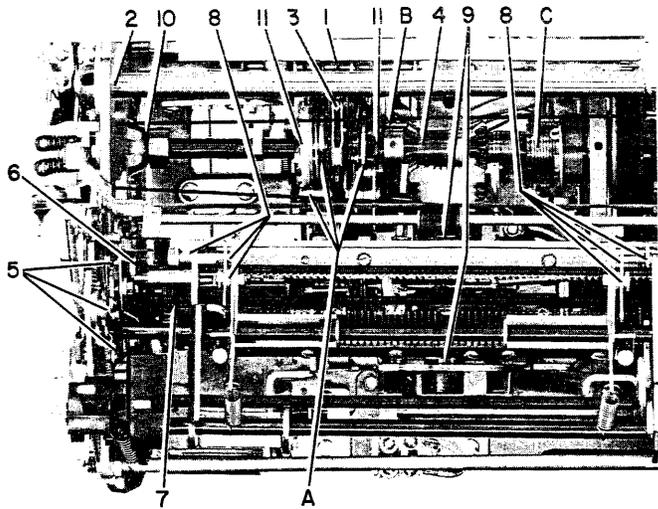


FIGURE 7. Operational Mechanism

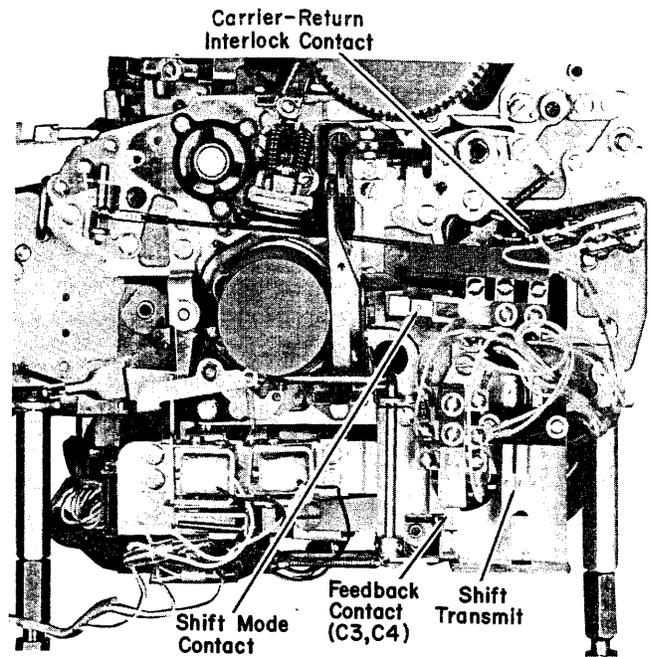


FIGURE 9A. Right View Showing Contact Location

IBM #10

1. Escapement-cam-follower roller
2. Print-shaft bearing
3. Escapement clevis
4. Spring-clutch arbor. Oil carriage return spring clutch only when reassembly is necessary
5. Index pawl
6. Tab-torque-bar pivot
7. Power-tab bellcrank-link ends and pivots
8. Feed-roll bearings
9. Escapement-shaft bearing
10. Operational shaft bearing
11. Operational cam pivot (ratchet) (Use #23 when parts are removed or replaced.)

IBM #23

- A. Operational-cam surfaces, rollers, and drive ratchets
- B. Actuating arm and check-pawl contact surface
- C. Torque-limiter spring clutch\*

\*Every 6 months / 1 Shift Operation  
 Every 3 months / 2 Shift Operation  
 Every 6 weeks / 3 Shift Operation

PRINTER CONTACT LOCATIONS

Figures 8 to 12 show the locations of the printer contacts.

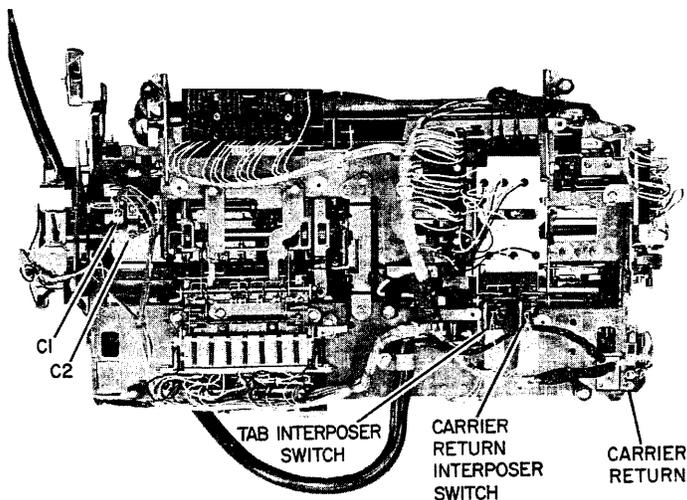


FIGURE 8. Bottom View Showing Contact Location

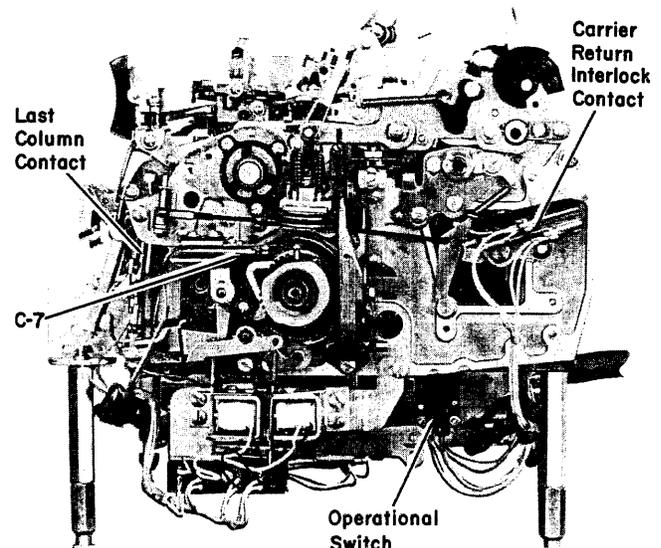


FIGURE 9B. Right View Showing Contact Location

PRINT FEEDBACK  
CONTACTS (C1,C2)

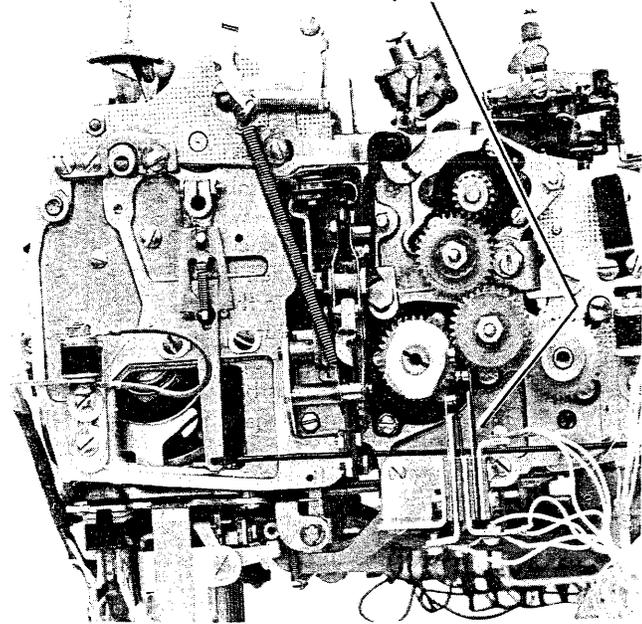
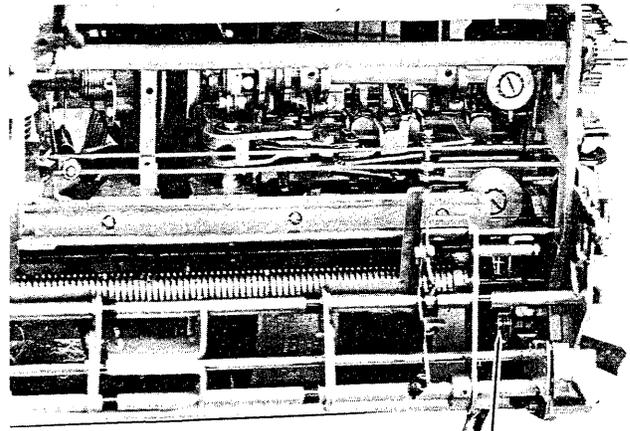


FIGURE 10. Left View Showing Contact Location



TAB INTERLOCK  
CONTACT

FIGURE 12. Upper Left Rear Corner Showing Contact Location

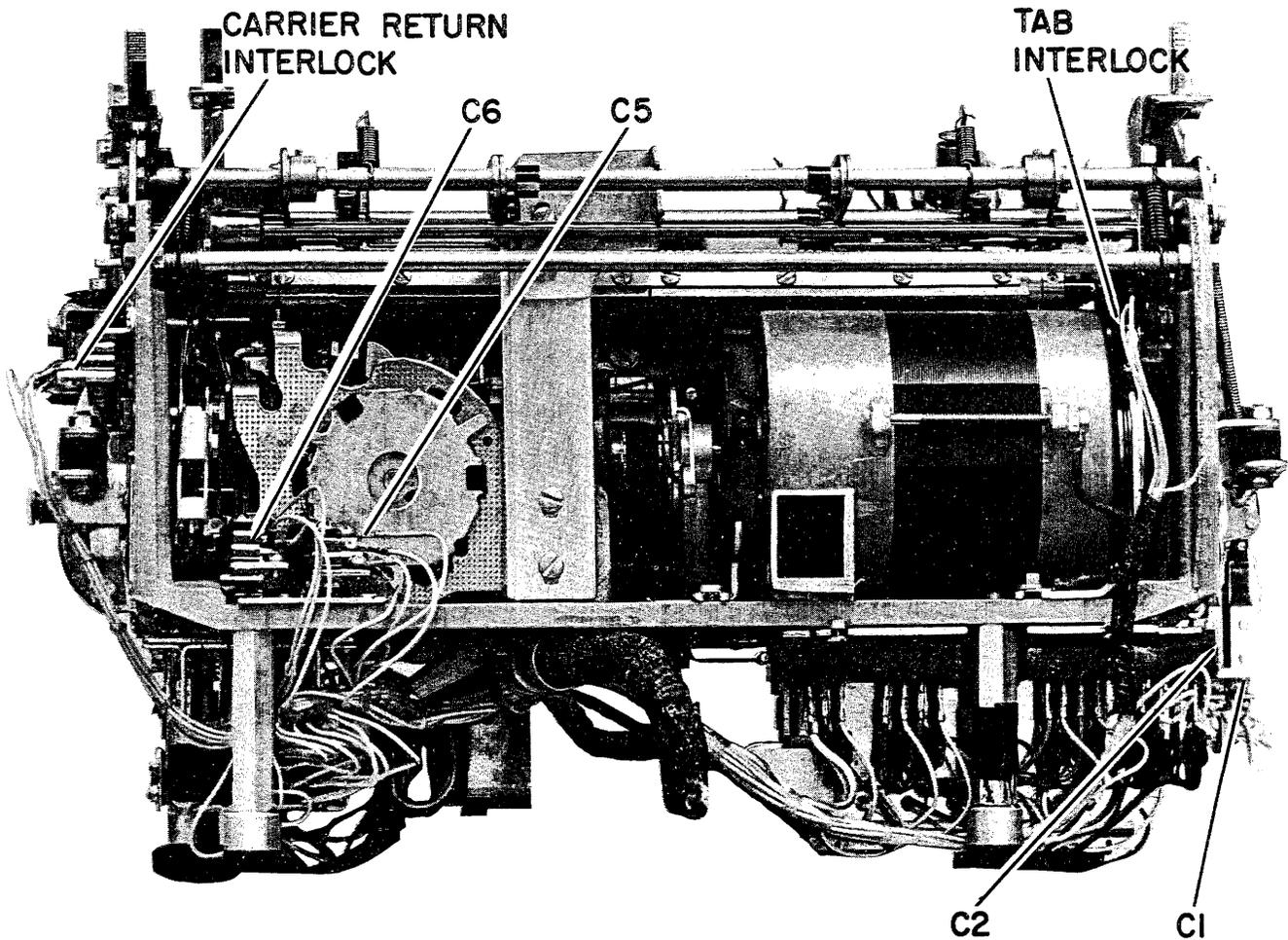


FIGURE 11. Rear View Showing Contact Location

## INSPECTION PROCEDURE

<u>Inspection Period</u>	<u>Inspection Area</u>
1	Cycle Clutch Tilt Mechanism Ribbon Feed Mechanism
2	Impression and Alignment Rotate Mechanism Detenting
3	Selection Magnet Units Cycle Clutch Unlatching Operational Magnet Units Pusher Unit Contact Cleaning
4	Escapement Motor Drive and Carrier Return Indexing and Paper Feed Shift (Enter Mechanism)

### FIRST INSPECTION PERIOD

#### CYCLE CLUTCH

1. Latch height: Measure with #3 scribe line on Hoover-ometer.
2. Cycle shaft collar: The cycle clutch should begin to slip approximately 15° before the check pawl detents. Hand cycle the machine, using a -5 rotate, 0-tilt character.
3. Nylon stop: Adjust for four degrees rotation or overthrow when the cycle shaft is latched home.
4. Shaft end play: .001" - .003".
5. All gears: Minimum play, no binds, screws tight.
6. Print-shaft timing: The keyway should be toward the dowel pin on the carrier.

#### TILT MECHANISM

1. Check the tilt motion: Use T0 and T3.
2. Check the tilt detenting: Use a T3 character and half-cycle the machine. Place a slight pressure on the rear of the tilt ring. Remove the detent, and allow it to return slowly. The ring should move no more than .005".

#### RIBBON FEED MECHANISM

1. A -5 rotate, 1-tilt character should strike the ribbon 1/16" from the bottom in the high lift position.
2. Check for enough tension of the ribbon-feed mechanism-ratchet-brake springs to hold the ribbon ratchets in a rotated position, to overcome positively the action of the centering spring.
3. The ribbon-feed pawl should hold the reversing interposer within .005" - .010" of its total travel with the ribbon-feed cam on its high point and the ribbon mechanism set for a reversing operation. Positive two-tooth feed plus .010" overthrow should result.

## SECOND INSPECTION PERIOD

### DYNAMIC CHECK

1. a. Move the roller to the top of the compensator.  
b. Repetitively type minus-five selections. The roller should return to the compensated position. If wear has caused the compensator roller to drop almost to the bottom of the slot, half-cycle a -5 character. Tilt the machine up on its back. Raise the nylon wedge manually, and tighten the rotate link until there is 1/16" travel left in the nylon wedge. Tighten the nuts on the rotate link. Note: The compensator nylon wedge must be clean and free of oil. If it does not drop easily, or appears to be oily or dirty, flush the wedge with cleaning fluid and wipe dry.
2. The general condition of all selection and outout-motion adjustments can be checked by making a complete strike-up of the keyboard. Type back over it several times, watching for signs of misalignment with the previously typed characters. If alignment is not satisfactory, the need for closer inspection can be met by observing the dynamic detenting action of the typehead.

Manually half-cycle the following selections one at a time, and observe the latches:

0-rotate, 1-tilt character  
-5 rotate, 1-tilt character  
+1 rotate, 0-tilt character  
+2 rotate, 0-tilt character  
+3 rotate, 0-tilt character

These characters allow each latch to be checked individually. Observe that the selected latches clear the bail fully, and do not snap off. Observe that the nonselected, or operated, latch seats fully on the bail, does not jump off, and makes the correct selection.

### IMPRESSION AND ALIGNMENT

1. The rotate and tilt tapes must be free from kinks and nicks.
2. Check for binds or excessive play in the tilt and rotate detents with respect to their guides. Check the tilt ring in relation to its pivots, and the upper ball socket with respect to the tilt-ring spacer.
3. Check for smooth compensator action.  
Static check:
  - a. Half cycle a -5 selection with the typehead removed.
  - b. Pull the rotate arm out until it is completely removed from the compensator leaf spring.
  - c. Release the rotate arm. This should cause the leaf spring to collapse against the power frame.

### ROTATE MECHANISM

1. Half-cycle a 0-rotate, 3-tilt character and observe the detenting. Follow the same procedure for a +5 rotate, 3-tilt character, a -3 rotate, 3-tilt character, and a -5 rotate, 3-tilt character.

The variance in bandwidth of these characters should not exceed .030".

Note: Check as follows. Half-cycle the character and remove detent from the head. Take the play out of the head in a clockwise direction. Allow the detent to return slowly, and observe the point the detent strikes or enters the skirt. Bandwidth equals the difference between the best and worst character.

## DETENTING

1. Print-shaft timing: The detent must enter and leave the head without hitting the skirt. Check by manually half-cycling. Use a -5, home, and a +5 character.
2. The skirt clearance should be .025" - .035" in a 2-tilt position. When both detents are engaged fully in their respective notches, there should be .001" minimum motion of the detent-cam follower with respect to the detent lever.

## THIRD INSPECTION PERIOD

### SELECTION MAGNET UNITS -- SCOPE PROCEDURE

1. Check the pick times of all magnets by observing (on an oscilloscope) the voltage rise across a 10-ohm, 1/2 watt resistor (part 321271) in series with the individual magnet coils, when a 48-volt pulse is applied to the coil. All pick times must be ten milliseconds or less, with the exception of U.C. shift magnet, red ribbon shift magnet and the keyboard-lock solenoid. The U.C. shift magnet and red ribbon shift magnet armatures must seal within 12 milliseconds maximum and the keyboard lock solenoid must pick in a maximum of 55 milliseconds. See Figure 13 for wave form of magnet pick time.

Pick-time readings are the best indicator of magnet performance. High pick times foretell adjustment discrepancies, wear, or sluggishness. They are often evidenced by noticeable machine slowness when repeat operations are performed. Note the following items when high pick times are encountered:

- a. With the armature manually attracted, an armature-to-yoke clearance of .001" - .006" is necessary to prevent an armature from rocking on the yoke. Carefully check the pivot points for wear (pivot plate adjustment).
- b. Except in the case of the operational magnets, the armature stops are to be adjusted for a .004" - .008" armature-to-yoke clearance. This clearance must be maintained to prevent permanent residual effects in the armature.
- c. In no case should an armature rock on the core.

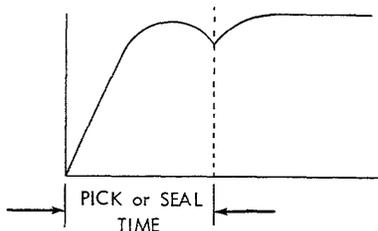


FIGURE 13. Waveform of Magnet Pick Time

## CYCLE CLUTCH UNLATCHING

1. Positive unlatching of the cycle clutch must occur when each armature is operated by hand, with the latch overthrow .002" - .007" (old style trip mechanism). On the spring-loaded (new style) trip mechanism, overthrow (with an armature operated) should measure .005" - .020" between the trip lever and the latch lever. Check to insure that the K.O. eccentrics do not choke off the armature travel (K.O. eccentrics should clear trip bail extensions by .003" - .008" with armatures manually attracted).
2. Check for .005" - .010" vertical clearance between the selection-armature latching surface and the pushers, and for .001" - .010" horizontal between the tip of the pushers and the armatures.
3. The trip bail pivot eccentrics must allow equal motion to be transmitted from the T2 and R5 armatures to the trip link. The eccentrics must be in the upper sphere of their adjustment to prevent binding.

## OPERATIONAL MAGNET UNITS

1. When an armature is operated, the armature pull-link adjustment should allow for positive interposer tripping with .002" - .010" overthrow clearance between the interposer and the pawl guide plate at the point of unlatching.

## PUSHER UNIT

1. Both latch-pusher cam-follower rollers must contact the cams on the selector cam shaft throughout a cycle.
2. Check the individual pusher-to-latch extension clearances. Clean all operational circuit-breaker contacts, and check for pitting.

## CONTACTS

1. The operational transmitting contact latches should be flush with the end of the contact-strap stop (interposers latched), and should have .005" - .015" clearance between the contact-strap stop and the latch (interposers unlatched).
2. There should be .002" - .010" clearance between the print-feedback O/S's and the low point of the feedback cams.
3. The tab interlock microswitch should move at least .031" after the switch has transferred when the tab torque bar is moving toward its rest position. The switch must remain transferred during tabulation and must transfer before the backspace cam reaches its high point.
4. The carrier-return-interlock (normally-open) strap should rise a minimum of .010" off its support terminal with the carrier-return-clutch latch latched.
5. Check the timing and air-gap adjustments on all contacts. All transmitting and checking contacts should have:
  - a. .020" air gap except the shift which is .040".
  - b. All circuit-breaker contacts and interlocks should have a .040" air gap.

## CONTACT CLEANING

Caution: Under no condition should contact files, burnishing blades or similar tools be used to clean contacts in this machine.

To clean the contacts, use IBM Contact Cleaner and clean bond paper.

## FOURTH INSPECTION PERIOD

### ESCAPEMENT

1. The carrier should escape smoothly and positively throughout the full length of the writing line and through the right-hand margin under letter escapement, spacebar operation, and tabulation.
2. Check for frayed or loose transport cords.
3. Tension should be maintained on the right-hand transport pulley to maintain its mounting parallel to the power frame. Its outside flanges should be 1-7/32" from the right-hand outside surface of the power frame.
4. The line-gage holder must clear the platen at all points, and not impede carrier motion.
5. A minimum of .010" clearance should exist between the carrier-return shoe and the spring-clutch. Note, however, that excessive clearance can result in erratic carrier-return motion.
6. Check for 1/2-3/4 pounds of mainspring tension measured at the carrier as it escapes through the linelock load at the extreme right-hand margin.
7. Check for .002" - .004" backlash of the tab governor and carrier-return pinion gears with the escapement gear.
8. Letter escapement should occur as soon after print as possible.
9. The trigger guide should disengage the trigger from the escapement-torque-bar arm when the escapement pawl has cleared the rack by .010" - .015". Both the letter-escapement and the spacebar operation should allow .005" - .010" excess motion after the trigger has disengaged the trigger from the torque-bar arm.
10. When operated, the tab lever should overthrow the tab-lever latch by .005" - .010" without being choked off by the tab torque-bar lockout lug or backup eccentric, and without overthrowing into the tab rack. Observe the operation at both ends and the middle of the torque bar. Dynamically check for tab failures using five irregularly set tab stops for at least five columns.
11. Check to make sure that the carrier-return operation unlatches the tab when both operations occur simultaneously.
12. With the backspace operated manually, the escapement pawl should just fail to get a new tooth on the escapement rack.
13. There should be a clearance of .005" - .015" between the front of the backspace pawl and a tooth of the backspace rack (with the carrier at rest).

14. Overthrow clearance of .010" - .020" is required between the interposer pawls and the operational-latch bracket when the operational cams are on their high point.

### MOTOR DRIVE AND CARRIER RETURN

1. Check for adequate tension of the motor-pulley belt, or for a frayed or noisy belt.
2. The selector and operational cam shafts, and the print and filter shafts, must have .002" end play.
3. There must be freedom from binds in the idler gear train with minimum backlash.
4. With the carrier-return cam on its high point, the carrier-return arm should overthrow its keeper by .020" - .030".
5. The carrier-return brake shoe should cause the carrier-return spring clutch to drive the carrier no later than when the escapement pawl clears the last one-third of the escapement rack tooth. The clutch shoe should overlap the last three coils of the spring clutch.
6. The carrier-return unlatching link must positively unlatch the carrier-return latch at the left-hand margin with .005" - .010" overtravel when the margin-rack overbank is set.
7. The escapement pawl must not drag the escapement rack during carrier-return operations.
8. Measure one-half to one pound tension of the shock unloader at the left-hand margin while unlatching the carrier-return keeper-latch arm.

### INDEXING AND PAPER FEED

1. Check for .015" - .030" clearance between the platen ratchet and the index pawl, at rest.
2. Index operation should result in one full-tooth motion of the index pawl with respect to the platen ratchet (in single-linespace position) and two full-teeth motion with no evidence of hesitation or drag (in the double-linespace position).

### SHIFT

Check the cam and spring for rust. Turn power on, and hold the shift ratchet (grey section). Release the ratchet by pressing the magnet. Allow the ratchet to rotate slowly while holding down on the magnet. The shift cam should stop at a fully detented position for each 180° operation. The white nylon roller should seat fully in cam notch.

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## ADJUSTMENT THEORY

### MOTOR AND DRIVE

1. Drive Belt - Adjust the motor mounting brackets forward or back to obtain a minimum amount of belt noise.

Both ends of the motor must be adjusted the same in order to maintain the rotor shaft perpendicular to the drive belt.

The belt must never be so loose that jumping cogs on the motor pulley is a possibility. Check by operating the shift mechanism while holding the carrier with the carrier return in operation. This loads the motor to a point where failure will be most probable.

2. Motor Pulley - Adjust the motor pulley left or right so that the drive belt rides fully on the teeth of both pulleys without rubbing the flange of either. Position the retaining clip for .005" to .015" end play.
3. Motor Clutch Pawl Stops (Fig. 1) - Form for a clearance of .010" to .020" between the clutch pawl tip and pulley ratchet when the pulley is manually rotated.

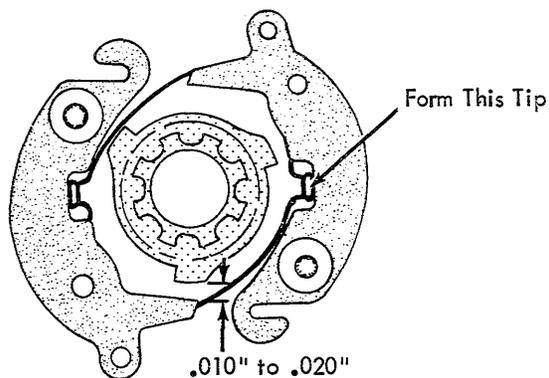


FIGURE 1. Motor Clutch Pawls

4. Idler Gears - Adjust the idler gear studs so that minimum backlash is present between mating gears. The mechanism must be free of binds throughout 360° rotation of the gears.

Minimum backlash is necessary to prevent erratic operation of the drive train and to insure minimum overthrow of the driven shafts.

The lower idler gear must be adjusted first because the upper idler gear is adjusted to the final position of the lower gear.

**CAUTION:** After any removal and replacement of the left hand cycle shaft bearing, the mesh of the lower idler gear must be checked. The lower idler gear stud is mounted to the bearing plate; therefore any slight rotation of the plate will affect the gear mesh.

### Selection Mechanism

5. Latch Bail Shaft - Adjust the plate that supports the right end of the bail shaft so that the bail shaft is parallel to the cycle shaft.

This adjustment is extremely important because the rollers on the latch bail **MUST** contact their respective selector cams at the same point and with the same pressure in order to insure that both cams operate the bail together.

The bail shaft is set at the factory and should not require a readjustment unless the plate becomes loosened or parts replacement is necessary. This is a difficult adjustment to make and should not be loosened unless absolutely necessary.

The bail shaft plate must be adjusted both vertically and horizontally in order to make the rollers of the latch bail ride their respective cams equally. Changing either the vertical or horizontal position will affect the other; therefore both adjustments must be considered together and adjusted alternately until both are correct. If a readjustment is necessary, the following procedure may be used.

- a. The correct vertical position is obtained by raising or lowering the bail shaft mounting plate until both bail rollers have equal pressure against their respective cams. Check by testing the drag on strips of paper inserted between the rollers and the cams.
- b. The front to rear position of the bail shaft plate can be set relative to the cycle shaft. Set the Hooverometer to span the distance between the cycle shaft and the left end of the bail shaft as illustrated in Fig. 2. Move the Hooverometer to the right and adjust the bail shaft plate forward or back to the same clearance as at the left side. With the bail shaft parallel to the cycle shaft, the bail rollers should be contacting their respective cams at the same point.

**NOTE:** As a final check for the adjustment of the latch bail plate, hand cycle the machine using a zero rotate, zero tilt character (all latches removed from the bail). Both latch bail rollers should maintain contact with their respective cams throughout the cycle.

**CAUTION:** On early level machines the cycle bail stop and the character interrupter must be readjusted after any change in the position of the bail shaft plate, because both of these parts are mounted on the plate.

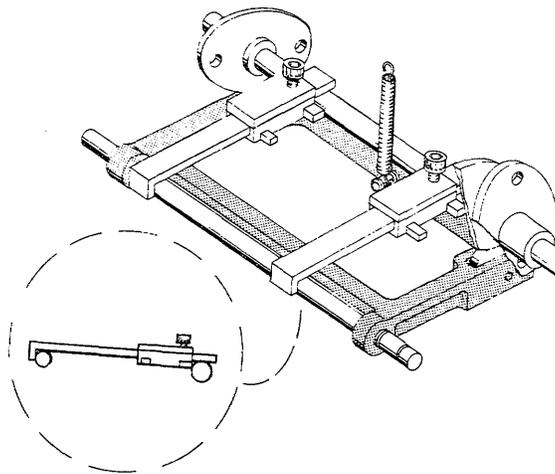


FIGURE 2. Latch Bail Shaft Plate Adjustment

## 6. Differential Guides

- a. The rotate and tilt differential guides should be adjusted left or right so that the vertical links of the two systems hang in a true vertical position (Fig. 3).

The guide for the rotate differential is attached to the top of the differential mounting bracket by two screws just behind the balance lever. The screws are accessible from the rear with the motor removed.

The tilt differential guide is attached to the bottom of the differential mounting bracket and is easily accessible from beneath the machine.

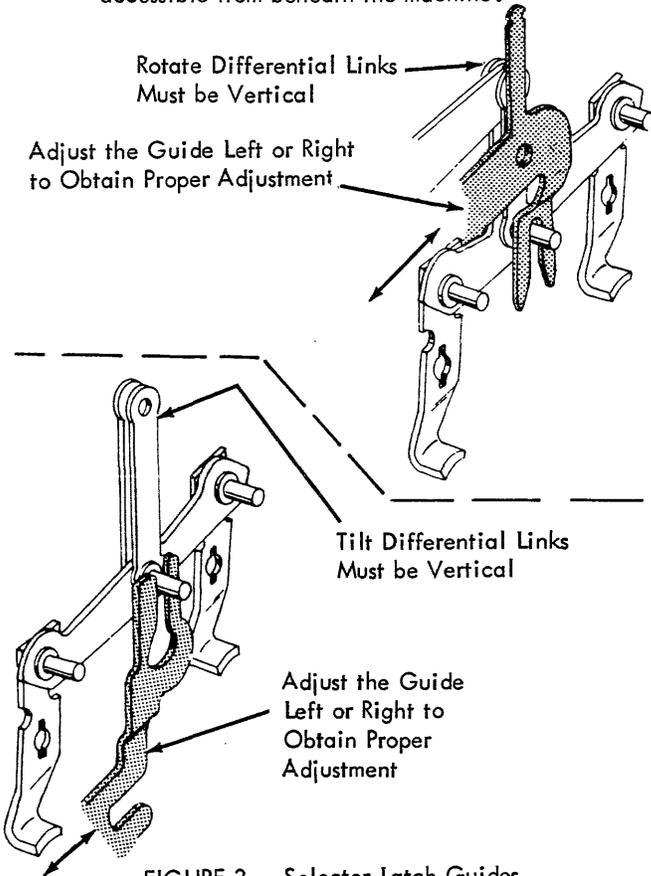


FIGURE 3. Selector Latch Guides

- b. The latch bail guide should be adjusted left or right so that all positive rotate and tilt selector latches hang vertically in the latch bail. The guide is attached to the lower left corner of the differential mounting bracket (Fig. 4).

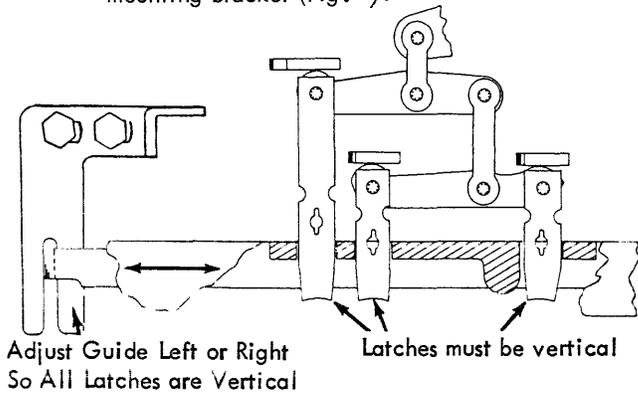


FIGURE 4. Latch Bail Guide

7. Latch Bail Stop - The latch bail stop (Fig. 5), located just beneath the bail, prevents the bail from getting beneath the selector latches. Adjust the stop to clear the latch bail by .005" to .015" when the bail is at the high point of the cycle shaft cams.

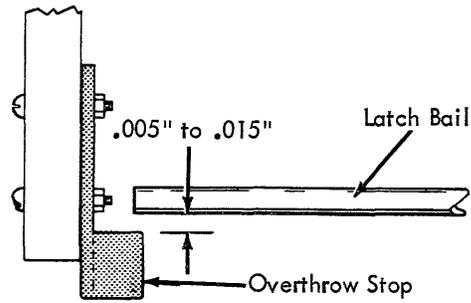


FIGURE 5. Latch Bail Overthrow Stop

NOTE: Excessive clearance will allow the bail to overthrow at the high point of the cams. During the overthrow it is possible for the latches to get on top of and bind off the bail.

8. Selector Latch Link - With the machine at rest adjust the negative 5 latch link so that the negative 5 latch will overlap the stop screw head by .050" to .060" (Fig. 6).

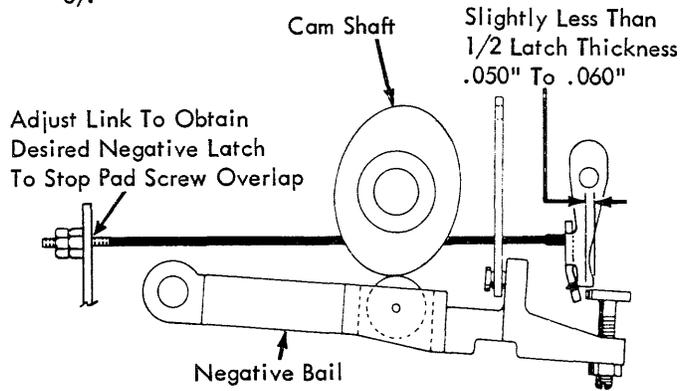


FIGURE 6. Negative Latch Link

Adjusting the link too short can result in erroneous selection because the latch will not have a secure bite on the negative-five stop screw. The force of operation could cause the latch to slip off part of the way through a cycle and cause a noisy operation as well as erroneous selection.

## LATCH PUSHER ASSEMBLY

### NOTE:

- Do not remove pusher plate unless replacement of the plate is required.
- The selector latch link adjustment (Fig. 6) must be correct before making the pusher to latch extension adjustment.
- When removal of the Latch Pusher Assembly is required, scribe (for reinstallation reference) the pusher plate to powerframe relationship. If the original relationship can be maintained, the adjustments will not have been destroyed by removal. In case of loss of relationship, position the pusher

plate as nearly as possible for the prescribed latch to pusher clearances (Fig. 8).

1. Pusher Bail Eccentrics (Fig. 7) - Adjust so that the top edge of the follower arms are flush with the pusher bail.

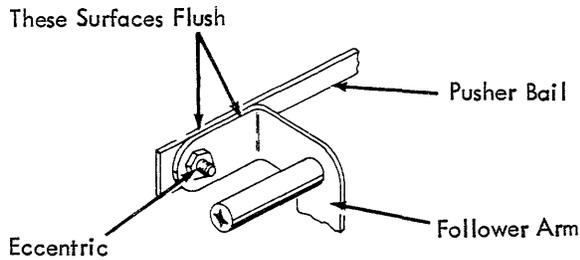
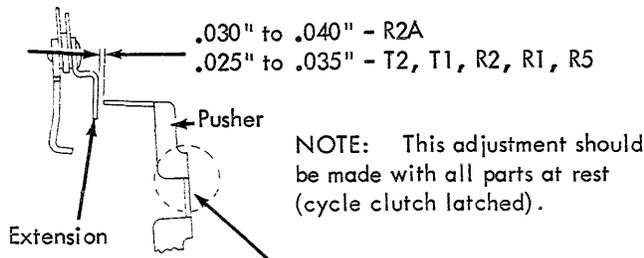


FIGURE 7. Pusher Bail



Form Within Circled Area

FIGURE 8. Latch Pushers

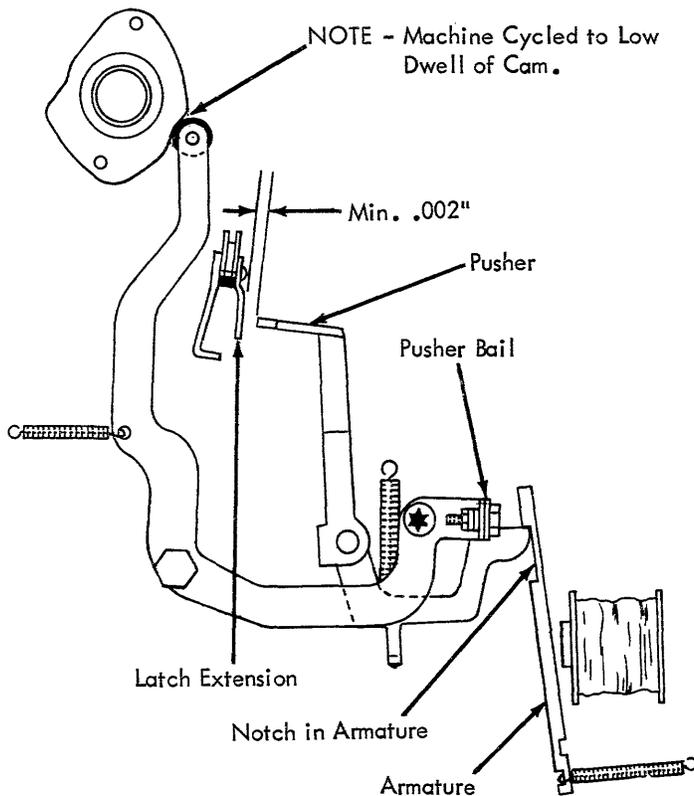


FIGURE 9. Pusher Clearance

2. Latch Pushers T2, T1, R2, R1, & R5 (Fig. 8) - Form to clear their respective latch extensions by .025" to .035".
3. Latch Pusher, R2A (Fig. 8) - Form to clear latch extension by .030" to .040".

Malselection may be caused by the latch pushers contacting their latch extensions when an unselected pusher is against its armature. There should be a minimum of .002" clearance (Fig. 9) between the pusher and the latch extension when the pusher is against its armature. To check this adjustment, turn machine power off, trip the cycle clutch, and hand cycle a few degrees through a cycle. The pusher cam follower should be on the low dwell of the pusher cam.

#### PRINT SELECTION MAGNET ASSEMBLY

##### NOTE:

For complete adjustment, the magnet unit should be removed. To prevent interference from the trip bail, turn the high points of the pivot eccentrics to the top.

1. Pivot Plate (Fig. 10) - Adjust for a clearance of .001" to .006" between the yoke and armatures with the armatures manually attracted. Measure clearance of the outside armatures (T2 & R5).

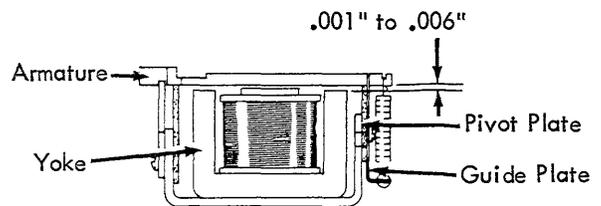
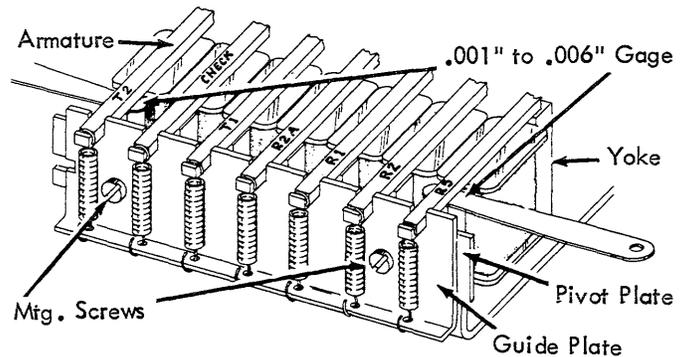


FIGURE 10. Pivot Plate

2. Guide Plate (Fig. 10) - Position as follows:
  - a. Vertically - to provide equal spring tension on all armature springs.
  - b. Horizontally - so that all armatures are centered in the guide slots.

3. Armature Stop - With the armature manually attracted, adjust for a clearance of .004" to .008" between the armatures and yokes (Fig. 12 - see Fig. 11 for assembly end view). Measure clearances at the outside armatures (T2 & R5).

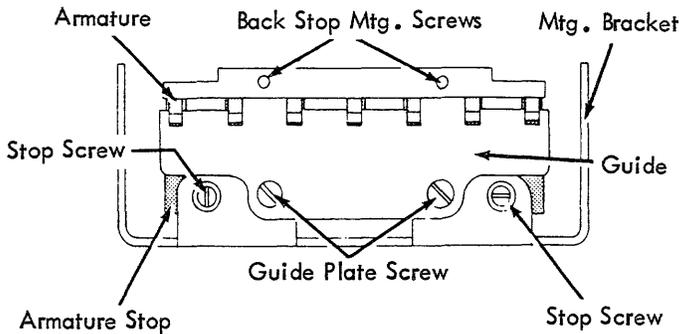


FIGURE 11. Armature Stop

4. Armature Guide - Position horizontally so that the armatures are centered in the guide slots (Fig. 11).

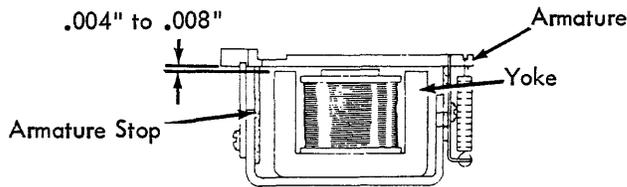


FIGURE 12. Armature Stop

5. Back Stop (Fig. 13) - Position vertically (with armatures at rest) for a clearance of .041" to .044" between the armature stop and armatures. Measure clearance at the outside armatures (T2 & R5).

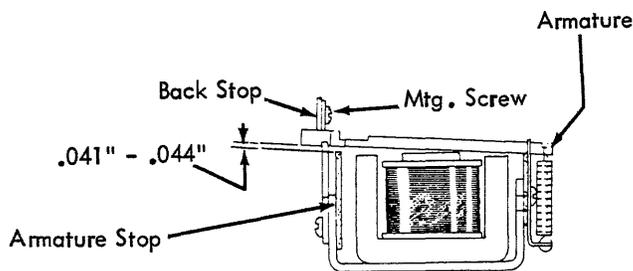


FIGURE 13. Armature Backstop

6. Pivot Eccentrics (Fig. 14) - Adjust so that the cycle clutch trip bail is parallel to the armatures. The following procedure may be used:

- a. Disconnect the trip link (Fig. 18).
- b. Apply slight pressure to the knockoff extension (Fig. 17) or trip link extension to hold the bail in contact with the armatures.
- c. Apply slight pressure to the T2 and R5 armatures (Fig. 10). Both armatures should be touching the trip bail. If not, adjust the pivot eccentrics to satisfy this condition.

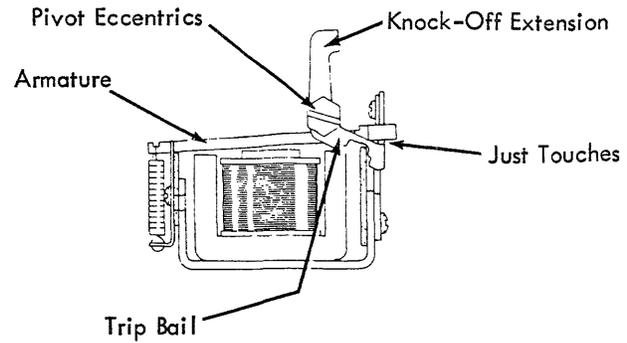


FIGURE 14. Pivot Eccentrics

NOTE: The high point of the pivot eccentrics must be toward the top (paper feed area) of the machine. If the pivot eccentrics are not positioned to the top, the print magnet armatures will contact the trip bail too soon, causing sluggish operation or failure to trip the cycle clutch.

- d. After completing step c, while holding the trip bail against the armatures, check the center armatures to be sure they are touching the trip bail or clear it by a maximum of .002". Excessive clearance can cause extra cycles.

NOTE:

Item 6 is a preliminary adjustment. For final adjustment, see note under Item 3 of cycle clutch trip mechanism.

7. Magnet Unit (Fig. 15) - Position under its two mounting screws for .005" to .010" clearance between the pusher tails and armature latching surfaces (armatures at rest).

This adjustment insures that the pusher does not contact its latch extension when the pusher is against its armature during a print cycle. If allowed to touch mal-selection will result.

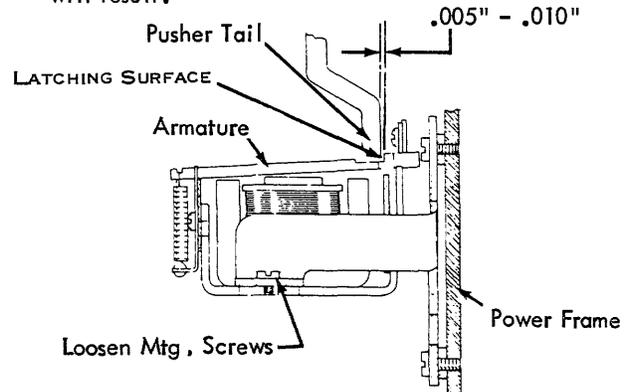


FIGURE 15. Magnet Unit Position

8. Mounting Bracket (Fig. 16) - Position under its four mounting screws for .001" to .010" clearance between the pusher tails and armatures.

NOTE:

Adjustments 7 & 8 are interacting - both requirements must be satisfied.

Excessive clearance may cause mal-selection since the armature may not hold the pusher tail when the magnet is not energized.

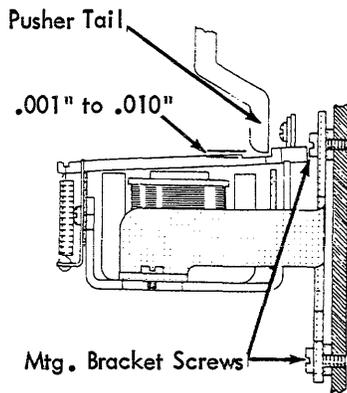


FIGURE 16. Mounting Bracket Positions

No clearance (the pusher holding the armature away from rest) can cause mal-selection since the pusher may not be released when the armature is attracted by its magnet. Also extra cycles may result since the armature at rest would be holding the cycle clutch trip bail partially rotated.

9. Knock Off Eccentrics (Fig. 17) - Adjust (T2 and R5 armatures manually attracted) to clear the trip bail extensions by .003" to .008".

Excessive clearance will cause extra cycles due to the armatures not being knocked off. It is necessary to knock off the armatures since residual magnetism is present.

No clearance will cause failure to cycle because the trip bail will not be able to rotate to trip the cycle clutch.

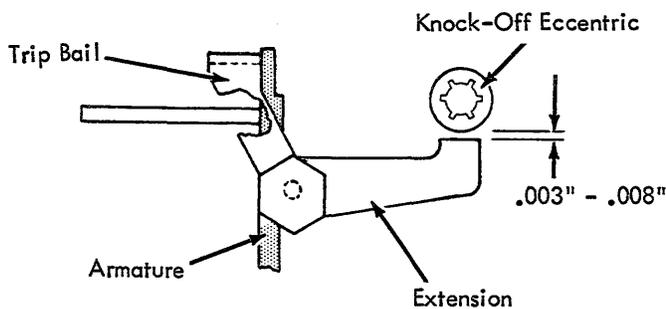


FIGURE 17. Knock Off Eccentrics

#### CYCLE CLUTCH TRIP MECHANISM

1. Latch Stop (Fig. 18) - Position so that the latch lever overlaps the trip lever lug by .040" to .045"

Insufficient "bite" could cause extra cycles since the trip lever may slip off the latch lever.

Excessive "bite" may cause failure to cycle since there is a limited amount of motion available from the armatures to pull the latch lever down.

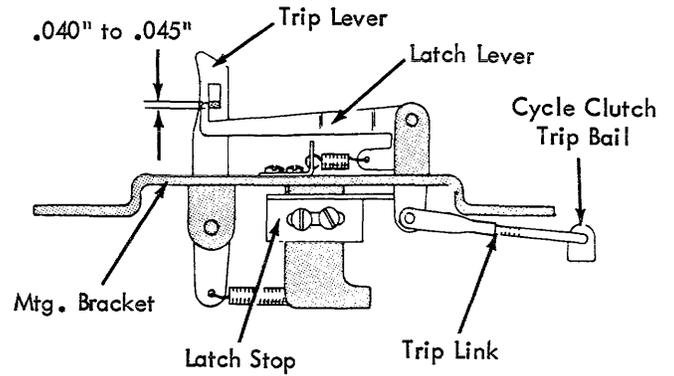


FIGURE 18. Latch Lever

2. Mounting Bracket (Fig. 18) - Position front to rear so that the cycle clutch latch has a .030" to .035" bite on the sleeve (Fig. 19).

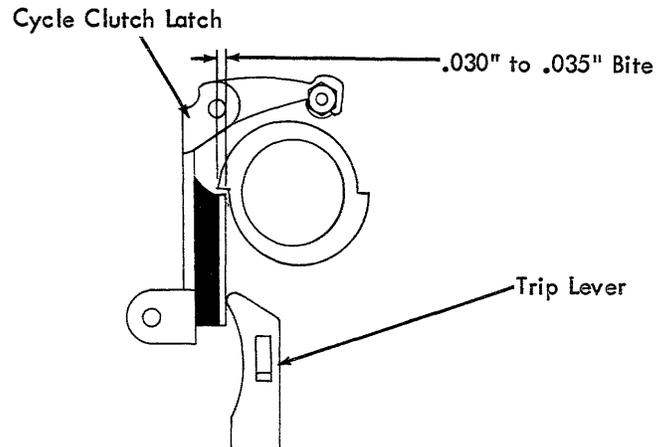


FIGURE 19. Mounting Bracket Positions

#### NOTE:

Be sure the restoring roller is not touching the restoring cam.

Excessive bite may cause sluggish release. Insufficient bite may cause extra cycles.

3. Trip Link Clevis (Fig. 18) - With either the T2 or R5 armature manually attracted, adjust the clevis so that the latch lever clears the trip lever lug by .005" to .020" (Fig. 20).

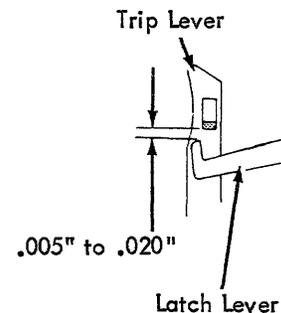


FIGURE 20. Trip Link Adjustment

**NOTE:**

If necessary, refine the pivot eccentric adjustment to obtain equal latch lever overthrow from the T2 and R5 armatures (Fig. 14). Adjustment No. 6, Page 1-4.

4. Cycle Clutch Latch Restoring (Fig. 21) - Position the restoring roller so that the trip lever overthrows the latch lever by .005" to .010" at its latching point on the low side of the restoring cam.

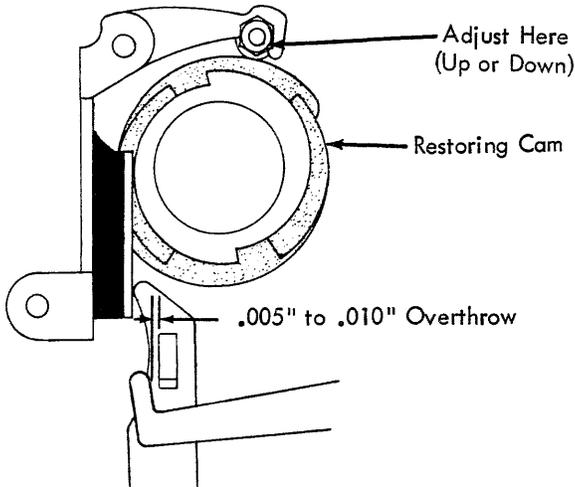


FIGURE 21. Restoring Roller

5. Cycle Clutch Latch Inhibitor (New) :

- a. Adjust the inhibitor trip lever (Fig. 22) so that the bottom edge of the inhibitor pawl is flush with the bottom edge of the cycle clutch latch (Fig. 26) with all parts at rest.

This adjustment provides an adequate "bite" between the cycle clutch latch and inhibitor pawl to prevent extra cycles.

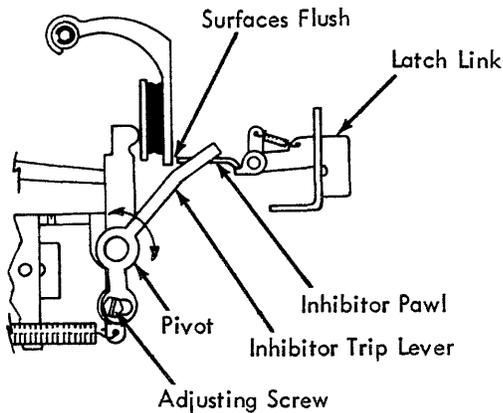


FIGURE 22. Inhibitor

- b. Position the inhibitor pawl mounting bracket front to rear for .030" to .035" between the front side of the cycle clutch latch and the inhibitor pawl (Fig. 23).

**CAUTION:** The R5 latch link adjustment should be checked after any change in the position of the inhibitor pawl mounting bracket.

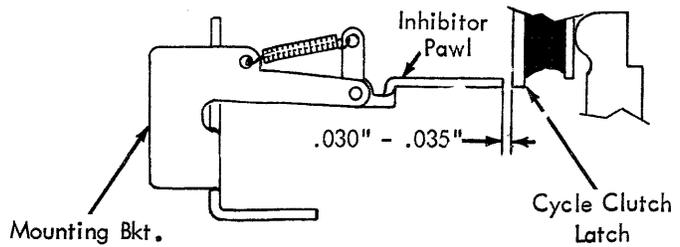


FIGURE 23. Inhibitor Pawl Mounting Bracket

**PRINT FEEDBACK CONTACT ASSEMBLY, C2**

1. Form the N/C support so that the O/P lifts the N/C contact .002" to .005" from the N/C support (Fig. 24).
2. Position the contact mounting bracket so that the O/P's clear the cam (at the low point) .002" to .010" (Fig. 24).

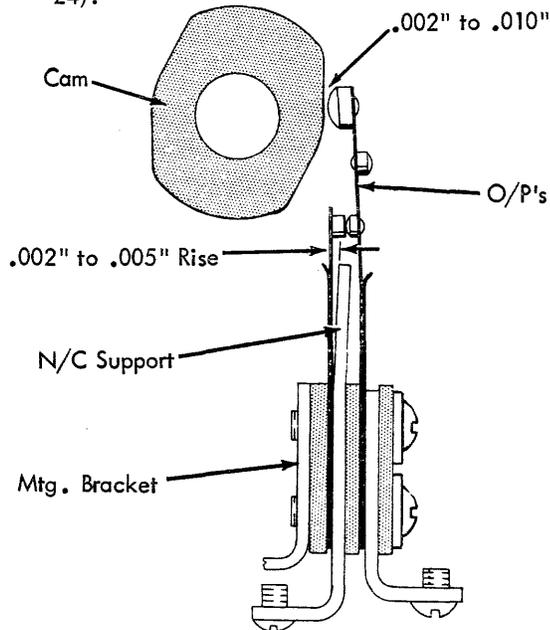


FIGURE 24. Print Feedback Contact C-2

The following Timing Chart is laid out using a 0° reference point. To use 180° as reference add 180° to the make and break times.

MACHINE	C-2 N/C	
	BREAK	MAKE
1447	20° ± 5	120 ± 5
1052	20° ± 5	120 ± 5
1053	20° ± 5	120 ± 5
1062	20° ± 5	120 ± 5

FIGURE 25. TIMING CHART

CONTACT	N/C DURATION	COLOR
C-2	80°	White
C-2	70°	Orange

FIGURE 26. CAM CHART

## SHIFT MECHANISM

1. Shift Cam Back-Up Roller - Adjust the back-up roller eccentric left or right so that .001" to .003" of the cam bearing extends beyond the cam (Fig. 27). The eccentric should be kept in the bottom half of its orbit.

The set screw for the back-up roller eccentric is accessible through a hole in the cam with the cam in the lower case position.

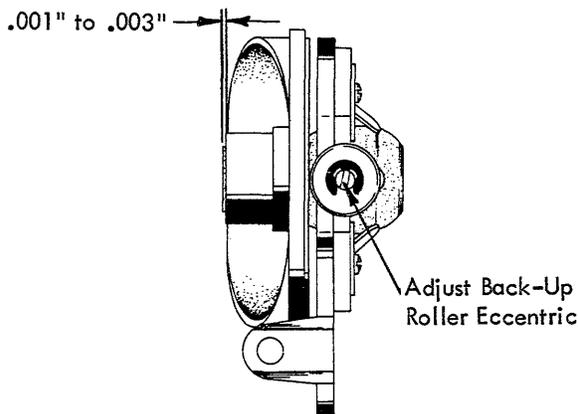


FIGURE 27. Shift Cam Back-Up Roller Adjustment

If the bearing did not extend beyond the cam, the shift clutch arbor could rub against the cam and create a noise as well as a drag on the cam when the cam was stationary.

Two problems could be created by having too much of the bearing extending beyond the cam. A gap would exist between the cam and the shift clutch arbor. This could allow a coil of the shift clutch spring to wedge into the gap and lock the machine. If the back-up roller were excessively far to the left, the cam would be forced to the left at the rear causing it to cock and bind at the pivot.

The shift clutch mechanism including the arbor should be removed in order to best observe the adjustment. Be sure that .002" to .004" end play exists in the operational shaft when the arbor is replaced.

**CAUTION:** Any change in the position of the back-up roller directly affects the typehead homing and the shift arm motion adjustments. Be sure to recheck these adjustments.

2. Shift Clutch Spring Retaining Plate - Adjust the retaining plate attached to the shift cam (Fig. 28) to satisfy the following condition. With the machine turned OFF and the shift cam detented, the shift clutch ratchet should rotate .028" to .059" when the shift release arm releases the ratchet. The rotation can be observed relative to the shift interlock (Fig. 29B). Half the distance from the center of one ratchet tooth to the next is  $\frac{3}{64}$ " or .047".

The adjustment of the retaining plate determines how much the clutch spring will be expanded when the shift mechanism is at rest. Expanding the spring too much may

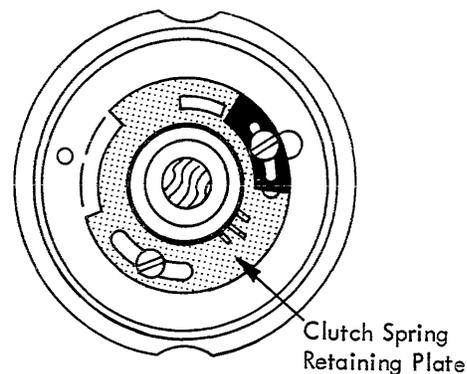


FIGURE 28. Shift Clutch Spring Retaining Plate

cause failure of the cam to reach the detented position, because the spring would be expanded too soon. Insufficient expansion would allow the clutch spring to drag when at rest creating a load on the motor and on the shift release mechanism.

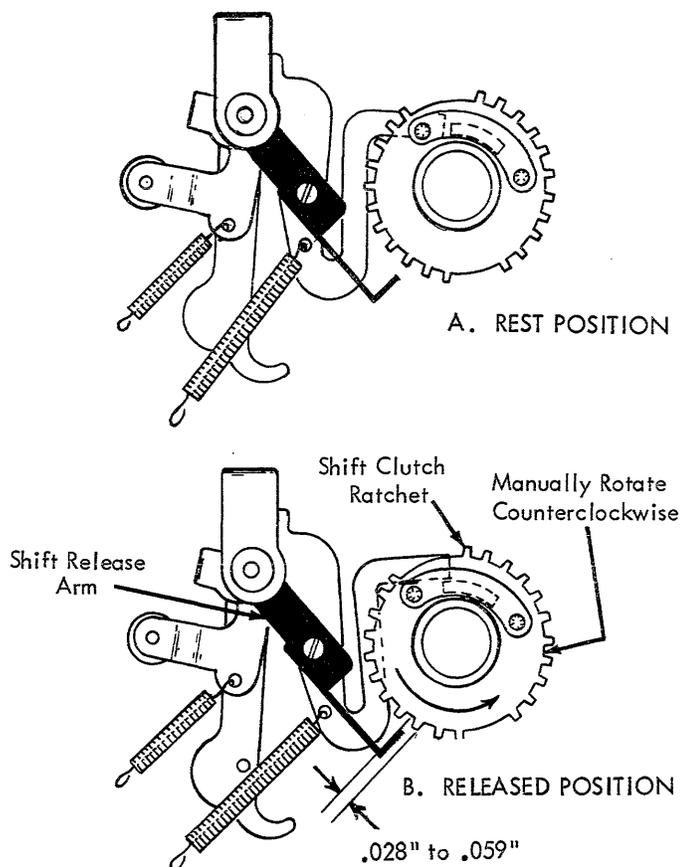


FIGURE 29. Shift Clutch Spring Retaining Plate Adjustment

**NOTE:** If sufficient adjustment cannot be obtained with the retaining plate, the right end of the clutch spring may be placed in another hole in the ratchet. The adjustment can then be refined with the plate.

3. Shift Cam Stop - Adjust the stop so that the shift clutch ratchet has .010" to .030" rotary motion between the shift cam stop and the shift release arm with the mechanism at rest (Fig. 30).

The adjustment insures that the shift cam will not be allowed to travel past the detented position.

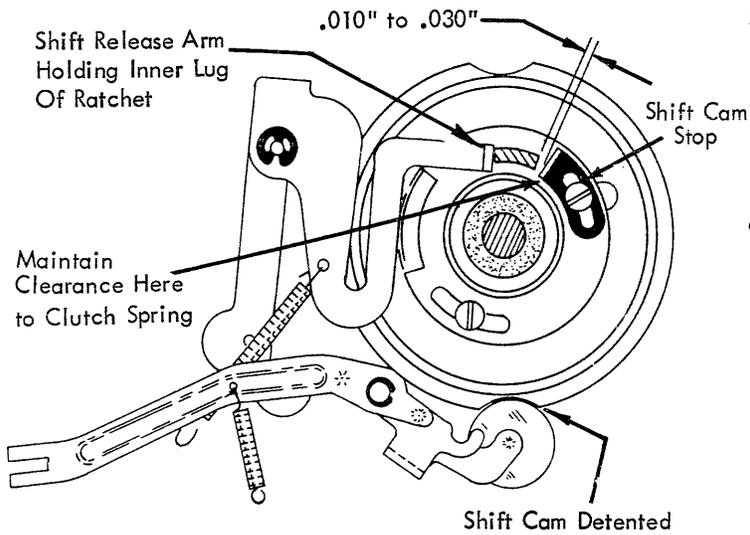


FIGURE 30. Shift Cam Stop Adjustment

NOTE: The stop should not bind against the spring clutch when the adjustment is made.

CAUTION: Be sure the cam is detented at the time the stop adjustment is checked.

4. Shift Cam Brake - The shift cam brake should be adjusted to have .035" to .040" bite on the braking rib of the cam (Fig. 31). That is approximately 1/2 the thickness of the rib.

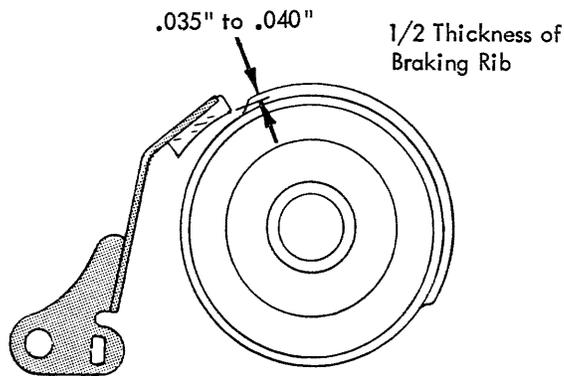


FIGURE 31. Shift Cam Brake Adjustment

Excessive braking action could prevent the cam from reaching the detented position in the lower case. Insufficient braking action would result in a noisy shift operation and expose the mechanism to possible parts breakage.

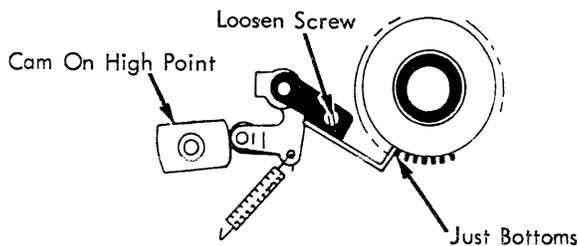


FIGURE 32. Shift Interlock

### 5. Shift Interlock

- a. With the shift interlock on the high point of the cam, adjust the interlock by its adjusting screw so that the tip just bottoms between two teeth on the shift clutch ratchet (Fig. 32).

6. Shift Interlock Cam - With the cycle clutch latched at rest and the backlash of the cycle shaft and filter shaft removed in the operating direction, advance the cam until a clearance of .040" to .060" exists between the tip of the interlock and the top of a tooth on the shift clutch ratchet (Fig. 33).

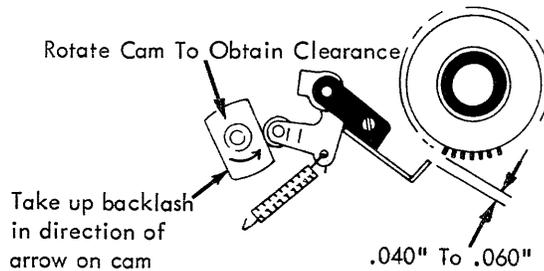


FIGURE 33. Shift Interlock Cam

### SHIFT MAGNET ASSEMBLY

NOTE: Shift mechanism adjustments must be correct before the following adjustments are attempted.

1. Hinge Plates (Fig. 34) - Position the hinge plates with the armatures manually attracted to obtain .001" to .003" clearance between the armatures and hinge plates.

This clearance insures free operation of the armature. With no clearance and oil on the two surfaces the armature would have a sluggish operation. Excessive clearance may cause slow operation due to the relationship between the magnetic field and armature.

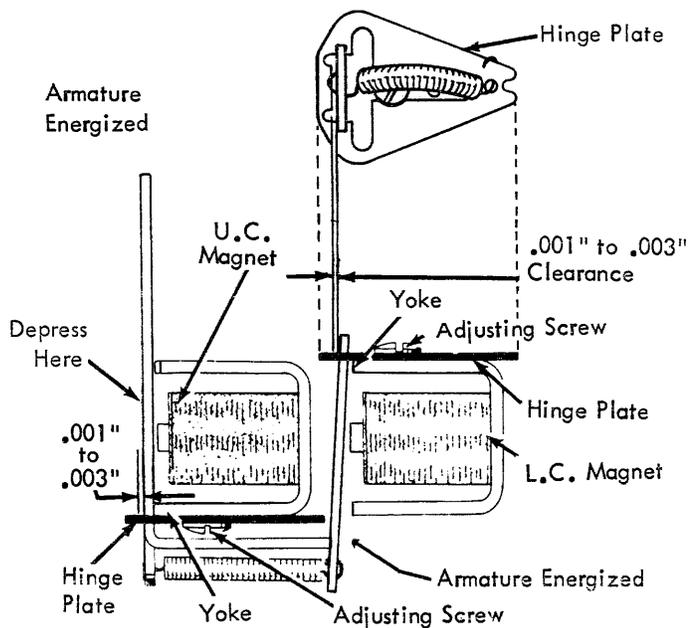


FIGURE 34. Hinge Plates

2. Armature Stops (Fig. 35) - Position the armature stops, with the armatures manually attracted, to obtain .003" to .007" between the armatures and yokes.

The adjustment insures that the armature will not touch magnet core. If an armature does touch a core it may be held by residual magnetism.

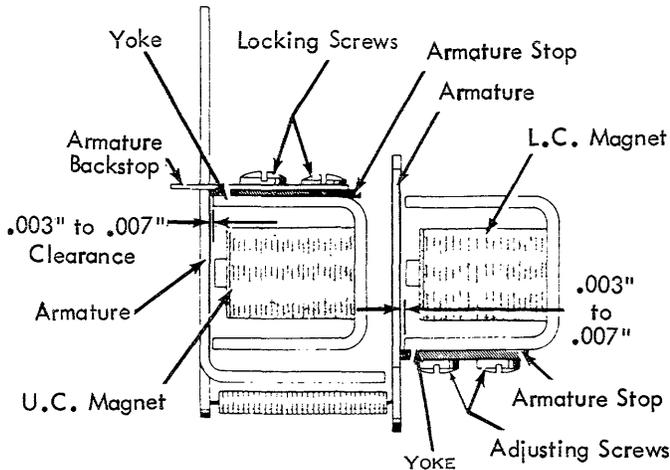


FIGURE 35. Armature Stops

CAUTION: When locking screws are loosened to make the U.C. armature stop adjustment, be careful not to disturb the armature backstop adjustment.

3. UC Magnet Assembly - Position so that its mounting screws are centered in the elongated holes with the hinge plates parallel with the assembly mounting plate.
4. LC Magnet Assembly - Position as follows:

- a. Front to Rear - LC armature (energized) clears the UC armature (at rest) by .010" (Fig. 36).

This clearance insures unlatching of the upper case armature.

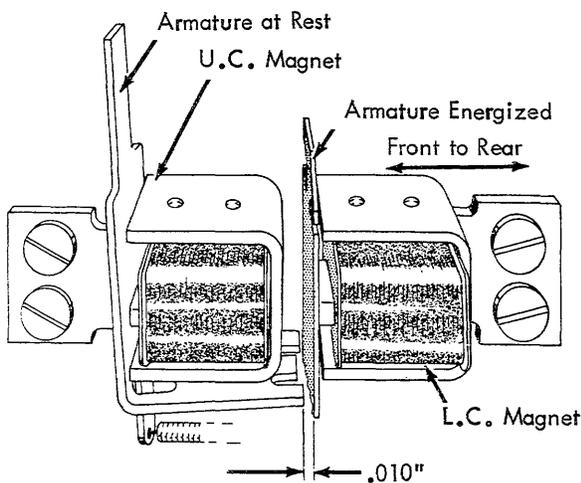


FIGURE 36. LC Magnet Assembly (Front to Rear)

- b. Up or Down - UC armature (energized) clears the LC armature (at rest) by .003" to .006" (Fig. 37).

When the upper case armature is picked the lower case armature must be able to snap forward and latch the upper case armature. If the clearance is excessive the upper case armature may move far enough to allow a shift to take place. When this happens the printer will be in lower case while the magnet assembly is latched in upper case.

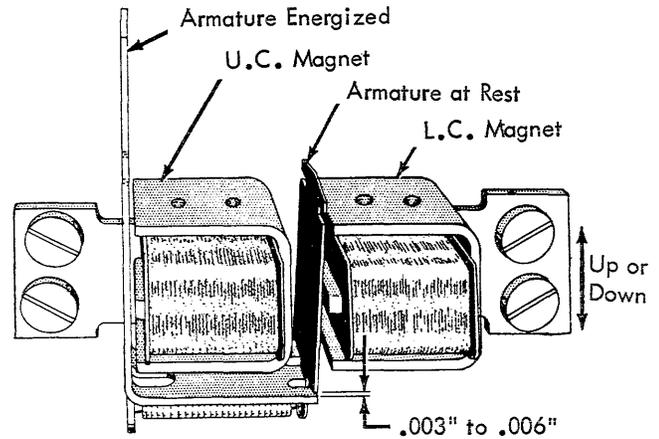


FIGURE 37. LC Magnet Assembly (Up or Down)

5. Magnet Assembly Mounting Bracket (Fig. 38) - Position the magnet assembly mounting bracket (UC armature energized) so that the release arm clears the shift ratchet lug by .005" to .015".

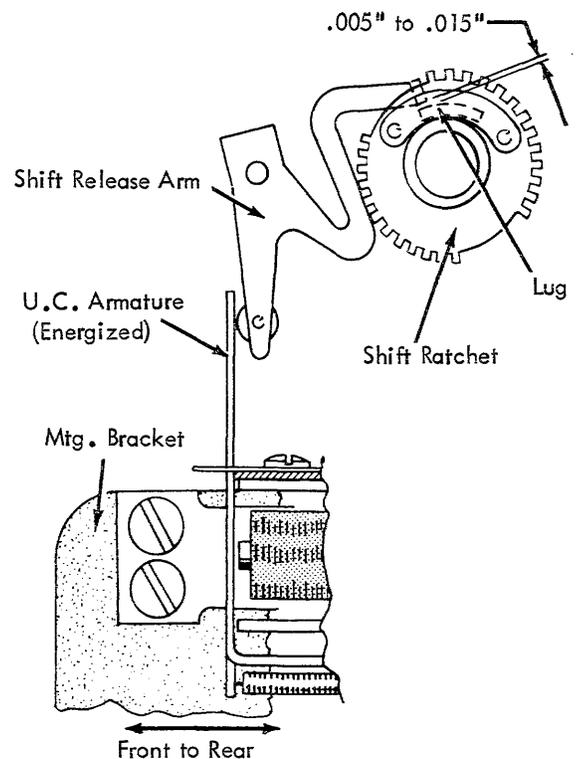


FIGURE 38. Magnet Assembly Mounting Bracket

6. UC Armature Backstop (Fig. 39) - Position (armature at rest) so that the UC armature clears the release arm follower by .002" to .008".

The clearance between the UC armature and shift release arm allows the armature to be in motion prior to picking up the load of the release arm. With no clearance the armature may fail to pick.

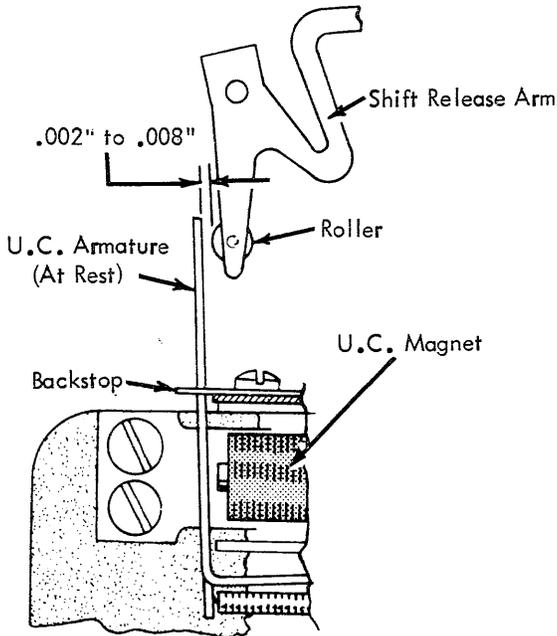


FIGURE 39. U.C. Armature Backstop

7. Shift Contact Assembly C-7 (Fig. 40) -

- a. C-7 Contact Rise - Form the N/C contact support so that the O/P lifts the N/C contact strap .002" to .005" (Fig. 40).

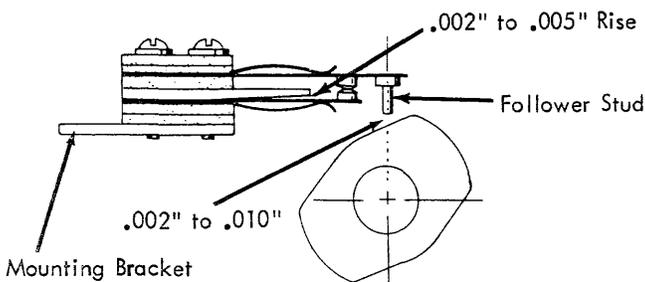


FIGURE 40. C-7 Contact

- b. C-7 Contact Assembly - Adjust by moving its mounting bracket so that the cam follower stud will be .002" to .010" from the low point of the C-7 cam at the vertical center line of the cam (all parts at rest).

**CAUTION:** Do not overtighten the C-7 cam set screws as they will cause a bind or crack the ratchet. Be sure the follower stud does not touch the ratchet through 360° rotation of the ratchet.

## CYCLE CLUTCH

1. Cycle Shaft - Shim the cycle shaft to obtain .001" to .003" end play of the shaft. The shims are placed between the left hand bearing and the check ratchet. The shims are available in various thicknesses and are coded by shape as described in the Parts Catalog.

**CAUTION:** The slight end play of the shaft insures that it will rotate freely. Excessive play could allow a coil of the cycle clutch spring to wedge between the two hub members of the clutch causing a machine lock-up. (End play can most easily be measured with the spring clutch removed.)

**NOTE:** With the end play removed to the right, maintain .002" clearance between the cycle shaft gear and the left hand bearing.

2. Cycle Clutch Latch Bracket - Adjust the bracket vertically so that the steps of the cycle clutch sleeve are horizontal when the sleeve is stopped by the latch (Fig. 41).

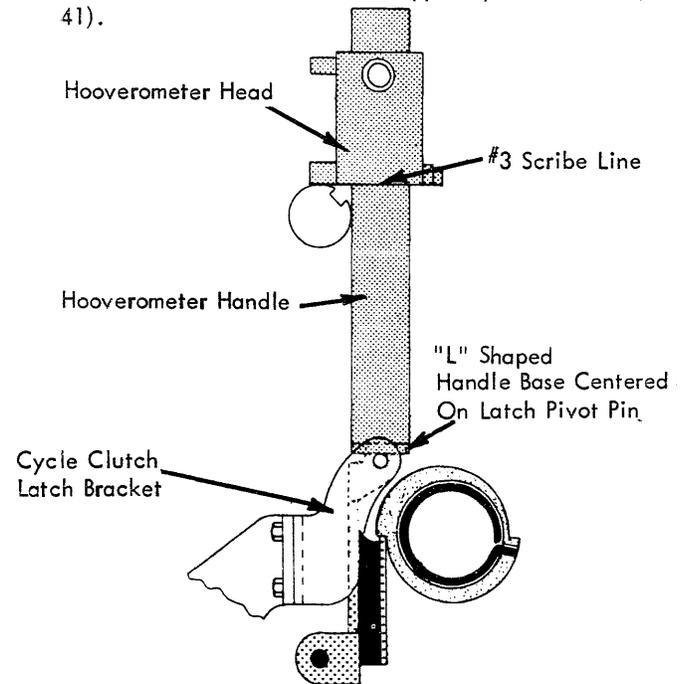


FIGURE 41. Cycle Clutch Latch Bracket Adjustment

To insure that the latch is parallel to the sleeve, it should be adjusted in the following manner.

- Loosen the two latch mounting screws and pull the latch to the top of its adjustment.
- Snug the screws "lightly".
- Turn the print or cycle shaft in a print direction. (This will force the cycle clutch sleeve down on the cycle clutch latch.) Using the Hoovermeter, check the latch height until it is correct (#3 scribe line).
- Tighten the cycle clutch latch mounting screws.

Keeping the sleeve surface in contact with the latch surface will insure that the latch will remain parallel to the sleeve while you are adjusting its height.

If the bracket were adjusted too low, the steps would be at an angle to the line of motion of the cycle clutch latch. The latch would have difficulty in moving forward to release the clutch sleeve, and a slow, hesitant operation would result.

With the bracket too high, the force of stopping the cycle shaft through the cycle clutch sleeve would tend to cam the latch forward. A repeat cycle operation could result.

When properly adjusted the top of the latch pivot pin is 1.546" below the top of the print shaft. This distance can be measured with the use of the Hooverometer. With the head of the Hooverometer set at the #3 scribe line, the head should rest on top of the print shaft with the handle touching the latch pivot pin (Fig. 41). Be sure the Hooverometer handle is vertical. It will be vertical if the base of the handle is centered over the latch pivot pin.

NOTE: Changing the height of the cycle clutch latch necessitates a readjustment of the cycle clutch collar, cycle clutch stop, and the cycle clutch latch restoring mechanism.

CAUTION: The latch bracket must not become cocked so that only a corner of the latch plate is stopping the sleeve. Excessive wear could result. The cycle clutch sleeve could also be tilted by the latch causing it to bear against the cycle clutch pulley hub creating a noisy operation.

### 3. Cycle Clutch Spring and Collar Adjustments

- a. Lateral position of the spring - Loosen the collar and position the spring left or right on its hubs so that the right hand end of the spring will clear the face of the cycle clutch pulley by .004" to .012" (Fig. 42).

NOTE: This adjustment insures that a maximum number of coils of the spring clutch will grip the driving hub during a cycle operation. Any slippage between the driving hub and the spring clutch could decrease the typehead velocity during a print operation resulting in intermittent light impression. A lack of clearance between the right end of the spring clutch and the face of the cycle clutch

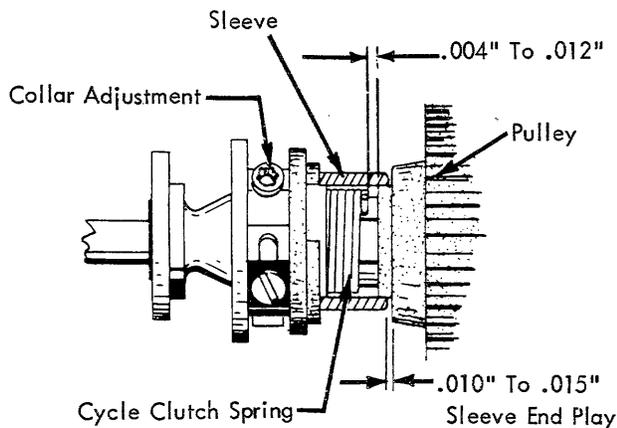


FIGURE 42. Lateral Position of the Cycle Clutch Spring and Collar

pulley would create a bind causing the spring clutch to place a heavy torque on the cycle clutch sleeve. This excessive torque on the sleeve results in a sluggish operation because the cycle clutch latch trip lever has difficulty tripping the latch off the sleeve.

- b. Lateral position of the collar - position the collar left or right so that the sleeve will have .010" to .015" end play.

NOTE: This adjustment insures that there will be no binds between the right end of the sleeve and the cycle clutch pulley. A bind will cause a sluggish operation just as in the previous adjustment.

- c. Radial position of the collar - (The position of the collar directly controls the radial position of the left hand end of the cycle clutch spring with respect to the cycle shaft. It determines how much the clutch spring will be expanded when the cycle clutch is latched and the cycle shaft is in its rest position). Adjust the collar so that when a zero tilt, negative-five rotate character is hand cycled the cycle clutch spring will begin to slip (expand) when the cycle shaft is 1/16" to 3/32" from its rest position measured on the surface of check ratchet (Fig. 43).

This adjustment is difficult to observe at the check ratchet. A 1/16" to 3/32" rotation of the cycle shaft will cause the print shaft gear to turn approximately one tooth. The adjustment can easily be read by one of the following methods.

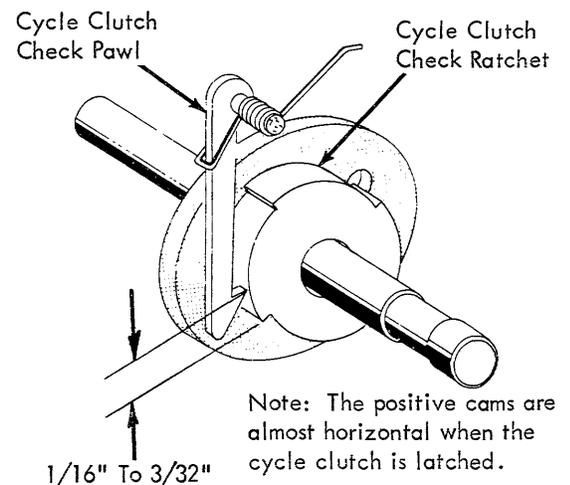


FIGURE 43. Radial Position of Cycle Clutch Collar

#### A. Print Shaft Gear Method

1. Hand cycle a zero tilt, negative-five character until the cycle clutch begins to slip.
2. Pencil mark the print shaft bearing in line with a tooth on the gear.
3. Release the cycle clutch again by depressing a selection magnet armature.

- Slowly hand cycle the machine until the check pawl just drops into a tooth on the check ratchet. The print shaft gear should have rotated 1/2 to one tooth. If the print shaft gear rotated further than one tooth the collar must be moved top toward the rear. Less than 1/2 to one tooth, move it top toward the front.

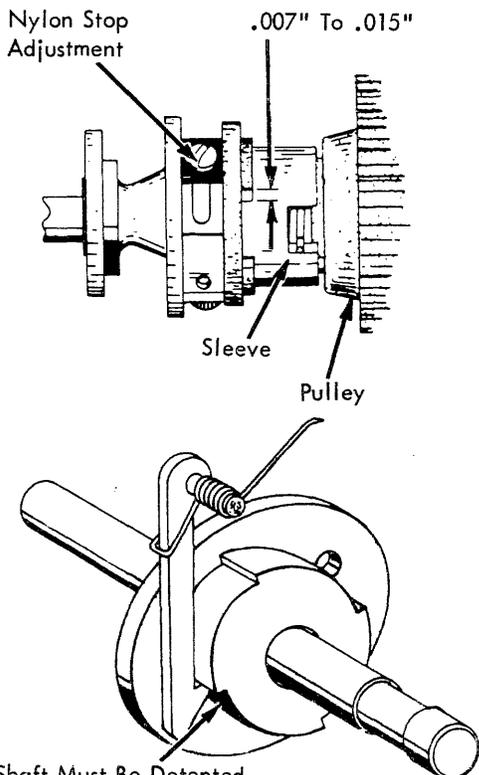
A zero tilt, negative-five rotate character is used because it offers the greatest resistance to the cycle shaft during the restoring portion of a cycle, causing the cycle clutch spring to slip at the earliest possible time.

NOTE: If the collar should become completely loose, a good starting point may be obtained by positioning the collar so that its adjusting screw head is approximately in line with the high point of the negative-five cam.

CAUTION: The cycle clutch stop attached to the collar may prevent the shaft from reaching the latched position. Any change in the cycle clutch collar adjustment will necessitate a readjustment of the stop; therefore it is usually best to loosen the stop before attempting to adjust the collar.

#### B Degree Wheel Method

With the machine at zero degrees (cycle clutch latched at rest) select a -5 rotate, 0 tilt character and hand cycle the machine slowly. The cycle clutch spring should slip and stop driving at 170 to 175 degrees.



Cycle Shaft Must Be Detented When Setting The .007" To .015" Overthrow

FIGURE 44. Cycle Clutch Overthrow Stop - Late

- Cycle Clutch Overthrow Stop - With the cycle clutch latched and the cycle shaft backed up against the check pawl in its rest position, advance or retard the overthrow stop on the cycle clutch collar so that it will allow the cycle shaft to overthrow its latched position by .007" to .015" (Fig. 44-late or Fig. 45-early).

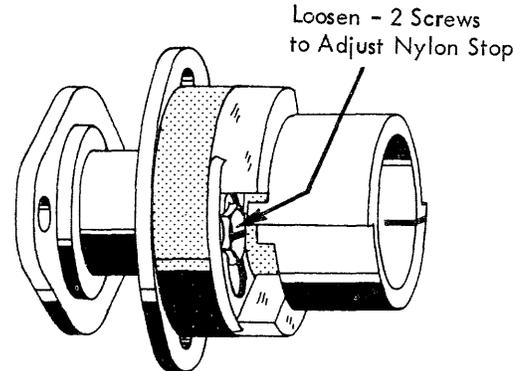


FIGURE 45. Cycle Clutch Overthrow Stop - Early

CAUTION: After adjusting the cycle clutch overthrow stop check the cycle clutch sleeve end play as the overthrow stop may bind against the sleeve.

- Filter Shaft - The filter shaft is set during manufacture at approximately 25° (Fig. 46). This adjustment is not critical. When the relationship of the filter shaft gear has been changed set the filter shaft for proper escapement cam timing. Be sure and check the shift interlock cam adjustment also.

NOTE: Be sure to maintain .002" to .004" end play of the filter shaft within the left hand filter shaft bearing. The mounting of the left hand filter shaft bearing allows .011" lateral play of the bearing. Do not confuse this lateral play of the bearing with the filter shaft end play.

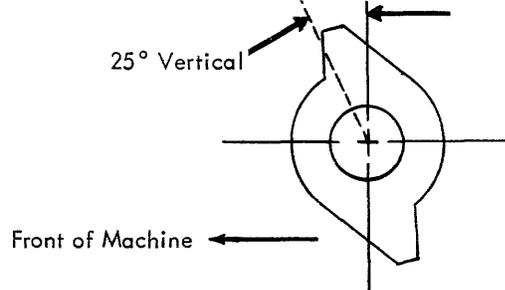


FIGURE 46. Filter Shaft

#### CARRIER AND ROCKER

##### Fine Alignment

- Tilt Tube End Play - (machines prior to gearless tilt). The tilt pulley should be adjusted up or down on the tilt tube so that .002" to .004" end play exists in the tilt tube (Fig. 47).

The tilt pulley is attached to the tilt tube by a set screw and key against a flat surface on the tilt tube. The set screw is accessible through a hole in the left side of the carrier. Move the carrier to the right and remove the tilt pulley spring and tilt detent spring. The tilt detent spring stud can then be removed through the hole in the

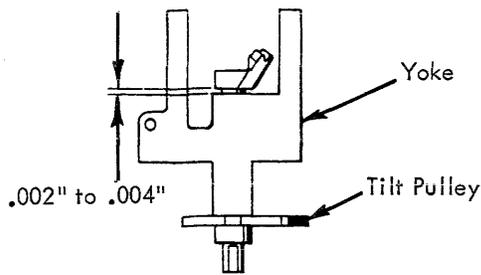


FIGURE 47. Tilt Tube End Play Adjustment

carrier. The hole in the carrier and rocker will make the tilt pulley set screw accessible with a fluted wrench.

NOTE: The height of the tilt sector gear is established by shimming between the gear and the top of the yoke. The height is set to obtain the proper backlash between the tilt sector gear and the tilt ring gear. Be sure to re-install the shim if disassembly is necessary.

2. Rotate Shaft End Play - Adjust the rotate pulley up or down on the rotate shaft so that .002" to .004" end play exists in the rotate shaft relative to the tilt tube or yoke (Fig. 48).

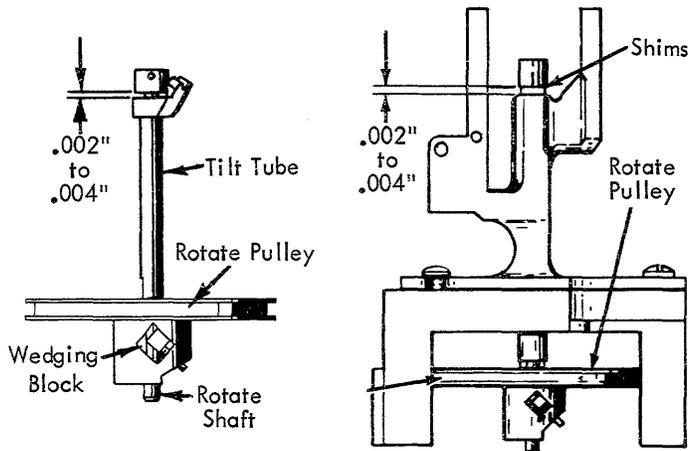


FIGURE 48A.  
Gear Type Tilt

The rotate pulley is secured to the rotate shaft by a wedging block and a set screw. The pulley set screw is accessible from below with the carrier centered over the cycle shaft and the shift in the upper case. After loosening the set screw, the grip of the block on the shaft must be broken by rotating the typehead counterclockwise manually while blocking rotation of the pulley. This can be done by inserting the 3" screwdriver at the rear between the notch in the pulley and the tape guide block. Be careful not to damage the tape or pulley with the screwdriver. **DO NOT** rotate the typehead clockwise against the tension of the tape in an effort to break the pulley loose. Tape breakage or other parts damage may result.

NOTE: The height of the lower ball socket is controlled by a shim located between the lower ball socket and the tilt tube or yoke. The height relative to the tilt ring must be controlled in order to insure proper operation of the ball joint. If disassembly of the rocker is ever necessary, the shim must be reinstalled.

3. Tilt Ring - The upper ball socket should be centered over the lower ball socket within .002". It is adjusted by moving the tilt ring left or right after loosening the tilt ring pivot set screws. All side play of the tilt ring should be removed by the pivot pins while still allowing the tilt ring to pivot freely.

If the tilt ring is not properly centered, the rotate position of the head can vary slightly as the head is tilted to the different tilt positions. This could constitute a portion of the band width in the rotate system.

The tilt ring is centered at the factory and every effort should be made to maintain its centered position. If tilt ring removal or replacement is necessary, a feeler gauge should be inserted between the tilt ring and the yoke to determine the clearance before the tilt ring is removed. The tilt ring should be replaced to the same clearance.

The tilt ring can easily be removed if the machine is half cycled to a two tilt position. On machines prior to the gearless tilt mechanism, care should be taken to insure that the tilt sector gears are properly meshed whenever the tilt ring is installed. The rear tooth of the tube sector gear should enter the second notch of the tilt ring sector gear (Fig. 49).

CAUTION: Side play in the tilt ring can cause poor horizontal and vertical alignment. It can also affect impression.

4. Upper Ball Socket - The upper ball socket must rotate completely free of binds with little or no up and down play. The adjustment is made by raising or lowering the tilt ring spacer by installing thicker or thinner shims at the front and rear (Fig. 49).

In order to check the upper ball socket for binds it is necessary to remove the ball joint so that the upper ball socket can be rotated by hand. This can be done either by removing the tilt ring and upper ball socket together and checking them off the machine or by removing the upper ball socket and replacing it without the ball joint. If the tilt ring is removed, its position relative to the yoke must be checked by a thickness gauge before removal.

NOTE: If the upper ball socket, tilt ring, or tilt ring spacer are ever replaced by new parts, the shimming adjustment must be checked.

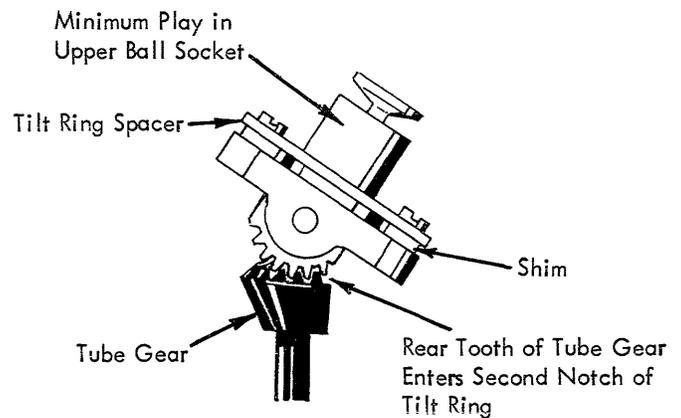


FIGURE 49. Upper Ball Socket Adjustment

**CAUTION:** Vertical play in the upper ball socket will affect vertical alignment and impression because the typehead will not maintain a definite position.

Also, care must be taken to insure that the entire rotate system is free from binds. A bind in the upper ball socket can result in poor horizontal alignment if the rotate detent fails to fully seat in the detent notch before print occurs. An excessive bind can cause unwanted roller droppage in the wear compensator during a negative selection. Binds in the system (carrier area) can be checked by manually operating the shift arm in and out.

5. Tilt Detent - Adjust the guide and pivot screw so that the tilt detent will operate freely with no side play (Fig. 50).

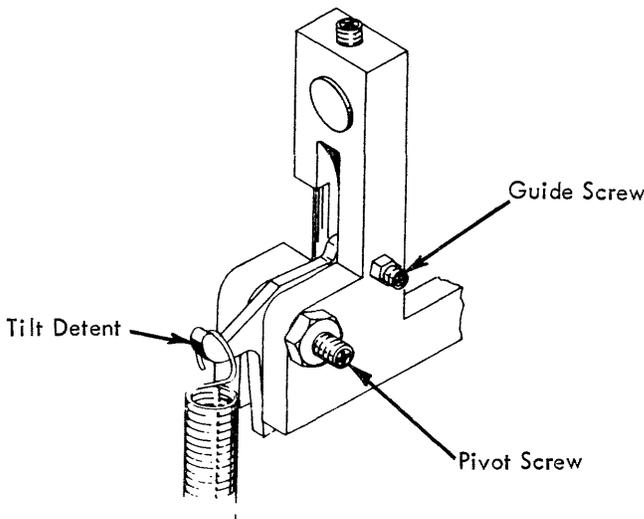


FIGURE 50. Tilt Detent Adjustment

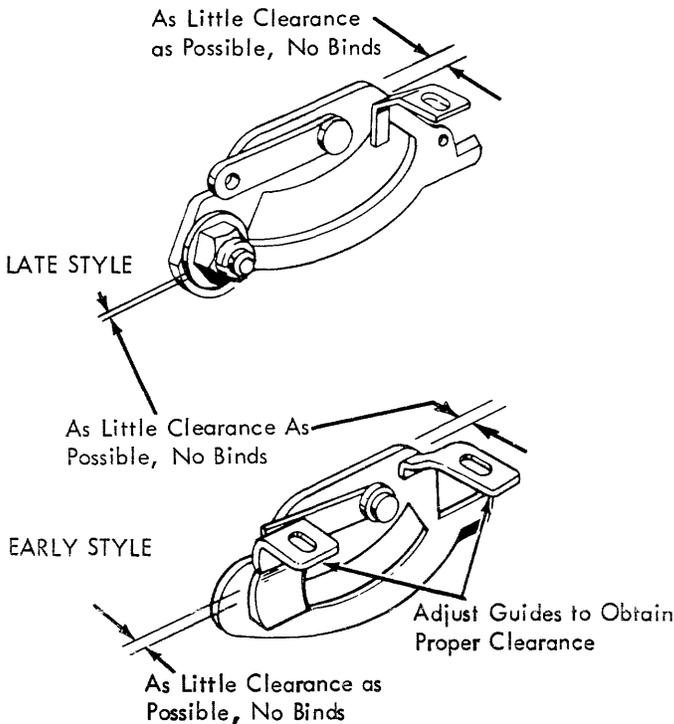


FIGURE 51. Rotate Detent Guides

Excessive side play in the tilt detent will cause poor vertical alignment. A bind in the tilt detent will affect both the vertical and horizontal alignment because it will retard or restrict the seating of the tilt detent which, in turn, will retard or restrict the seating of the rotate detent.

6. Rotate Detent - Adjust the front and rear guides so that the rotate detent will operate freely with no side play (Fig. 51).

Excessive play in the detent will result in poor horizontal alignment because the detent cannot positively position the typehead.

7. Rocker Shaft - Adjust the rocker shaft left or right to obtain .002" to .004" side play in the rocker (Fig. 52).

The side play exists between a C-clip around the shaft at the right of the rocker and a thrust washer against the carrier casting at the left of the rocker. The rocker shaft is held in place by a set screw at the left end of the shaft.

Excessive play in the rocker could affect horizontal alignment by allowing the rocker to shift its position left to right.

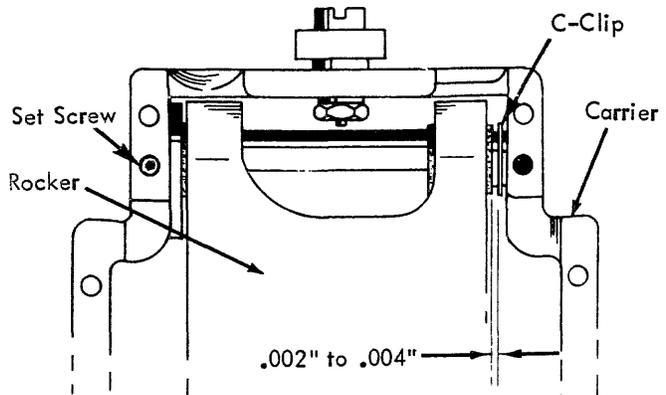


FIGURE 52. Rocket Shaft Adjustment

8. Print Sleeve End Play - Adjust the print sleeve end play to be .002" to .004". The end play is controlled by the print cam on the right hand end of the sleeve. The adjustment should not be gained with the ribbon lift cam because its set screw tightens down into a dimple in the print sleeve fixing the position of the cam (Fig. 53).

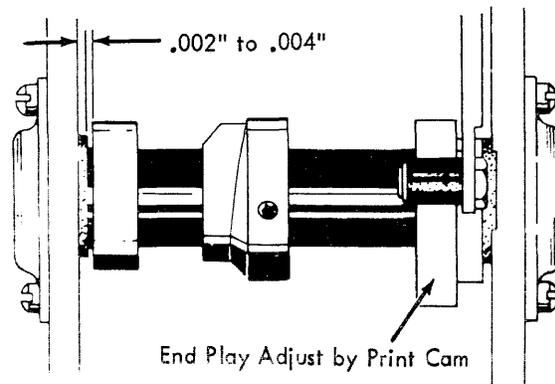


FIGURE 53. Print Sleeve End Play

9. Detent Cam Follower Bracket - Position the detent cam follower bracket which is mounted to the left side of the carrier by two screws to satisfy the following conditions:

- a. Front to rear for a clearance of .015" between the print sleeve and the end of the pin on the cam follower (Fig. 54A).

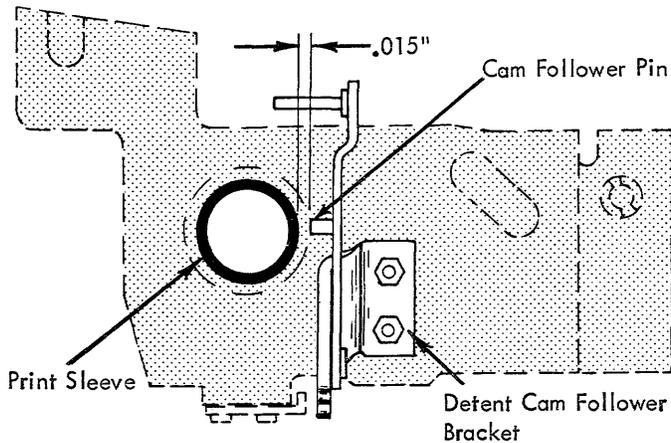


FIGURE 54A. Detent Cam Follower Bracket

- b. Vertically so that the bottom surface of the pin on the cam follower lines up with the scribe line #1 on the Hooverometer when the Hooverometer is placed against the print sleeve as shown in Figure 54B.

This bracket is set at the factory with a dial indicator and should not require readjustment unless it becomes loose.

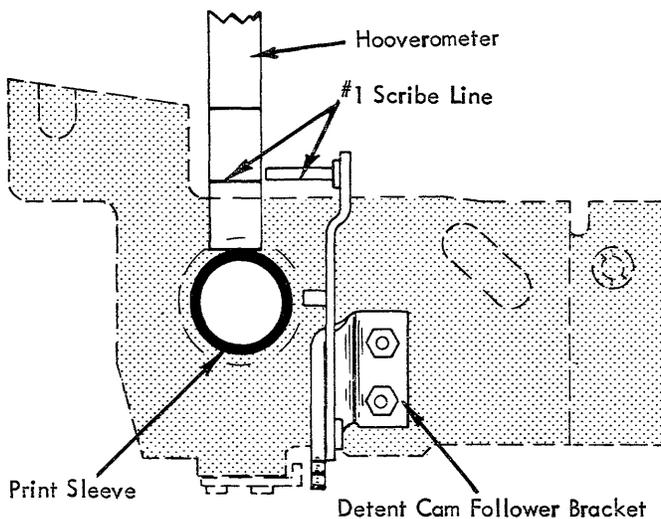


FIGURE 54B. Detent Cam Follower Bracket

NOTE: The position of the bracket directly affects the timing relationship between the detent cam and the print cam. An improperly adjusted bracket may cause the detents to begin to withdraw before the typehead prints, or the typehead to print before the detents have fully seated. If this occurs it will generally show up as poor vertical alignment because the tilt detent always seats after and withdraws ahead of the rotate detent.

10. Detent Mechanism (Machines prior to gearless tilt) - The detent mechanism must be adjusted to satisfy the following conditions:

- a. Position the ribbon feed and detent cam left or right on the print sleeve so that the inside rib of the cam will be in line with the left hand edge of the ribbon feed cam follower (Fig. 55).

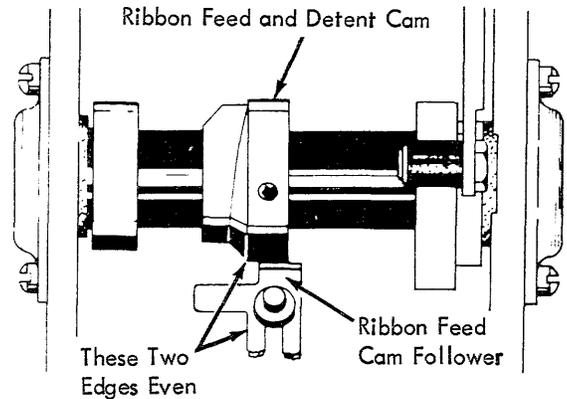


FIGURE 55. Ribbon Feed Cam

- b. Adjust the detent actuating lever support front or rear (under its locking screw) so that the rotate detent will clear the teeth on the typehead skirt by .025 to .035" when the cycle shaft is at rest (Fig. 56). This clearance should be observed when the typehead is manually tilted to a two tilt position since the two tilt position provides the rotate detent with the least amount of motion.

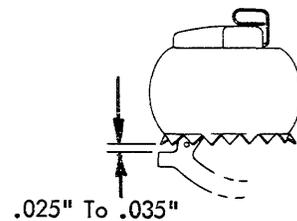


FIGURE 56. Skirt Clearance

Moving the actuating lever support to the rear will increase skirt clearance.

- c. With the detent cam follower on the low dwell of the detent cam (detents fully seated) rotate the actuating lever support until .001" clearance is felt between the detent actuating lever and the detent cam follower roller. Rotating the support clockwise will increase the clearance.

NOTE: The adjustments of the detent mechanism directly affect each other and must be adjusted alternately to obtain the correct clearances.

The .001" clearance adjusted into the system between the detent actuating lever and the detent cam follower insures that the tilt detent will fully seat in the detent notch of the tilt ring. Too much clearance would allow the detents to enter their notches too early and withdraw too late. This could cause an intermittent erroneous character to print, parts breakage, or roller droppage in wear compensator.

The .025" to .035" skirt clearance allows the rotate detent to enter and withdraw from the typehead notch area at the proper time with respect to the rotating typehead. If this clearance is too small the rotate detent will enter the notch area too early and withdraw too late. This will also cause an intermittent erroneous character to print, parts breakage, or unwanted roller droppage. Too much skirt clearance will only cause premature wear on the detent mechanism due to the leverage gain.

Since the detent cam and print cam are both keyed to the print shaft, the relationship between the detent timing and the point at which the typehead prints is non-adjustable. The design of the two cams is such that the detents will be fully seated in their notches when the typehead contacts the platen during a print operation. The only thing that can affect this timing relationship is the position of the detent cam follower mounting bracket. The position of this bracket is fixed at the factory and should not be changed.

### 11. Detent Mechanism (Gearless Tilt)

The detent mechanism must be adjusted to satisfy the following conditions:

- a. With the cycle shaft at rest and the typehead manually held in a tilt two position, adjust the ribbon feed and detent cam left or right on the print sleeve (Fig. 57) so that the rotate detent will clear the detent teeth on the typehead skirt by .025" to .035" (Fig. 58).

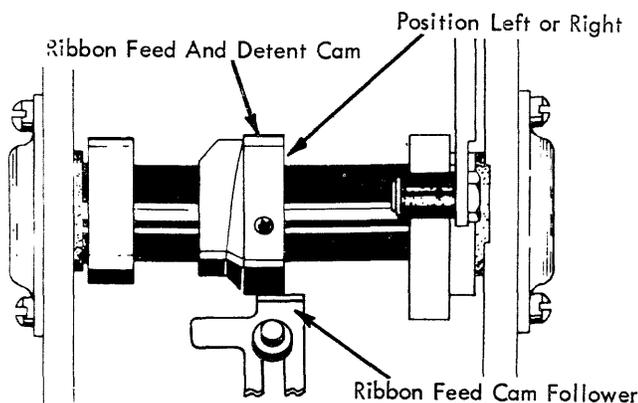


FIGURE 57. Detent Cam Adjustment

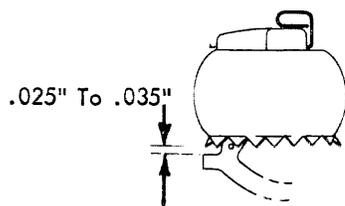


FIGURE 58. Skirt Clearance

- b. With the detent cam follower on the low dwell of the cam (detents fully seated), loosen the locknut on the detent actuating lever support and adjust the screw up or down until there is a clearance of .001" felt between the detent actuating lever and the detent cam follower roller (Fig. 59).

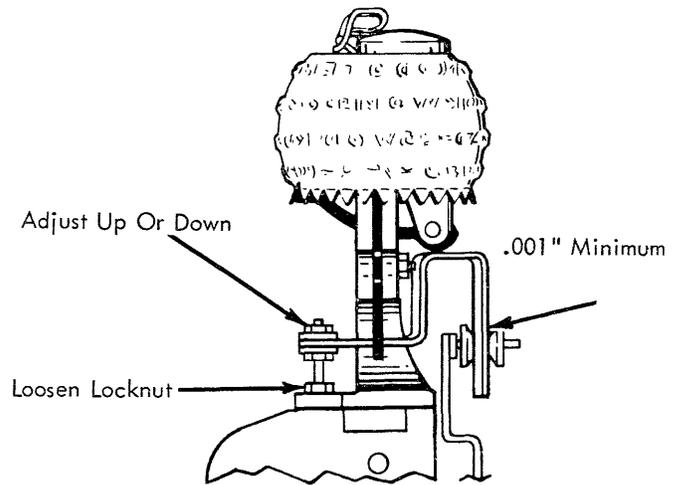


FIGURE 59. Detent Lever Support

Adjusting the screw upward will increase the clearance.

NOTE: Read the "note" under Adjustment # 10 as it pertains to the gearless tilt mechanism also.

### ALIGNMENT

1. Preliminary Print Shaft Timing - With the cycle shaft latched in its rest position, loosen the print shaft gear and rotate the print shaft so that the keyway is approximately in line with the end of the ribbon lift cam follower pivot screw (Fig. 60). The keyway will be about 45° to the rear from the top of the shaft.

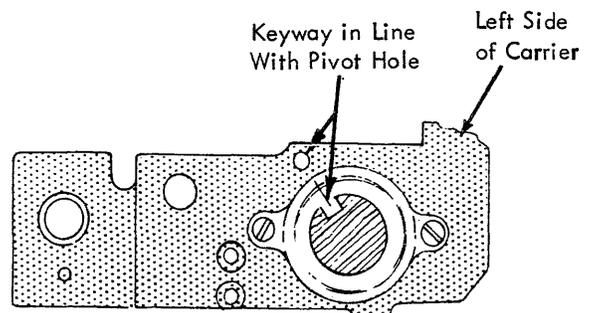


FIGURE 60. Preliminary Timing

The preliminary setting of the print shaft establishes a coarse timing of the two detent entry and withdrawal so that the detents will not be engaged in their notches when the typehead and tilt ring are in motion. A more accurate timing adjustment will be made later.

2. Tilt Selector Latches - Form the two stop lugs (Fig. 61) above the tilt selector latches so that the latches will reset simultaneously (under the latch bail) just as the cycle clutch check pawl drops into the notch on the check ratchet at the rest position (Fig. 62).

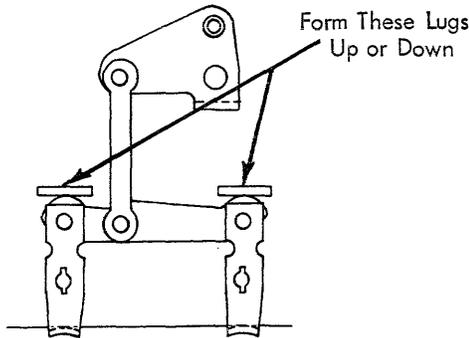


FIGURE 61. Selector Latch Stop Lugs

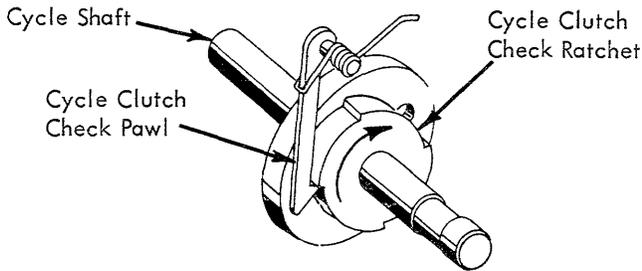


FIGURE 62. Latches Reset as Check Pawl Drops In

The adjustment can easily be checked by hand cycling a zero-tilt character twice in succession. As the cycle shaft begins to pass its rest position, place your finger lightly against the cycle clutch check pawl while observing the selector latches. If the adjustment is correct you should feel the check pawl drop into the rest position notch on the check ratchet simultaneously as the two selector latches reset under the latch bail.

Form the stop lugs by tapping them up or down with a hammer and screwdriver. The stop lugs should be over-formed slightly then brought back to the correct position otherwise the "memory" of the metal will cause them to restore toward their original position.

NOTE: It is very important for each selector latch to receive the same amount of motion from the latch bail, when operated, in order to produce the proper amount of motion to the tilt arm link for a desired selection. If one of the stop lugs is adjusted too low, its respective latch will reset early under the latch bail producing an excessive amount of latch clearance for that latch. This means that this latch when operated will not receive as much motion from the latch bail as the other latch will when it is operated. This condition which is undesirable causes the band width of the system to increase.

3. Tilt Arm Motion - Adjust the tilt link up or down on the tilt arm (Fig. 63) to control the tilt ring motion so that the tilt ring will coarse align the same for a 3-tilt character as it does for a zero-tilt character.

In order to check this adjustment, it is necessary to roughly home the tilt ring first. To rough home, half-cycle a zero-tilt character and adjust the right hand tilt pulley (Fig. 63) so that the tilt detent will enter slightly on the rear side of the V-shaped detent notch in the tilt

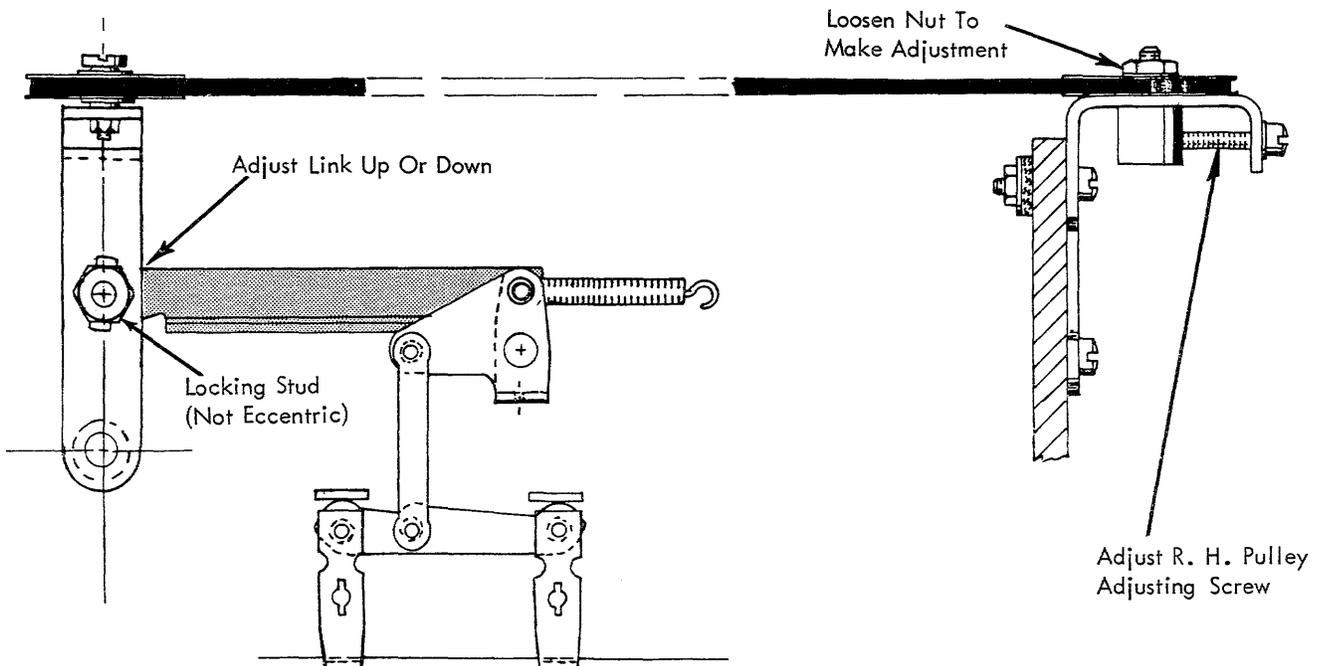


FIGURE 63. Tilt Mechanism

ring when the tilt ring play is removed in the restoring direction (Fig. 64). As the tilt detent is allowed to seat itself, the rear of the tilt ring should rise slightly. This is a preliminary adjustment and will require refinement after the proper tilt arm motion is obtained.

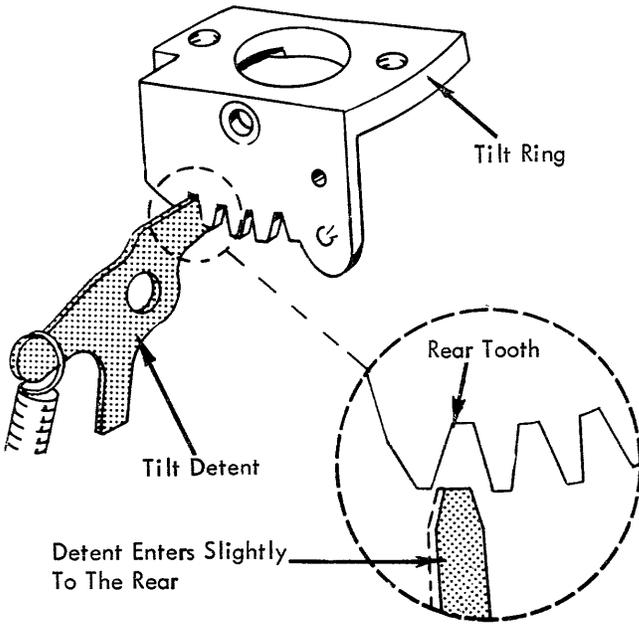


FIGURE 64. Rough Homing

Once the print shaft has been preliminarily timed and the tilt ring rough homed, all of the following adjustments that require half-cycling should be done under power so as to include all the stresses on the system.

When the tilt arm motion is adjusted properly, a half-cycled (3-tilt) character will coarse align the same as a half-cycled (0-tilt) character. That is, both selections will provide the same rising action to the rear of the tilt ring as the detent is allowed to seat in the detent notch. If the 0-tilt and 3-tilt coarse align the same, the 1-tilt and 2-tilt selections will also coarse align the same because of the leverage designed into the system.

NOTE: The right hand tilt pulley lock nut may be left loose while making the tilt arm motion adjustment, because a slight readjustment of the pulley may be necessary during the tilt arm motion adjustment.

On late level machines the-tilt arm link has a horizontal elongated mounting hole where it fastens about the shouldered screw on the tilt arm and the tilt arm is lightly spring loaded away from the side frame by a hairpin spring. The tilt pulley spring is far stronger than the hairpin spring, thus holding the tilt arm against the right hand end of the elongated mounting hole in the link. Although this modification has no definite effect on a tilt operation, its function is to remove any slack that may appear in the tilt tape. An example is when an operator changes the typehead she may accidentally tilt the head causing the tape to slacken.

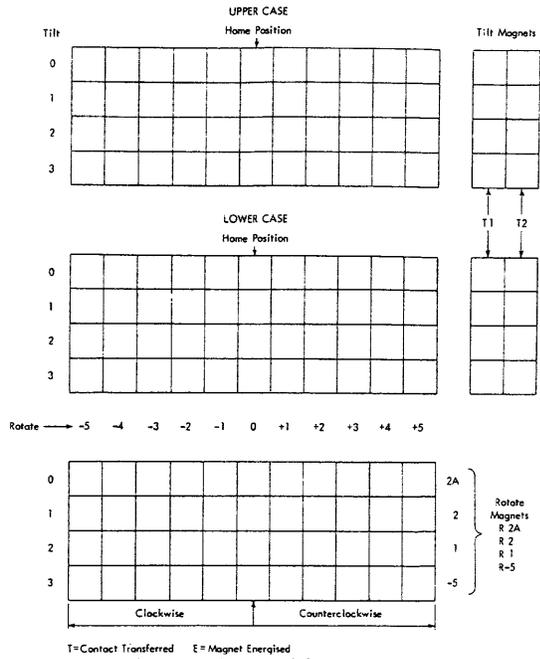


FIGURE 65. Typehead Chart

4. Tilt Ring Homing - With a zero-tilt character half-cycled and the tilt ring play removed in the negative or restoring direction (Fig. 66) adjust the right hand tilt pulley so that the rear of the tilt ring will rise about .005" when the detent is manually allowed to seat in the detent notch (Fig. 67A). Note: The rear of the tilt ring is nearest the platen.



FIGURE 66. Removing Tilt Ring Play

Check the other tilt positions and then refine the homing adjustment on the tilt selection that provides the least amount of rise to the rear of the tilt ring.

As a further check, remove the tilt ring play in the positive direction and observe the detent entry on the forward side of the detent notch (Fig. 67B). The detent should enter far down the forward slope of the detent notch but not so far that it contacts the tip of the tooth. By homing the tilt ring off center, favoring the positive side of the detent notch, a maximum amount of wear potential is achieved.

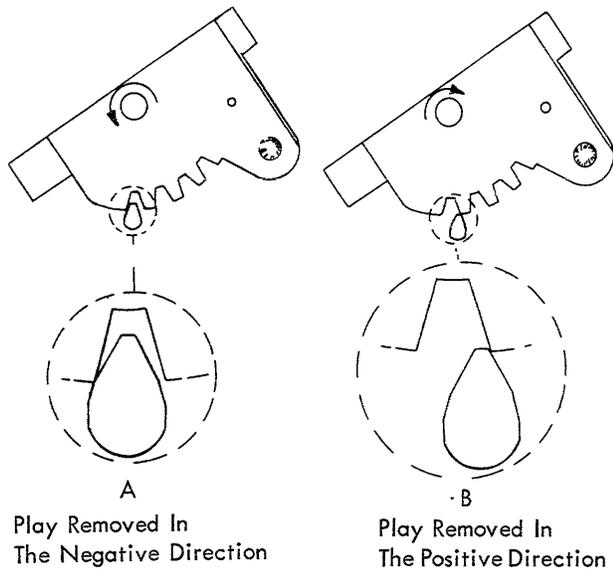


FIGURE 67. Tilt Detent Entry

5. Rotate Spring Tension - Adjust the rotate spring in the rocker so that it will have 1-7/8 to 2 pounds tension when the machine is half-cycled using a lower case negative 5 character. The least amount of tension is present in the spring when it is in this position. The typehead must be removed when making this adjustment.

The rotate spring tension is adjusted by turning the spring cage from the front (Fig. 68A). The cage can be turned clockwise to increase the tension by pulling the cage toward the left with a spring hook. The spring drum retainer automatically snaps into position to retain the adjustment. If tension is to be decreased, the retainer must be pulled forward to allow the cage to rotate counterclockwise. Care must be taken to decrease the tension slowly so that the cage does not spin freely. Spring damage could otherwise result.

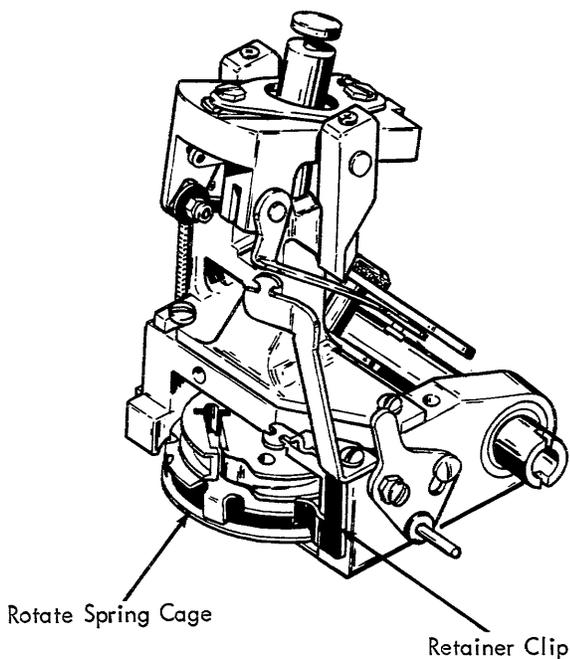


FIGURE 68A. Rocker Assembly

Tension of the spring is critical in that it must be properly balanced with the springs of the wear compensator. Excessive tension will overload the levers system and increase wear. Insufficient tension will not provide the torque necessary for rapid lower case negative rotate operations. It will also affect the wear compensator operation if the tension is not sufficient to overcome the compensator damper spring in the negative-5 position.

The rotate spring tension should be measured with a spring scale as indicated by Fig. 68B. Using a lower case -5 character, read the spring scale while slowly allowing the shift arm to move in towards its stop screw. The spring scale should read 1-7/8 to 2 pounds just as the arm reaches its stop screw. To overcome static friction, read the spring scale while the arm is moving.

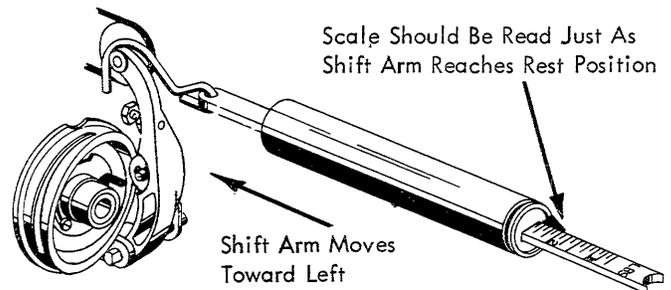


FIGURE 68B. Spring Scale Measurement For Rotate Spring Adjustment

If a spring scale is not available, the tension may be obtained in the following manner (Fig. 69). With the machine half-cycled at a negative five lower case (machines which are locked in upper case use upper case -5 character) position and the typehead removed, insert a large spring hook around the lower compensator arm. Pull so that the rotate arm eccentric just clears the damper spring and release it. The tension of the rotate spring should be enough to completely collapse the damper spring against the power frame with the damper spring stop adjusted at the bottom of the spring.

Machine Half Cycled To A  
Negative 5 Lower Case  
Character

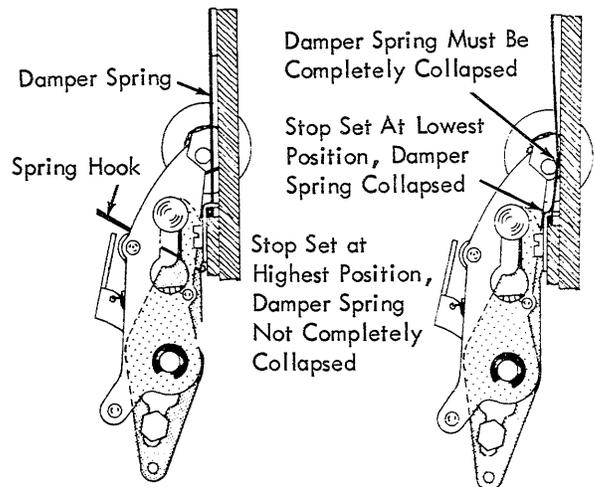


FIGURE 69. Rotate Spring Tension

With the damper spring stop all the way up, the damper spring should not be completely collapsed. Check and adjust the rotate spring to satisfy both conditions.

NOTE: Lower damper spring stop to bottom before proceeding with sequence.

CAUTION: The damper spring method is only usable when it is impossible to obtain a spring scale.

NOTE: The accuracy given to the next seven coarse alignment adjustments determines the "band width" (denting variation) of the rotate system. Each one of these seven adjustments contributes to the band width in a different manner. Generally, it takes experience in making each adjustment to learn how much accuracy is needed to end up with an accumulated band width which is acceptable. The band width of the rotate system should never exceed .020" nor should any extra time be spent in trying to obtain one any less than .010".

References will be made to 2 different methods of obtaining a zero rotate character. These methods can be defined as:

Latched Home - zero rotate with NO plus or minus rotation. I/O Home - zero rotate with BOTH plus 5 and minus 5 rotation.

## 6. Rotate Selector Latches

- a. Form the stop lugs above the positive rotate selector latches (Fig. 70) so that the latches will reset simultaneously (under the latch bail) just as the cycle clutch check pawl drops into the notch on the check ratchet at the rest position.

NOTE: The adjustment theory under "tilt selector latches" also pertains to the rotate selector latches.

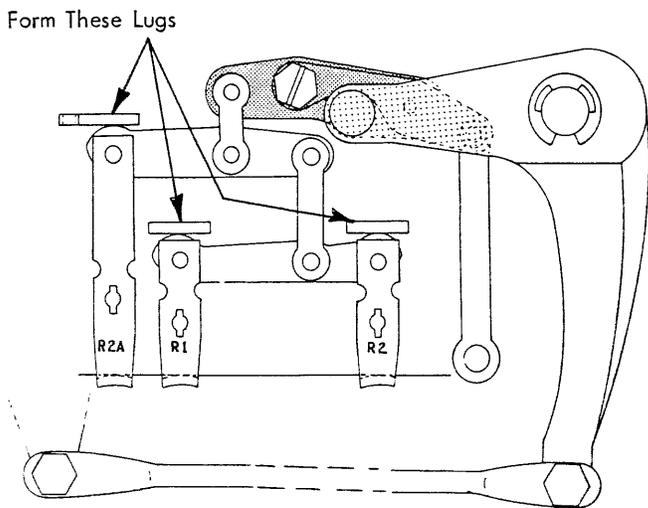


FIGURE 70. Rotate Selector Latches

- b. Adjust the negative-5 latch stop screw so that the negative-5 latch (Fig. 71) will reset simultaneously as the check pawl drops into the notch on the check ratchet at the rest position.

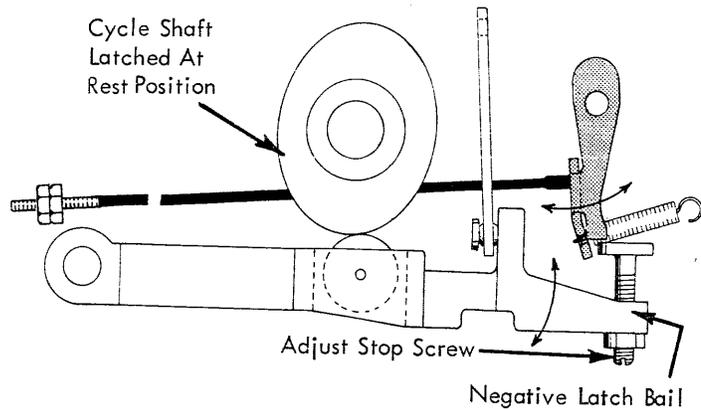


FIGURE 71. Negative 5 Latch Stop Screw

The negative-5 latch controls the position of the negative latch bail during zero and all positive rotate selections. Changing the latch adjustment causes the coarse alignment of the zero and all positive rotate selections to change equally with respect to the negative selections. No change is felt in the coarse alignment of the negative rotate selections when the negative-5 latch adjustment is altered because the latch is out of the system during all negative selections (Fig. 72).

Considering the balance lever to be properly adjusted, the effects of the negative-5 latch adjustment on the system can be explained by the following: From the rest position the amount of movement in the negative direction given to the rotate bellcrank is fixed because the negative latch bail moves from the high point of the negative cam to its low point. From the rest position the amount of movement in the positive direction given to the rotate bellcrank can be increased or decreased by changing the negative-5 latch adjustment. In other words, when the machine is at rest the negative-5 latch bail is resting on the high point of the negative-5 cam. Whenever a zero rotate or positive selection occurs, the negative-5 latch bail is allowed to follow its cam towards the low point until it is restricted by the negative-5 latch. This small increment of negative motion to the negative-5 latch bail during a zero rotate or positive selection causes the positive motion to be reduced by an equal increment. Therefore, the adjustment of the negative latch can change the balance of motion between positive and negative selections. Even though it is possible, it is not permissible to use the negative latch adjustment for balancing purposes. The negative latch should always be adjusted for the proper reset clearance. This allows the system to operate with optimum leverage loads in both positive and negative selections. Balancing between positive and negative should always be accomplished by adjusting the balance lever.

NOTE: Figure 72 illustrates how the coarse alignment detenting would change at the typehead if only the negative-5 latch adjustment were maladjusted on a machine. It is possible for this same detenting pattern to show up on a machine that has the correct negative-5 latch adjustment but other adjustments

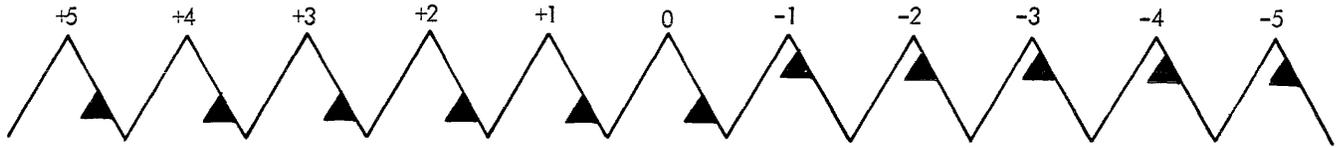


FIGURE 72. Excessive Negative 5 Latch Clearance

maladjusted. For this reason it is best to adjust the negative latch as specified in the adjustment rather than by adjusting it while observing the effects that the adjustment change will produce at the typehead.

7. Rotate Arm Vertical - With the typehead removed and the machine half-cycled to an upper case zero rotate character latched home, adjust the rotate link so that the point at the top of the rotate arm is  $15/32$ " from the machine sideframe. The compensator roller should be  $1/16$ " from the top of the slot when this adjustment is made.

The adjustment can be measured using the #1 scribe line on the Hooverometer handle as illustrated in Figure 73. The scribe line measurement makes allowance for the thickness of the compensator damper spring.

The adjustment sets up a vertical condition for three points in the rotate arm, the center of the pulley, the rotate arm pivot point, and the rotate link connection. With the rotate arm vertical at a half-cycled zero rotate position, the leverage within the rotate arm will be the same for positive and negative movements of the arm.

NOTE: The eccentric stud at the top of the rotate arm should be turned all the way to the left at this point to prevent interference with subsequent adjustments.

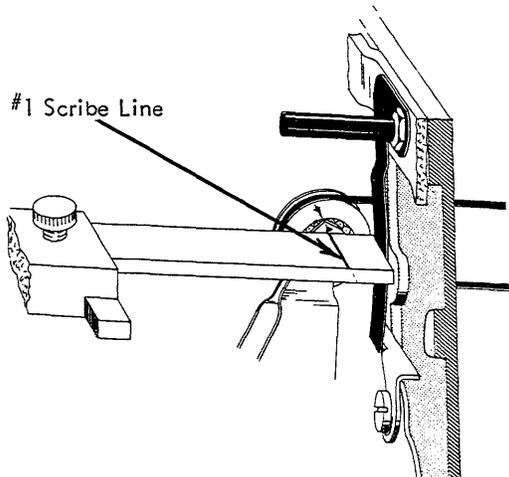


FIGURE 73. Rotate Link Adjustment Measurement

8. Preliminary Typehead Homing - Half-cycle the machine using an upper case zero rotate (latched home) character. Loosen the set screw in the bottom of the rotate pulley and slip the typehead so that the detent will enter  $.010$ " to  $.020$ " from the center of the detent notch, on the negative side of the notch, when the head play is lightly removed in the negative direction (Fig. 74).

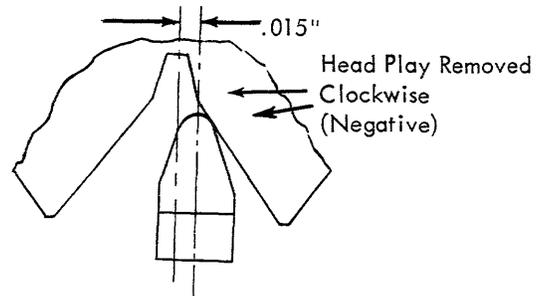


FIGURE 74. Type Head Homing

The main purpose of this preliminary homing adjustment is to aid the Customer Engineer in making the rest of the coarse alignment adjustments. It places the typehead in approximately the correct position so that its rotation, for a given selection, may be easily measured and used as a tool in making the next four adjustments. After completing this sequence of adjustments the preliminary homing adjustment may have to be refined.

9. Balance Lever - With the machine in upper case loosen the lock nut on the balance lever and move the right hand member of the balance lever (Fig. 75) left or right until a half-cycled +5/-5 (I/O home) combination detents (coarse aligns) the same as a half-cycled zero rotate character. The combination can easily be obtained by holding the negative-5 select magnet armature.

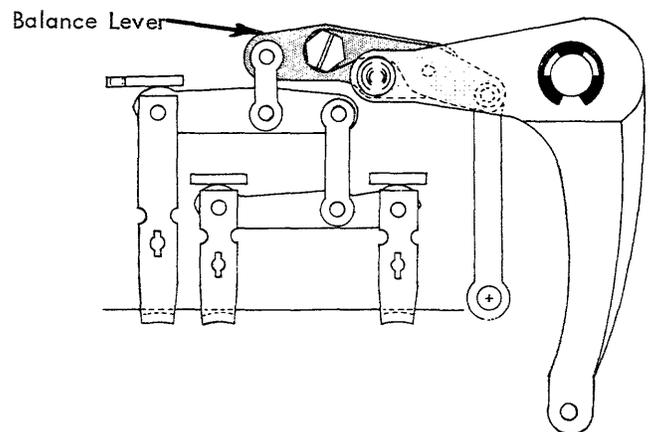


FIGURE 75. Balance Lever Adjustment

Begin the adjustment by half-cycling a zero rotate character in the normal manner. Check the detent entry to see exactly how much off-center the detent enters with the head play removed clockwise. Next half-cycle using the cancellation method described above and check the detent entry. If it is different from the normal zero

rotate character, it indicates that the typehead has moved because of an unbalanced condition between the positive and negative motions.

With the machine in the half-cycled position using the cancellation method, adjust the right hand member of the balance lever left or right until the detenting is exactly as it is when a zero rotate character is half-cycled normally. Changing the balance lever adjustment will not appreciably affect the detenting of the half-cycled zero rotate character (latched home).

NOTE: The nut on the balance lever screw can be left loose until the correct adjustment is obtained. Be sure not to move the adjustment when tightening the nut.

In (Figure 76) the effects of the wear compensator are disregarded and all adjustments are correct except the balance lever. The right hand member of the balance lever is maladjusted too far to the left creating too much negative motion and not enough positive motion. Looking at the positive side of Figure 76 you can see that the maladjusted balance lever causes a progressive loss of motion to the rotate bellcrank from the zero to a positive five rotate position. The greatest loss of motion is felt at the positive five position because the left end of the balance lever receives the most motion for this selection. When the negative side of the balance lever is operated, the maladjusted balance lever causes the rotate bellcrank to receive an excessive amount of motion as illustrated by the detenting of the negative five rotate position. This excessive motion is felt equally in all of the negative selections because the negative end of the balance lever receives the same motion from the cam for all negative selections. The progressive loss of motion felt from the negative five to the negative one rotate position is caused by the positive side of the balance lever. It produces a deficiency of motion in the negative selections just as it did during the positive selections.

Notice the detenting of a negative one selection in Figure 76. This selection combines the error of a positive four and a negative five causing the negative one to be the worst detenting selection with respect to the zero rotate selection. Although the cancellation method (+5/-5) combines even a greater error than the negative one selection, either one may be used to effectively make the balance lever adjustment. Checking the detenting of the other positions is not necessary.

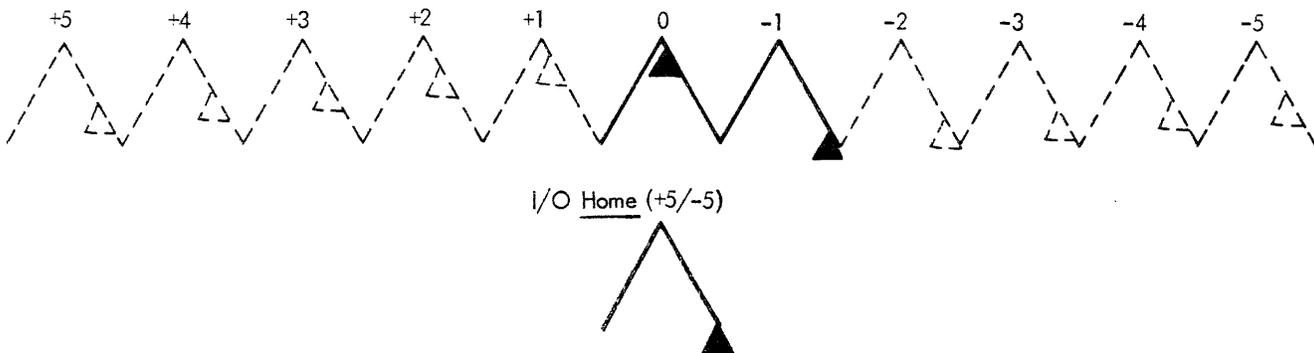


FIGURE 76. Excessive Negative Balance

If the balance lever were out of adjustment in the opposite direction so that there was too much positive and not enough negative motion, the error pattern would remain the same except that the detents would move towards the opposite side of the detent notches.

10. Rotate Arm Motion - The adjustable plate on the bottom of the rotate arm (Fig. 77) should be adjusted up or down so that a half-cycled upper case +5 rotate character detents the same as a half-cycled upper case -3 rotate character. When observing the detenting remove the head play lightly in the negative direction.

The rotate arm motion is measured only as far as the negative three position in the negative direction. The negative four and five positions are not used because these two positions are affected by the ratio change operation of the wear compensator.

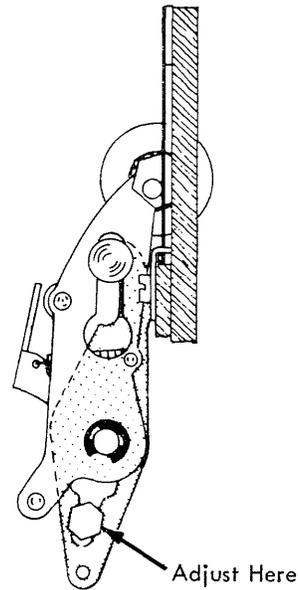


FIGURE 77. Rotate Arm Movement

By comparing the detenting of the -3 and +5, it can be determined whether or not the rotate arm is multiplying the motion, received from the rotate link, enough to rotate the typehead to the selected position. Once the -3 and +5 characters are detenting the same, then all of the selections between positive five and negative three will

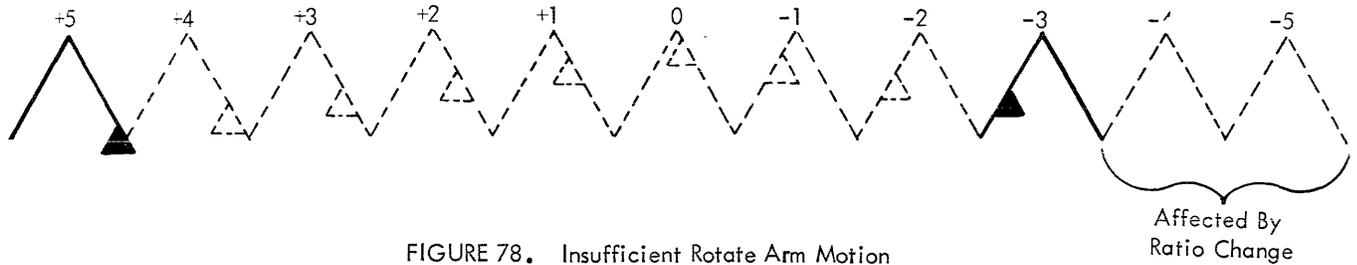


FIGURE 78. Insufficient Rotate Arm Motion

detent well within the acceptable band width provided that all of the previous adjustments have been made correctly. If a slight difference in detenting must exist between the -3 and +5 characters it is permissible and sometimes desirable provided that the -3 detents more negative than the +5 character. In other words, it is better to have too much rotate arm motion than too little. The reason for this is to place a small amount of wear potential into the system for the areas of the differential mechanism where wear cannot be compensated for (positive latches and latch bail). Thus, as wear occurs in these areas causing the rotate arm motion to decrease, the detenting variation between the +5 and -3 characters will also reduce.

Figure 78 illustrates the effects on detenting caused by insufficient rotate arm motion. Notice that the largest detenting variation occurs between the +5 and -3. This is because the +5 and -3 operate in opposite directions and the error that appears when these two positions are compared is the combined error of both positive and negative motion.

If the rotate arm motion was excessive the detenting pattern would remain the same except that each detent would be on the opposite side of its detent notch.

NOTE: The adjustment may be left loose during each check until the correct position is obtained.

11. Final Typehead Homing - (Eccentric Stud Adjustment)  
Use the following procedure to adjust the eccentric stud.

- a. Damper spring stop - as a preliminary adjustment, slide the damper spring stop down as low as it will go behind the damper spring (Fig. 79).
- b. Raise the compensator roller all the way to the top of the V-shaped wedging slot.
- c. Half-cycle an upper case -5 character and adjust the eccentric stud (Fig. 80) in against the machine sideframe until the -5 character detents .010" to .020" in the negative direction from the center of the detent notch when the head play is lightly removed in the negative direction (Fig. 81). Make sure that the damper spring is fully collapsed against the machine sideframe.

After the eccentric stud has been properly adjusted the compensator roller must be reset by raising it to the top of the V-shaped slot and striking a series of -5 characters. The compensator roller should seat 1/16" down from the top of the slot. If it drops too little or too much the rotate link should be ad-

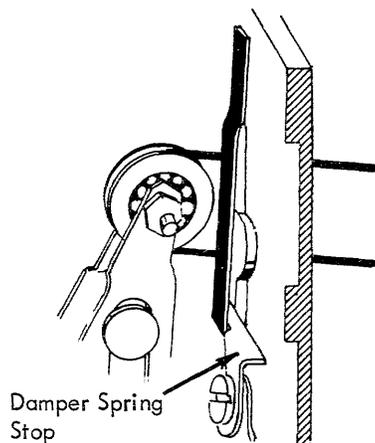


FIGURE 79. Damper, Spring Stop - Preliminary Adjustment

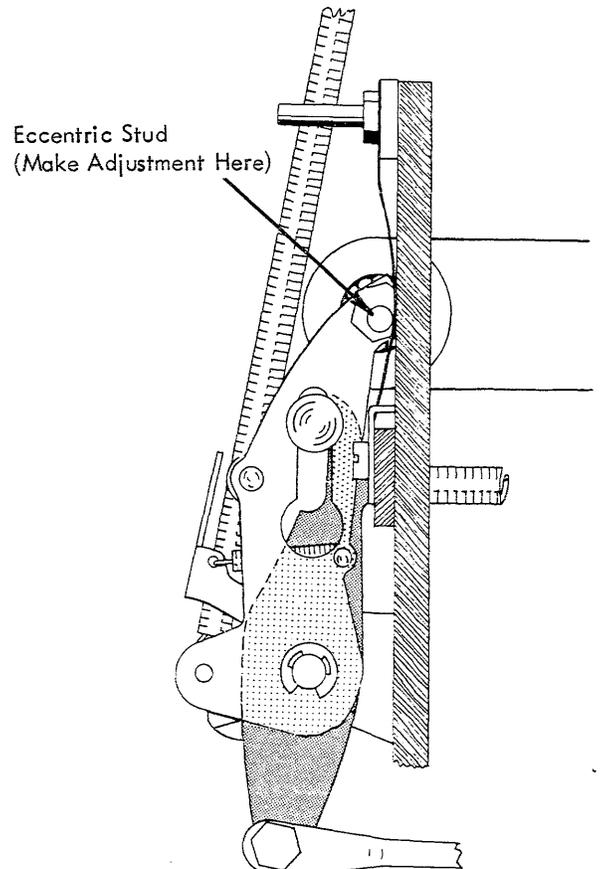


FIGURE 80. Eccentric Stud

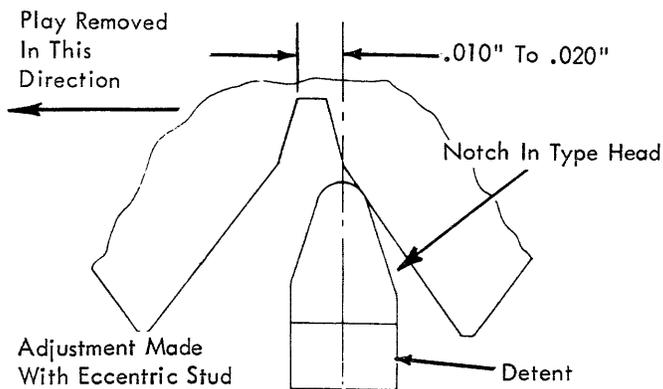


FIGURE 81. Final Typehead Homing

justed and the roller reseated until the 1/16" is obtained. Having the roller seat 1/16" from the top of the slot sets up a vertical condition between the compensating arm and the rotate arm so that the leverage within the arm assembly will be the same for both positive and negative movements of the arm.

In some cases it may be found that after the eccentric stud is adjusted the roller will not drop but remain trapped at the top of the V-shaped slot. If this occurs, lengthen the rotate link and then recheck the eccentric stud adjustment.

NOTE: The eccentric stud should always be kept in the lower half of its orbit so that it will tend to turn in the tightening direction as it operates against the sideframe. Also, if the correct detenting of the -5 character cannot be easily obtained with the eccentric stud adjustment the preliminary homing adjustment (Adj. #8) must be readjusted.

- d. Damper spring stop - with the typehead removed, raise the stop so that when a lower case -5 character is half-cycled the damper spring will just collapse against the sideframe. Check by pulling the compensator arm away from the sideframe with a spring hook and then allow it to go back in slowly (Fig. 82).

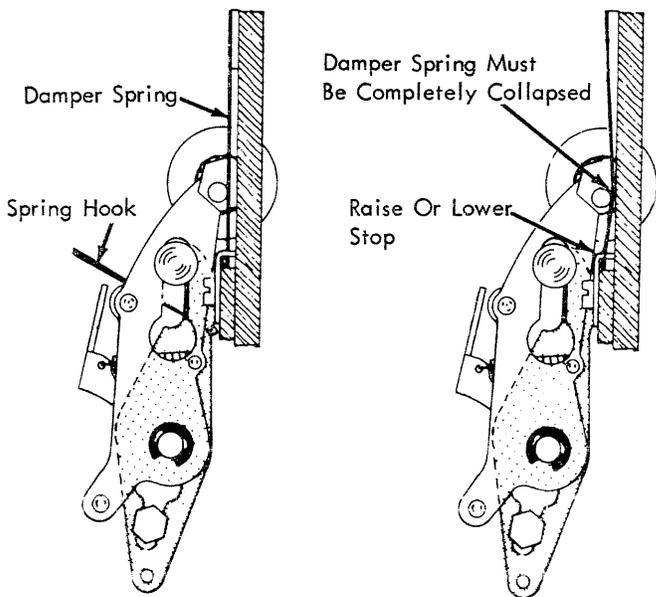


FIGURE 82. Damper Spring Stop

The main purpose of the eccentric stud adjustment is to stop the negative motion of the rotate arm as it approaches the negative five position so that all of the pressure on the compensator roller will be relaxed when the compensating arm has reached its full negative position. Assuming that no ratio change was felt in the system at the time of making the eccentric stud adjustment, stopping the rotate arm early to relax the pressure on the roller will cause the negative motion of the rotate arm between the negative four and negative five rotate positions to be reduced, or the detenting of the negative five to be positive with respect to all the other rotate positions.

Since the ratio change adjustment will not affect the negative five position, the typehead is then rehomed to the negative five position making it detent properly but causing all of the other positions (-4 through +5) to detent too far negative. The lost motion of the rotate arm is still felt between the negative four and negative five rotate positions. The rotate arm motion in this area can be controlled by the ratio change adjustment which will be discussed under the next adjustment. This rehoming of the typehead to the negative five position (which is usually a slight refinement of the original homing adjustment) is accomplished by the eccentric stud adjustment rather than by slipping the rotate shaft within the rotate pulley. It has been found that the homing adjustment can readily be refined to the negative five position with the eccentric stud while at the same time obtaining a relaxed condition for the compensator roller (accomplished by controlling the length of the rotate link and reseating the compensator roller).

- 12. Ratio Change Adjustment - With the machine half-cycled to an upper case -3 character, form the paddle on the rotate eccentric arm until the upper case -3 character detents the same as the upper case -5 character. Each time the paddle (Fig. 83) is formed the machine must be recycled under power before observing the detenting of

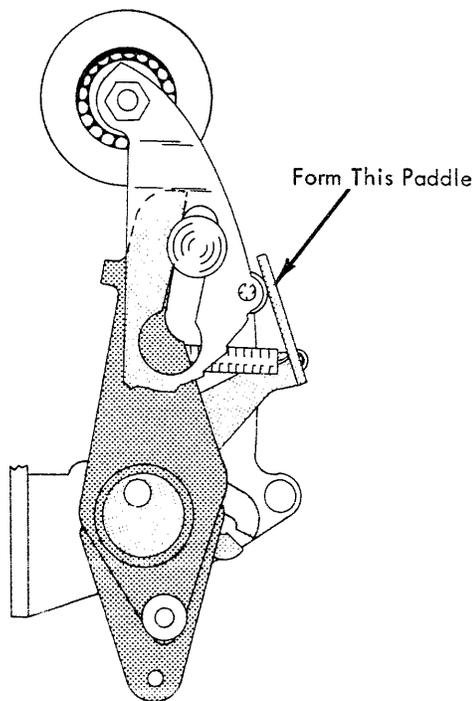


FIGURE 83. Arm Assembly In -3 Position

the -3 character. This allows the eccentric shoulder to reseat itself in the compensating arm.

**CAUTION:** When forming the paddle the V-shaped wedging slot may accidentally open up causing the roller to drop. If this occurs, reseat the roller by raising it to the top and striking a series of -5 characters. This adjustment should require only slight forming of the paddle.

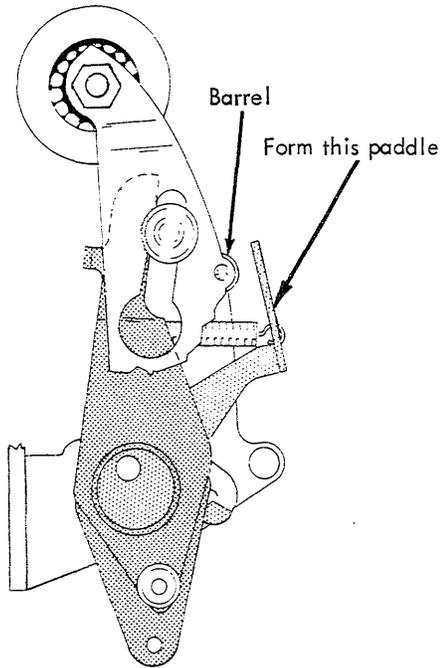


FIGURE 84. Arm Assembly in -5 Position

Forming the paddle has no effect on the negative five position. This can easily be seen by looking at Figure 84 which shows the arm assembly in a negative five position.

In this position there is a clearance between the paddle and the barrel on the rotate arm; therefore any change in the paddle position just increases or decreases this clearance without affecting the negative five position of the rotate arm.

The paddle adjustment does affect all of the rotate positions from a negative three to a positive five position equally because it controls how long the compensating arm will rotate about the eccentric shoulder on the rotate arm as it travels from the negative five position towards the negative three position. In other words, the more clearance there is between the rotate arm and the paddle, the farther the compensating arm can travel under a ratio change condition as it moves towards the negative three position.

Figure 85 illustrates how the detenting pattern of the typehead is affected by the ratio change adjustment.

Notice in Figure 85A that all the rotate positions from the -3 to the +5 detent equally but much less negative than the -5. This indicates that there is too much ratio change (too much motion) in the system between the -5 and the -3. The paddle should be formed in until the -3 detents the same as the -5.

Figure 85B illustrates the detenting pattern of a system that lacks a sufficient amount of ratio change. All the rotate positions from -3 to +5 detent alike but too far negative with respect to the -5. The system lacks motion between the -5 and the -3; therefore the paddle should be formed out to increase the amount of ratio change. Note that the negative four position is detenting the same as the -3 in Figure 85B. This is because the ratio change is

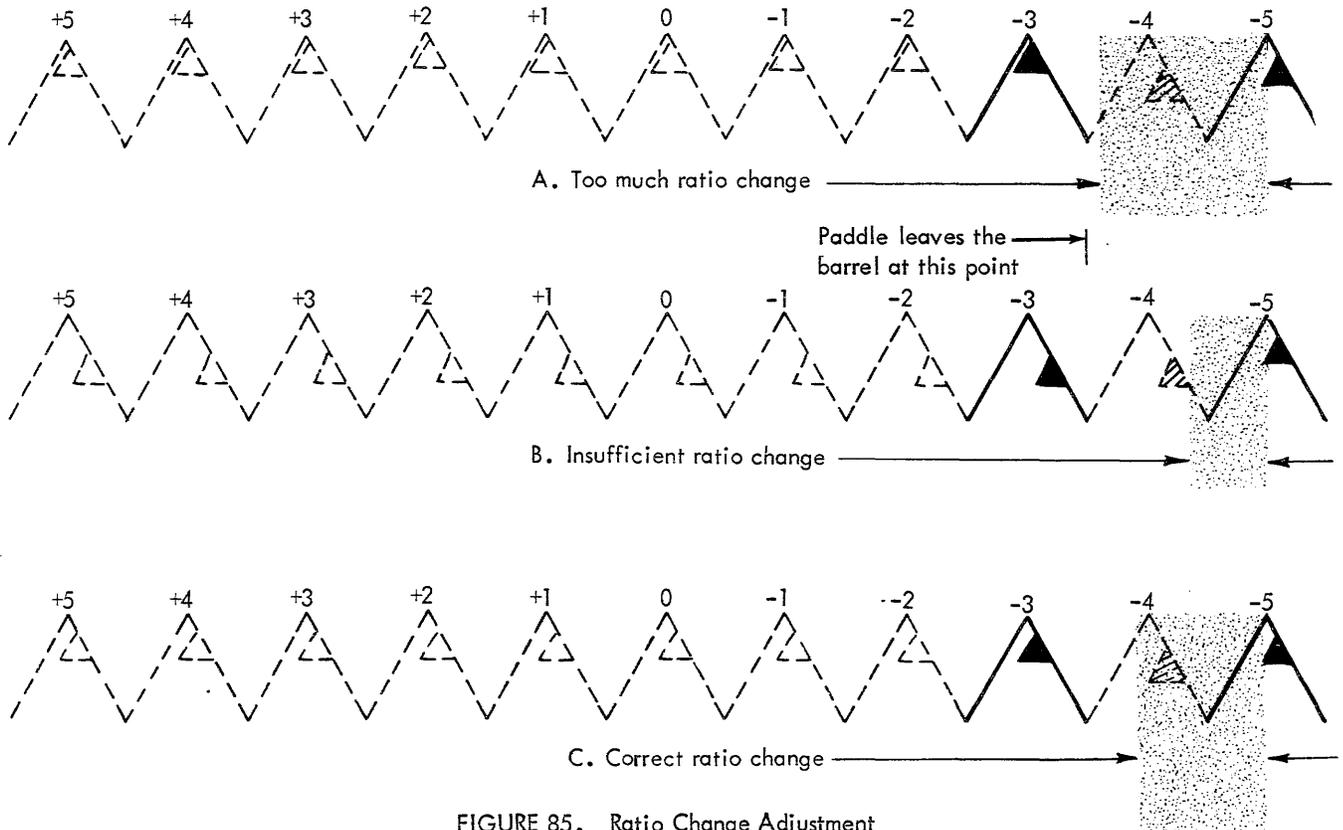


FIGURE 85. Ratio Change Adjustment

not occurring at the negative four position, thus the arm assembly is operating as one solid arm at this position.

In Figure 85C the correct amount of ratio change is in the system. All positions from the -3 to the +5 detent the same as the -5. Note that when the -3 detents the same as the -5, the detenting of the -4 is slightly different. This is caused by the ratio change. No attempt should be made to control the detenting of the -4 position because its position may vary on each machine depending on the amount of ratio change required (of each machine) to make the -3 detent the same as the -5.

13. Print Shaft Timing (Final) - Advance or retard the print shaft relative to its gear to obtain the proper timing of the rotate detent. Hand-cycle an upper case -5 character and observe the rotate detent as it operates in the typehead notch. The detent must enter the correct detent notch and withdraw without restricting the restoring of the typehead. There should be .002" to .004" backlash felt in the typehead when the detent is near the bottom of the slope of the detent notch (Fig. 86).

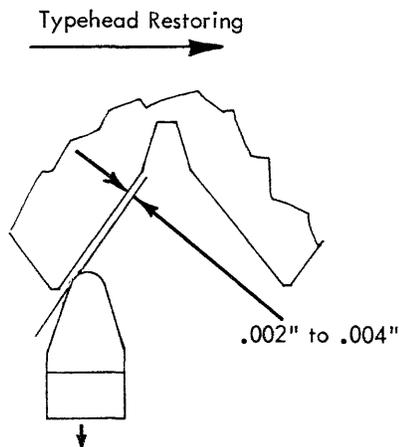


FIGURE 86. Withdrawal Clearance For The -5 Character

After adjusting the timing of the rotate detent to the upper case -5 character, check the detent entry and withdrawal of an upper case +5 character. If the detent restricts the typehead from restoring on withdrawal when the +5 is slowly hand-cycled, advance the print shaft slightly until the +5 has a withdrawal backlash of .002" to .004". When the withdrawal adjustment has been completed check the detent entry on both the +5 and -5. The detent must enter the correct notch.

**CAUTION:** After hand-cycling the machine the compensator roller must be raised to the top of the wedging slot and resealed under power by striking a series of -5 characters.

If difficulty is encountered in obtaining the correct detent timing, check the following items:

- a. Detent skirt clearance - favor the high side of the tolerance.
- b. Typehead homing - favor the high side of the tolerance.
- c. Band width - make sure that it is not excessive.

- d. Head play - it should be .045" measured at the typehead skirt. If excessive head play is suspected the ball joint should be replaced and the typehead homing adjustment refined.

**CAUTION:** Excessively advanced or retarded timing can cause parts damage as well as poor horizontal alignment or improper selection. This could happen if the detent entered the wrong notch or remained in the notch too long.

**NOTE:** Be sure to maintain .002" to .004" end play in the print shaft.

14. Shift Motion - The shift arm adjusting screw (Fig. 87) should be adjusted in or out to obtain 180° rotation of the typehead during a shift operation.

The adjustment can be checked by observing the detenting in the lower case compared to the upper case using a -5 character. The detent **MUST** enter the lower case notch **EXACTLY** the same as it does the upper case notch. Check by half-cycling the machine and manually withdrawing the detent. Remove the head play clockwise and allow the detent to re-enter slowly. A final check can be made by comparing the detent withdrawal timing of the upper and lower case. They must be exactly alike.

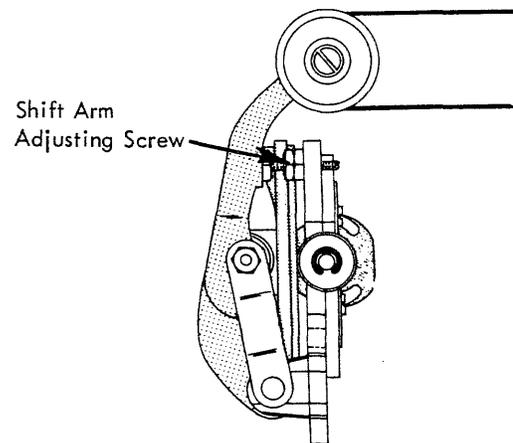


FIGURE 87. Shift Motion Adjustment

Maladjustment can cause misalignment in the lower case while the upper case remains good.

**CAUTION:** Be sure that the shift arm is detented at each position during the check and that the cycle shaft is properly latched at the half-cycle position.

15. Final Check - After completing the foregoing adjustments, a final check should be made to see if any refinements are necessary. Compare the coarse alignment of 0 rotate compared to +5, -1, -3, -4, -5. The band width of this group should not exceed .020" and none of the group should detent closer than .010" to the center of the notch when the head play is removed in the negative direction.

The following table can be used to diagnose the cause of excessive band width between a 0 rotate and +5, -1, -3, -4, -5. These characters are chosen because of their rotate selections. If an excessive band width exists, it will be greatest among these characters. In making the diagnosis follow the sequence as listed.

Excessive Band Width Between

Cause

0 (zero) and -1	Incorrect balance
-3 and +5	Incorrect rotate arm motion
-3, +5 and 0 (zero)	Incorrect latch clearances
-5 and -3	Incorrect paddle adjustment

Unwanted compensator roller droppage may result from one or more of the following.

- a. Improper detent timing
- b. Malselection (popping latches)
- c. Incorrect rotate spring tension or damper spring tension.
- d. Binds in the typehead, upper ball socket, rotate shaft, rotate pulley, or rotate spring.
- e. Binds in the compensator or lever system.
- f. Loose differential mounting bracket.
- g. Excessive band width or head play.

If the band width appears to be all right but the alignment is not satisfactory, check the following items:

- a. Detent timing
- b. Play or binds in the tilt or rotate detents. Side play in the rotate detent can be checked by repeating any full size character such as the letter "N" so that it repeats for a full line. Move the carrier back manually and repeat the operation without indexing. The second line should cover the first line exactly. If any of the characters are shadowed, side play in the rotate detent could be the cause.
- c. Loose fitting upper ball socket

- d. Excessive play in the carrier or rocker
- e. Binds in the rocker parts
- f. If the -5 characters vary horizontally, improper damper spring tension could be the cause.
- g. Improper tilt adjustments can cause poor horizontal alignment by delaying the detent seating.

NOTE: After the machine has been in use for some time wear in the tape system will allow the typehead to drift in the negative direction. It is not necessary to slip the rotate shaft within the rotate pulley to REFINe the typehead position. The proper position may be gained by refining the eccentric stud adjustment. Be sure to RESEAT the compensator roller after changing the eccentric stud adjustment. (Maintain the roller position 1/16" from the top of the slot by adjustment of the rotate link.)

PRINT MECHANISM

1. Copy Control Lever - With the copy control lever detented in the forward position, the high points of the eccentrics should be vertical (Fig. 88). Adjust the copy control lever on the shaft to satisfy this condition.

This adjustment provides the most effective operation of the eccentrics in moving the platen forward and back.

NOTE: The stop ears on the copy control detent spring should be formed to provide positive detenting in the extreme front and rear positions of the lever.

CAUTION: The adjustment of the copy control lever, while important as a preliminary setting, should not require adjustment unless it becomes loose or parts replacement is necessary. Any change in the adjustment will affect the front to rear position of the platen requiring that other adjustments be altered to compensate.

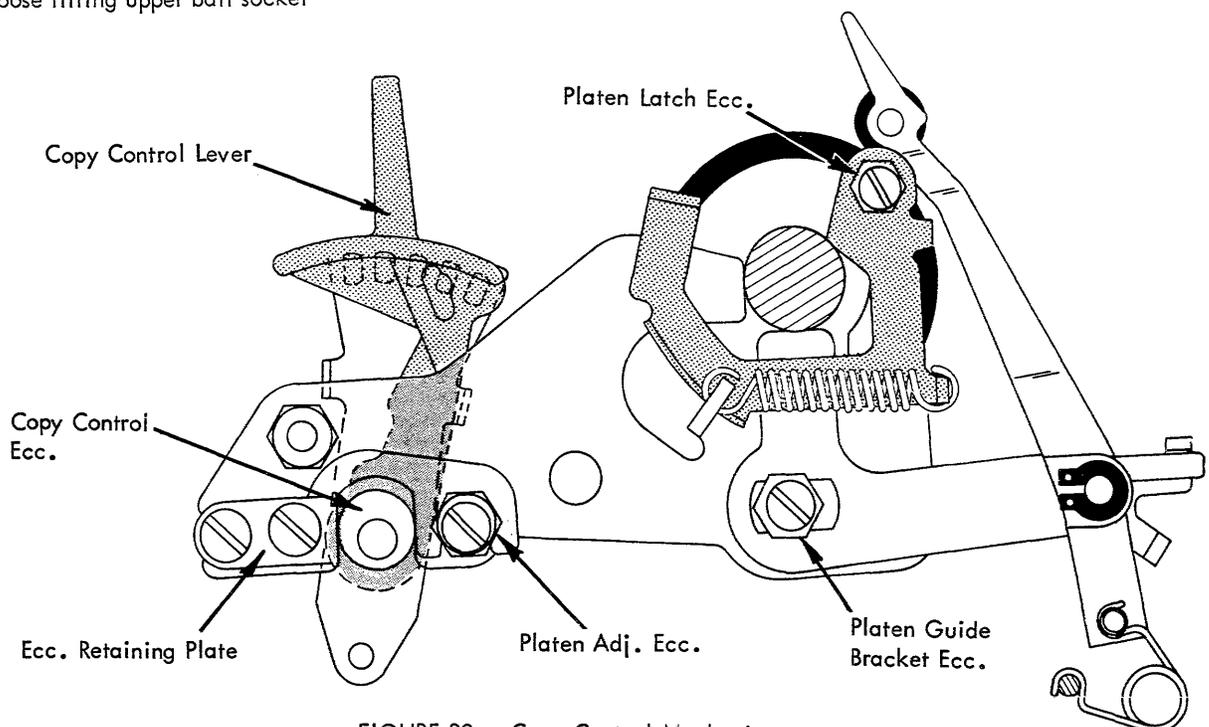


FIGURE 88. Copy Control Mechanism

The copy control lever should be all the way forward unless stated otherwise for the following adjustments.

2. Eccentric Retaining Plates - For maximum efficiency of the copy control eccentrics, adjust the plate on each side of the machine so that no front to rear play exists between the eccentrics and the retaining plates (Fig. 88). Be sure that no binds exist.
3. Platen Latches - Adjust the platen latch eccentrics with the high part down so that the platen is held firmly in position vertically and horizontally (Fig. 88). The latches should latch and unlatch freely with the feed rolls released.
4. Platen Position - To properly adjust the print mechanism, the correct position of the platen must be established first and then the print adjustments made relative to the platen position. This involves both a height adjustment and a front to rear position. Because of the method used in measuring these positions, it is necessary to consider them together and adjust them alternately until both are correct.
  - a. Platen Height - With the head of the Hoovermeter set at the #4 scribe line, the platen should just touch the base of the handle when the head is resting on the escapement rack (Fig. 89).

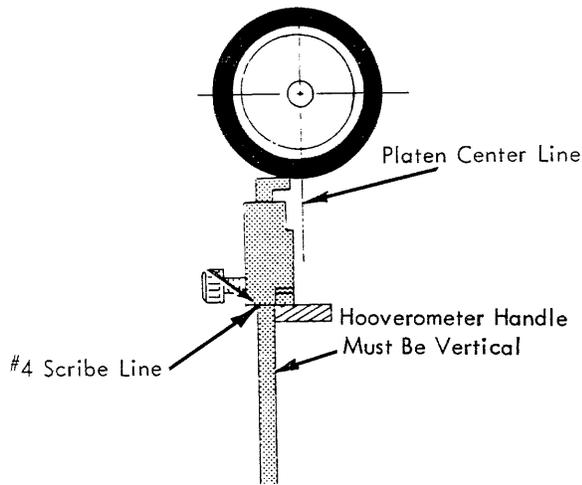


FIGURE 89. Platen Height

Adjust the platen guide bracket eccentrics to obtain this condition (Fig. 88). The high part of the eccentrics should be kept to the rear. It is necessary to remove the deflector and front feed rolls when checking the adjustment with the Hoovermeter.

NOTE: The Hoovermeter should be inserted at a position just to the left of the escapement cord drum when checking the right side and directly in line with the rotate-two latch when checking the left side. The handle of the Hoovermeter must be as nearly vertical as possible during the checks. The base of the handle does not reach the center line of the platen when the handle is vertical, but the difference in height has been compensated for in the location of the scribe line.

- b. Platen Front to Rear - With the head of the Hoovermeter set at the #2 scribe line, the tool should just span the distance between the platen and the print shaft as illustrated in Fig. 90. Adjust the platen adjusting eccentrics to obtain this condition (Fig. 88).

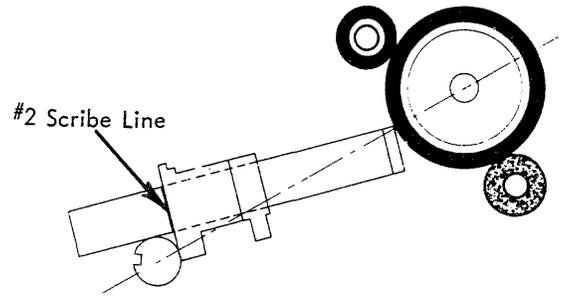


FIGURE 90. Front to Rear Platen Adjustment

Check at both ends of the platen. In order to adjust the platen adjusting eccentrics it is also necessary to loosen the front screws in the eccentric retaining plates. (Be sure that the Hoovermeter does not rest on the print shaft keyway.)

NOTE: After the correct vertical and horizontal positions of the platen are obtained with the Hoovermeter, the vertical position may be refined to provide even printing between the tops and bottoms of the characters. Check at both ends of the writing line.

## 5. Carrier Shoe Adjustment

- a. Carrier Shoe (early) - Adjust the upper carrier shoe eccentric mounting stud to provide .001" to .004" vertical motion of the carrier at the rear (Fig. 91). Check at several points along the writing line.

This amount of play insures free lateral movement of the carrier yet restricts the vertical movement to help prevent variation in the vertical alignment of the type.

NOTE: The eccentric is accessible with the 3" screwdriver through the opening in the escapement bracket just above the tab torque bar. The side of the screwdriver blade should be used if possible.

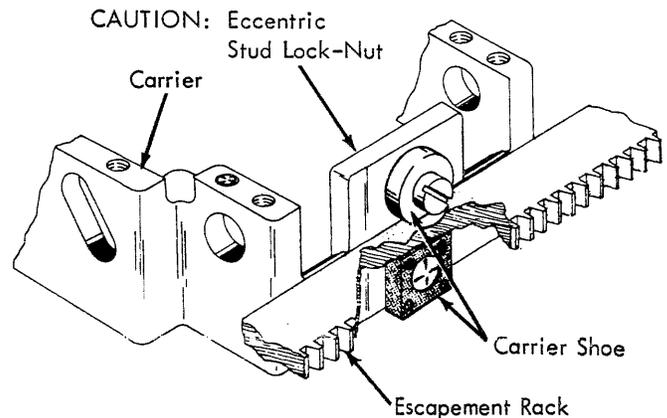


FIGURE 91. Carrier Shoe - Old Style

- b. Carrier Shoe (late) - Adjust the upper carrier shoe eccentric mounting stud to provide .002" to .006" vertical motion of the carrier at the rear (Fig. 92) when the spring load on the upper shoe is suppressed.

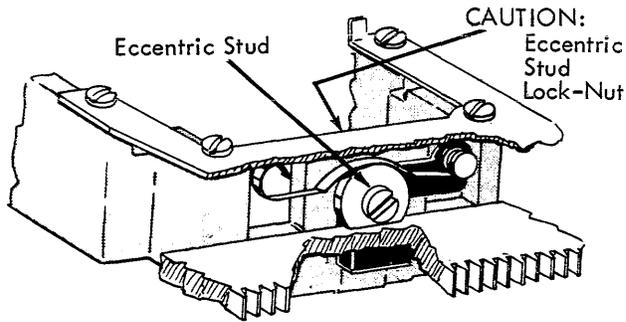


FIGURE 92. Carrier Shoe - New Style

NOTE: The vertical motion may be felt by firmly moving the carrier up and down at the rear, so as to overcome the effects of the spring load on the upper shoe.

6. Velocity Control Plate - The velocity control plate must be adjusted to satisfy the following two conditions:
- With the cam follower held lightly against the low point of the print cam, the center of the home character should clear the platen by .260" to .270".
  - With the cam follower held lightly against the high point of the print cam, the home character should clear the platen by .020" to .030".

The copy control lever should be forward for both adjustments. These adjustments should be made with the carrier at the extreme left hand position.

The adjustments can be made easily if the following procedure is used.

- Raise the anvil adjusting eccentrics and the restoring cam follower eccentric to prevent any interference, and remove the ribbon feed plate for accessibility. (Fig. 96).
- If the velocity control plate is loose or completely out of adjustment, set the high part of the eccentric forward and tighten it in place. Adjust the plate so that about 1/32" of the adjusting slot is visible above the binding screw and tighten the screw friction tight. These settings provide a good starting point. (Fig. 93).
- Hand cycle the machine using a zero rotate, zero tilt character until the print cam follower is on the high point of the cam. Do not hold the typehead toward the platen. With the mechanism in this position, adjust the velocity control plate eccentric until a slight drag is felt on three tab cards inserted between the typehead and the platen (Fig. 93). A heavy drag should be felt on four cards. No drag should be felt on two cards. You should not be able to insert five cards.

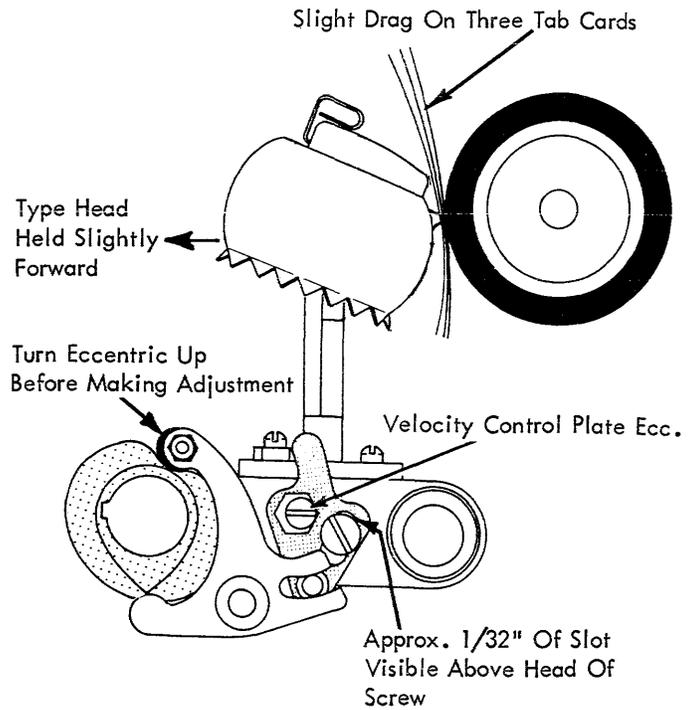


FIGURE 93. Velocity Control Plate Eccentric Adjustment

This will place the limit of powered travel of the typenead .020" to .030" away from the platen (providing the typehead with the proper amount of free flight).

- Hand-cycle the machine until the print cam follower is at the low point of the cam. This may not be at the rest position. The low point of the cam can be determined by observing the movement of the head toward the front of the machine. With the typehead at its most forward point, adjust the velocity control plate pin forward or back in the cam follower slot until a clearance of .260" to .270" exists between the center of a zero rotate, zero tilt character and the platen (Fig. 94).

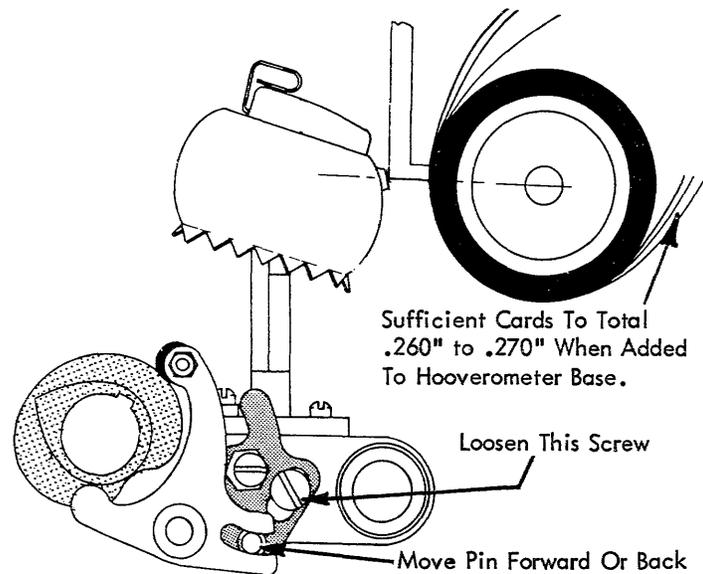


FIGURE 94. Velocity Control Plate Adjustment

Since this .260" to .270" is measured between the typehead and the platen it is not a measurement of the powered travel of the typehead. The .020" to .030" free flight is included in this .260" to .270" and must be subtracted in order to determine the amount of powered travel. The powered travel must never exceed .265" as this will cause typehead breakage.

The base of the Hoovermeter handle can be used as a measuring device as illustrated in Fig. 95. The handle base is about .250" thick; however they do not all measure the same. Each handle should be measured with a dial indicator or micrometer to determine its exact size. When the size of the handle base is determined, a thickness of tab cards should be placed around the platen that will total .260" to .270" when added to the thickness of the handle base.

- e. Both adjustments must be rechecked and refined until these conditions are obtained. Be sure to tighten both screws firmly when the adjustments are completed.

NOTE: The adjustments should be checked with the ribbon removed.

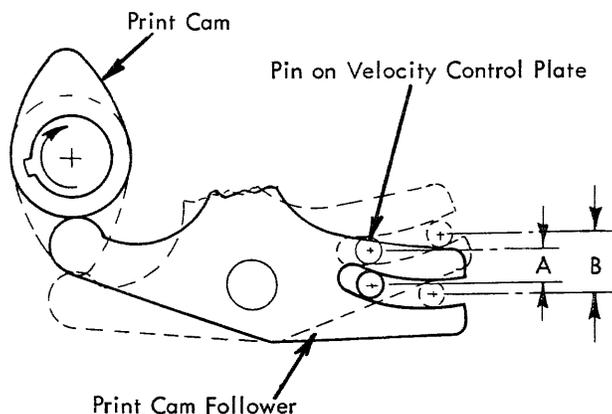


FIGURE 95. Velocity Control Plate Adjustment

The print cam has a fixed amount of rise from its low point to its high point. For this reason, the print cam follower always receives the same amount of powered travel or motion from the print cam. However, the amount of powered travel that the rocker and typehead receive from the print cam follower is directly dependent upon the position of the velocity control plate pin in the forked slot of the follower (Fig. 95). Moving the pin to the front of the slot decreases the powered travel of the typehead as shown by dimension A (Fig. 95). Moving it to the rear increases the powered travel, as shown by dimension B.

Because of the constant operational speed of the print cam and follower, the typehead velocity must increase or decrease proportional to the increase or decrease in powered travel. An accompanying change in typehead velocity occurs when the powered travel is changed because the typehead must always travel from its rest position to its active position in the same amount of time re-

gardless of what this distance may be.

The proper impact velocity of the typehead can be achieved by controlling the amount of powered travel of the typehead while maintaining at the same time the correct amount of free flight. Since the position of the platen has been previously fixed and the amount of free flight is determined by the point at which the limit of powered travel occurs relative to the platen, only the rest position (beginning of powered travel) may change when the amount of powered travel is changed. Therefore, in order to maintain a fixed amount of free flight to the typehead when the amount of powered travel is changed, the velocity control plate pin must also be adjusted up or down relative to the rocker.

The eccentric shouldered nut (Fig. 93) on the velocity control plate provides a means of controlling the vertical position of the velocity control plate pin relative to the rocker thereby controlling the free flight of the typehead. The elongated hole in the velocity control plate (behind the binding screw) allows the velocity control plate pin to be adjusted front or rear in the forked slot of the follower thereby controlling the amount of powered travel that the typehead will receive. Each adjustment affects the other and must be adjusted alternately until both are correct.

These adjustments are designed to produce optimum print quality for most applications; however, a certain amount of variation in velocity is permissible in order to satisfy a customer's application. Be cautious of creating an excessive increase or reduction in velocity as this will adversely affect the uniformity of impression between characters and the general appearance of the printed copy.

7. Anvil - The eccentric at each end of the anvil is adjusted so that the anvil properly restricts the free flight of the typehead. The adjustment can be checked by printing a period or similar character with the copy control lever set all the way back. The period should fail to print or print very faintly. With the copy control lever pulled forward one notch (fourth position), the period should print lightly. The ribbon and one sheet of paper should be used when making the check. The check should be made at each end of the platen only, because flexing of the parts will allow a slightly different condition in the middle of the platen. The high part of each eccentric should be kept outward towards the side (Fig. 96).

NOTE: The restoring cam follower eccentric should be adjusted all the way up while the anvil is being set. The carrier buffers must also be moved up out of the way of the anvil (Fig. 96).

The free flight must be restricted to insure that the characters will all emboss the paper to the same depth. If no restriction were applied, the smaller characters such as punctuation marks would be allowed to emboss too deeply. The surface area somewhat restricts the amount of embossing for the larger characters; thus if the free flight of the rocker is stopped at the right point, even impression between all characters will result.

CAUTION: Raising or lowering either end of the anvil

will slightly affect the adjustment at the other end. Be sure to recheck each adjustment.

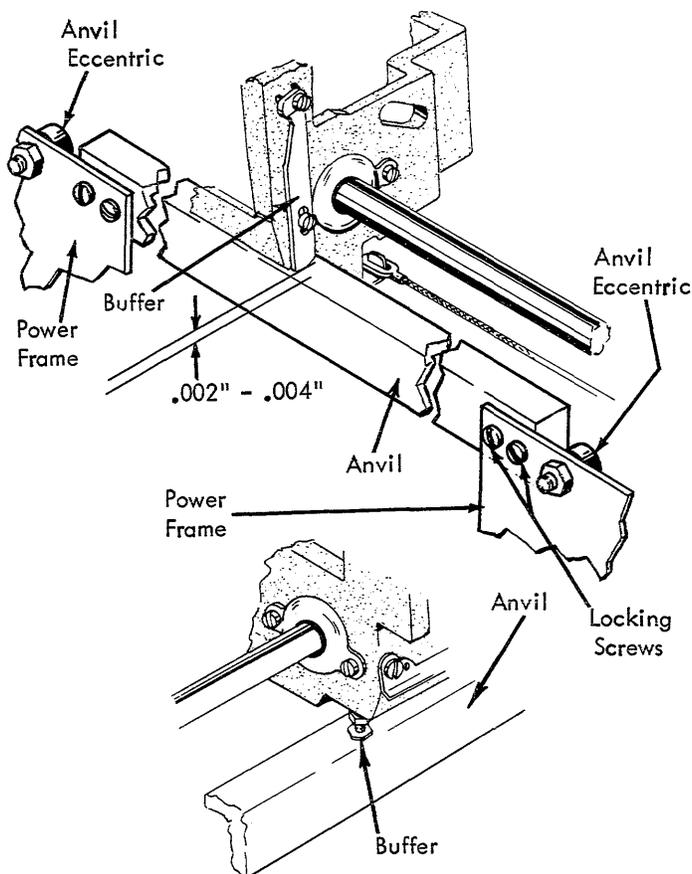


FIGURE 96. Carrier Buffers (15 Inch Machines)

8. Carrier Buffers - A buffer plate attached to the right side of the carrier and an adjusting screw under the left side strike the top of the anvil to prevent the print shaft from flexing downward. Each should have .002" to .004" clearance with the top of the anvil (Fig. 96).

9. Print Cam Follower

- a. Print Cam Follower Stud - Adjust the pivot stud left or right so that the rubber roller on the follower is centered on surface of the restoring cam. The stud is held in place in the carrier by a set screw that is accessible from the bottom of the machine.
- b. Restoring Cam Follower Eccentric - With the print cam follower at the high point of the cam and the platen removed, hold the typehead toward the rear until it is restricted by the anvil and striker. The rubber roller should just touch the restoring cam (Fig. 97). Adjust the eccentric, keeping the high point forward, to satisfy the condition.

NOTE: If the roller is too close to the restoring cam, it may bind against the cam during print shaft rotation. If too much clearance exists, the typehead may not be restored as quickly as it should and blurred characters may result.

10. Even Printing - Position the yoke under its mounting screws so that the density of the left and right sides of a printer character will be uniform.

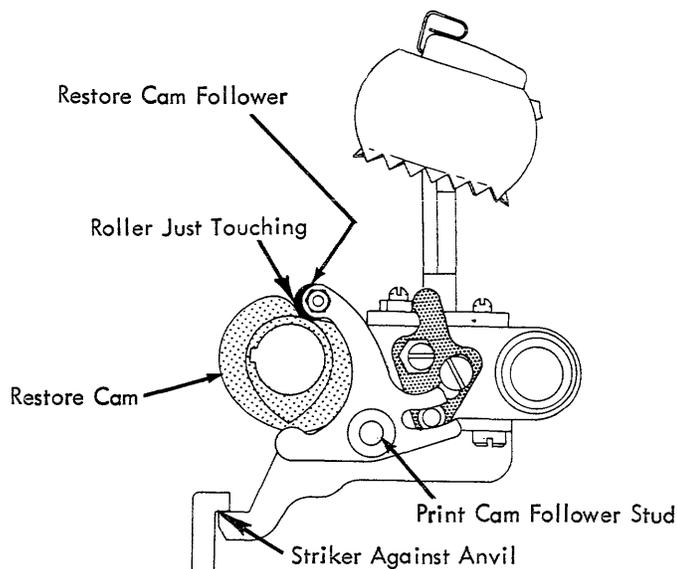


FIGURE 97. Restoring Cam Follower Eccentric Adjustment

CAUTION: This adjustment affects the tilt ring homing adjustment, the typehead homing adjustment, and the detent cam and actuating lever adjustments (skirt clearance). Be sure to check these after changing the position of the yoke.

ESCAPEMENT MECHANISM

1. Escapement Bracket -

- a. With the carrier to the left, adjust the escapement bracket front to rear so that .001" to .002" exists between the raised area of the escapement bracket and the tab torque bar. The rear surface of the escapement bracket should be kept parallel with the tab torque bar (Fig. 98).

Early printers which do not have a raised area should be adjusted for .011" to .017" between the escapement bracket and tab torque bar.

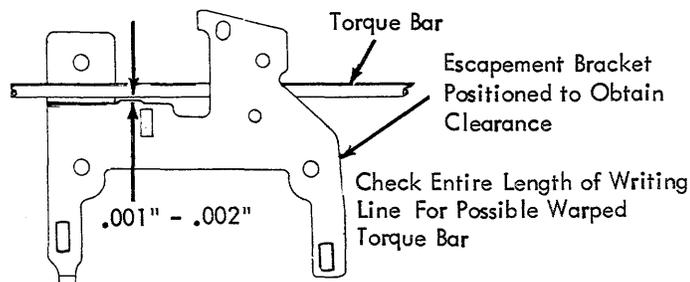


FIGURE 98. Escapement Bracket

- b. With the carrier to the right, form the extension on the tab rack plate so that .001" to .002" exists between the raised area of the escapement bracket and the tab torque bar. This is the extension which supports the tab torque bar on the right side (Fig. 99). Note: This part is case hardened on early machines. Use caution when forming. Adjustment "a" should be rechecked if this extension is formed.

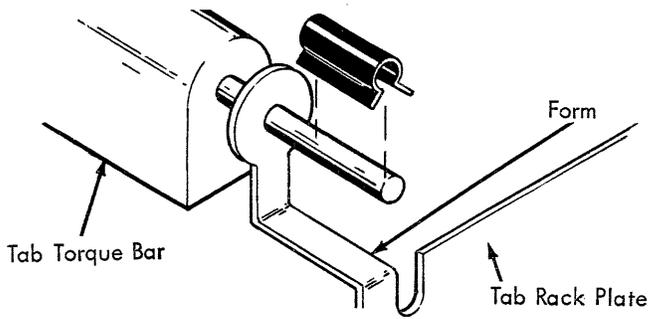


FIGURE 99. Tab Rack Plate

NOTE: The following relationships are affected by the position of the escapement bracket - tab lever trigger to tab torque bar, tab lever pawl to tab rack, tab lever to escapement and backspace pawls, tab lever trigger to tab overthrow stop, escapement and backspace pawls to escapement torque bar, escapement torque bar to pawl pivot stud, and escapement torque bar to tab latch. Each of these relationships must be checked and readjusted if necessary after any adjustment of the escapement bracket.

2. Escapement Torque Bar Stop

- a. Late - The torque bar stop located at the right end of the torque bar should be adjusted for a rest position clearance of .008" to .010" between the torque bar and the lug on the escapement pawl (Fig. 100).

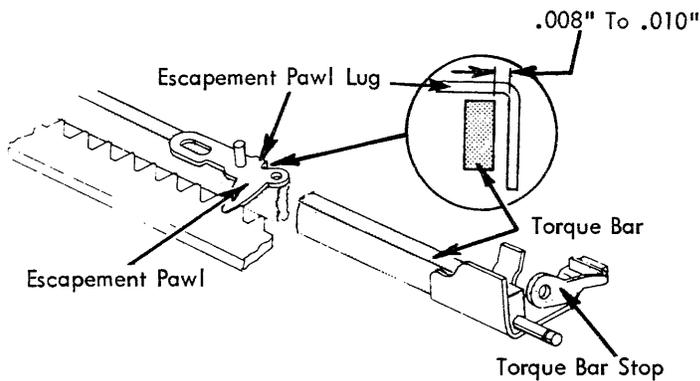


FIGURE 100. Torque Bar Stop (New Style)

- b. Early - Form the torque bar stop located at the left end of the torque bar so that a clearance of .002" to .006" exists between the torque bar and the lug on the escapement pawl (Fig. 101).

The escapement cam used with the new style escapement mechanism provides greater available travel for all escapement parts; therefore more clearance is permissible and desirable between the torque bar and the escapement pawl lug.

**CAUTION:** Make certain that the escapement trigger does not prevent the escapement torque bar from resting against the stop when making the torque bar stop adjustment. Also, check the pawl mounting stud and, on long carriage machines, the torque bar back stop. Neither one of these should be touching the torque bar when the stop adjustment is being made.

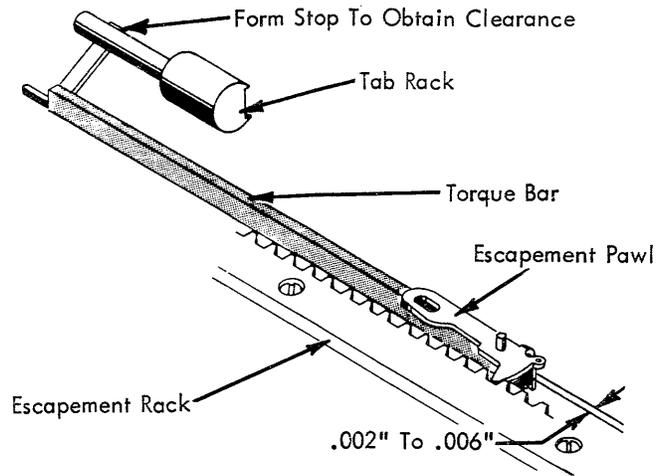


FIGURE 101. Torque Bar Stop (Old Style)

3. Pawl Mounting Stud - Rotate the pawl mounting stud so that it clears the escapement torque bar by .001" at the closest point along the writing line (Fig. 102). Keep the high part of the eccentric toward the left so that the force of the torque bar will tend to tighten the stud instead of loosen it.

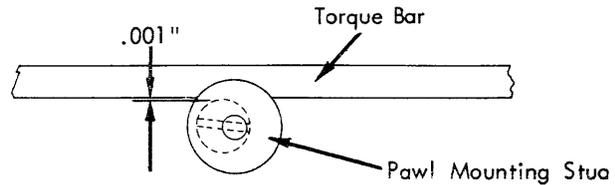


FIGURE 102. Pawl Mounting Stud Adjustment

4. Torque Bar Back Stop - Adjust the back stop forward or back on its mounting stud so that there is a .001" to .005" clearance with the torque bar (Fig. 103).

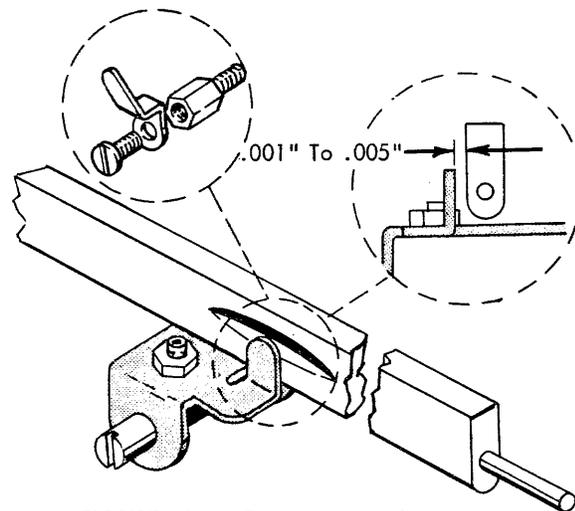


FIGURE 103. Torque Bar Backstop

5. Pivot Pin Eccentric (found on early level machines only) The eccentric collar should be adjusted with the high point up so that it just touches the operational latch bracket (Fig. 104). This prevents the pivot pin from bowing during a print escapement operation. The eccentric should also be adjusted laterally on the pivot pin so that the end play of the pivot pin will be .002" to .005".

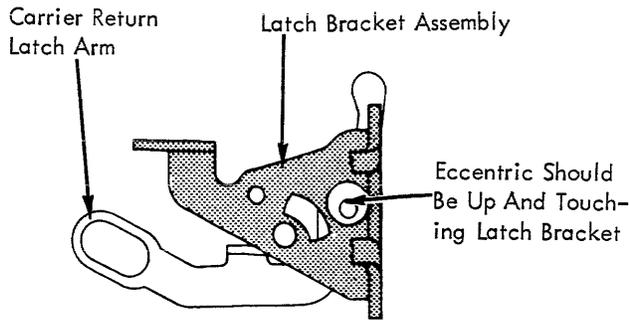


FIGURE 104. Pivot Pin Eccentric  
(Early Level Machines Only)

NOTE: The eccentric may require a readjustment if the rest position of the pivot pin is changed during carrier return adjustments.

6. Escapement Cam - Adjust the cam by rotating it on the filter shaft so that the cam follower roller just reaches the low point of the cam at the rest position (Fig. 105).

The cam is accessible from the top by inserting the fluted wrench between the carrier return and backspace key-levers just in front of the margin rack. (The keylevers are not present on all printers.)

Check the adjustment by holding the cycle clutch check pawl out of the way so that the cycle shaft can be rotated backward. Rotate the filter shaft gear backward slightly and observe that the escapement trip link moves forward immediately. This will insure that the escapement cam is not resting past the low point. To insure that the cam follower has fully reached the low point, hand-cycle a print operation. The escapement trip link should not move during the first part of the cycle.

The cam adjustment affects the timing of the print escapement. Advanced timing could cause the trip to occur before the print action, resulting in crowding or blurring of the printed characters. Retarded timing will cause the cam follower to rest part of the way up the incline of the cam. This could restrict the escapement

trigger from the resetting over the torque bar lug as the filter shaft returns to its rest position.

7. Escapement Trip Link - Adjust the trip link so that a clearance of .007" to .010" exists between the torque bar lug and the hook of the escapement trigger in the rest position (Fig. 105).

CAUTION: In adjusting the escapement trip link be sure that the trigger lever upstop (Fig. 107) and the adjustment screw in the spacebar latch lever (Fig. 136, page 41) do not restrict the upward travel of the trigger lever.

The adjustment insures that the torque bar will always be rotated far enough to trip the pawls from their racks.

If excessive clearance is present, the escapement may eventually fail as wear occurs in the system and reduces the amount of travel given to the trigger.

Insufficient clearance may prevent the trigger from resetting over the torque bar lug at the end of each cycle. It may also cause the escapement trip to occur too early in the cycle. The trip should not occur before the print action.

8. Escapement Trigger Action - Adjust the trigger guide (early style machines) or the trigger knock-off eccentric stud (new style machines) so that the escapement trigger will become disengaged from the torque bar lug when the escapement pawl clears the rack by .010" to .015" (Fig. 106).

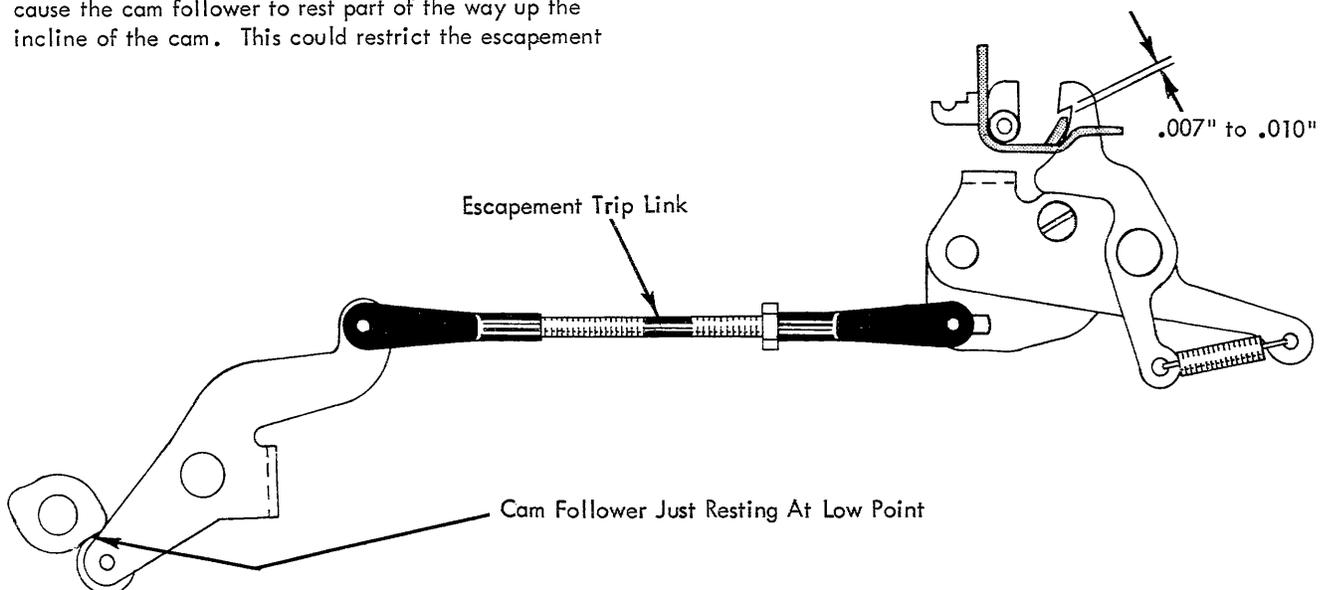


FIGURE 105. Escapement Cam And Link Adjustment

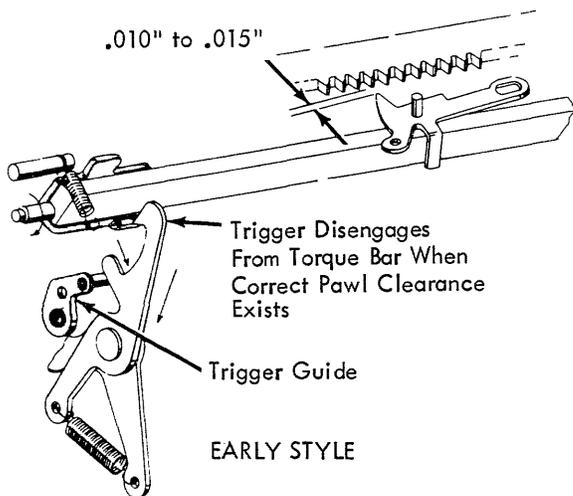
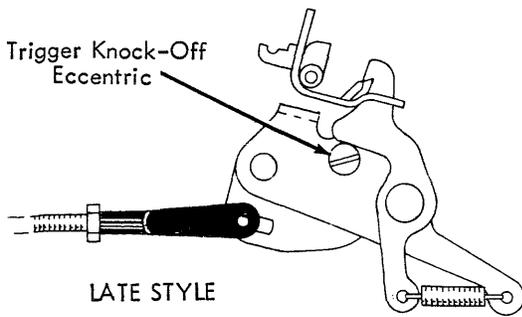


FIGURE 106. Escapement Trigger Guide Adjustment

9. Trigger Lever Upstop - With the machine at rest and a clearance of  $.007''$  to  $.010''$  existing between the trigger and the lug on the torque bar, adjust the trigger lever upstop so that it has a clearance of  $.001''$  to  $.005''$  with the trigger lever (Fig. 107).

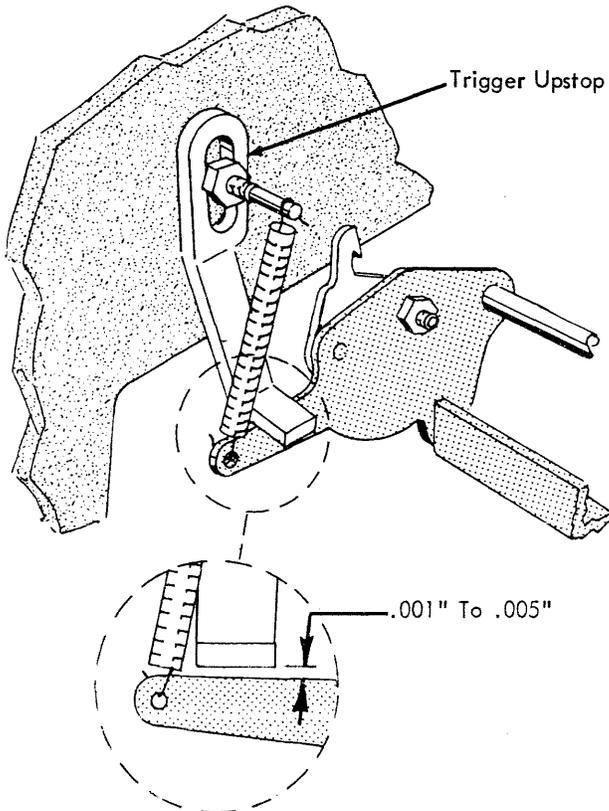


FIGURE 107. Trigger Lever Upstop

The trigger upstop prevents the trigger lever from bouncing as it returns to its rest position.

## MAINSRING AND CORDS

1. Gear Mesh - The proper gear mesh between the escapement cord drum and the carrier return pinion involves two adjustments. Both must be considered together.
  - a. Adjust the operational shaft laterally so that the crown surfaces of the escapement cord drum gear and the carrier return pinion are even (Fig. 108).

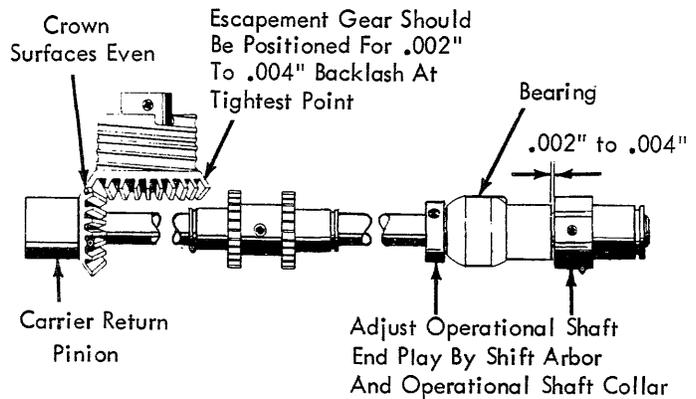


FIGURE 108. Gear Mesh and Operational Shaft Adjustment

The position is controlled by a collar set screwed to the shaft and the shift clutch ratchet. Be sure to maintain  $.002''$  to  $.004''$  end play in the operational shaft.

- b. The escapement cord drum gear should be adjusted forward or back to obtain  $.002''$  to  $.004''$  backlash at the point of tightest mesh with the carrier return pinion. Be sure that no binds exist throughout the travel of the carrier.

**CAUTION:** The mainspring tension should be RELAXED before the escapement cord drum gear is loosened. The cord tension should also be relaxed by removing the cord from the pulley on the cord tension arm. Be sure that no end play exists in the escapement shaft before attempting the gear mesh adjustment.

**NOTE:** No attempt should be made to adjust the cord tension with the escapement cord drum because the drum is set-screwed to a flat spot on the escapement shaft.

2. Tab Governor Pinion - Adjust the tab governor pinion to have  $.002''$  to  $.004''$  backlash at the point of closest mesh with the escapement cord drum gear. Adjust the pinion by moving both the tab governor hub and collar located on each side of the pinion. The pinion should have a minimum of end play yet still rotate freely (Fig. 109).

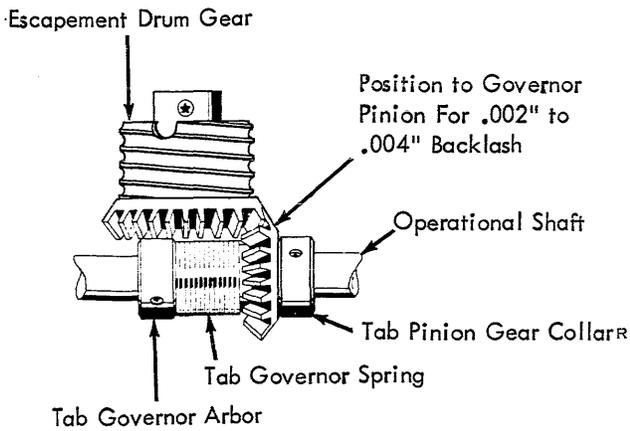


FIGURE 109. Tab Governor Pinion

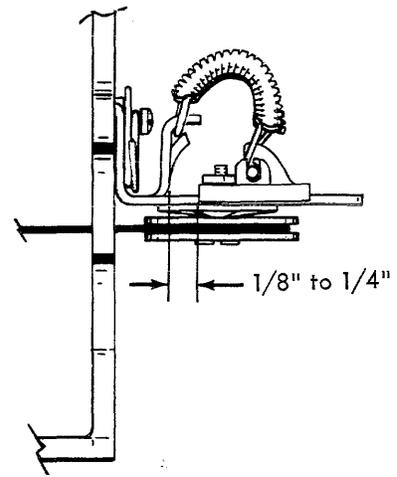


FIGURE 110C. Cord Tension

3. Cord Tension - With the cords properly threaded (Figs. 110 A & B), adjust the carrier return cord drum so that the pulley pivot screw nut clears the pulley bracket by 1/8" to 1/4" (Fig. 110C).

A time saving method of transport card adjustment may be accomplished by tying a knot in the end of the cord as close to the hook as possible.

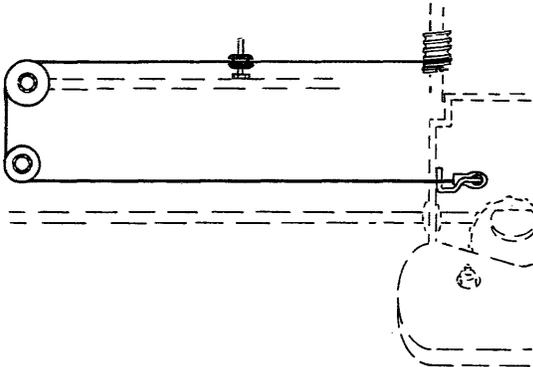


FIGURE 110A. Carrier Return Cord

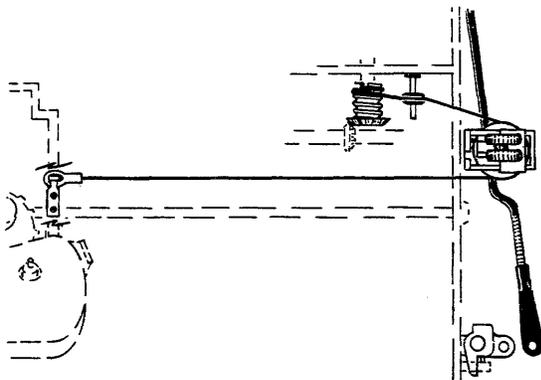


FIGURE 110B. Escapement Cord

The position of the pulley insures that it will not contact the cover as it compensates for the cord stretch. Adjusting the pulley nearer the powerframe puts an unnecessary load on the cords.

**CAUTION:** Be sure to remove all end play from the escapement shaft before tightening the carrier return cord drum. End play is removed by holding the escapement shaft forward while the cord drum is moved to the rear against the rear bearing.

**CAUTION:** The mainspring should be handled carefully to prevent it from slipping when the tension is being increased or decreased. The outside loop of the main spring must not be in a position to contact C-5.

**NOTE:** The eccentric mounting stud for the front idler pulley should be set so that the pin is horizontal and above center on the eccentric. The pin will then be angled toward the left slightly.

4. Mainspring Tension - The mainspring tension should be 1/2 to 3/4 pounds measured at the carrier as it escapes through the line lock load at the extreme right hand margin. Adjust by turning the mainspring cage. The capacitor (if present) and the cage stop screw must be removed in order to make the adjustment.

**NOTE:** An approximate setting can be obtained by making 5 full turns on the mainspring with the carrier at the extreme right hand limit of its travel. On printers with 100 inch mainspring 6-2/3 to 7-2/3 turns will be necessary. The 100 inch mainspring is stamped on the rear.

#### OPERATIONAL CONTROL MECHANISM

1. Keylever Pawl Overlap - Adjust each keylever pawl guide stud so that all the keylever pawls overlap their respective interposers by .035" to .045" with both parts at rest (Fig. 111).

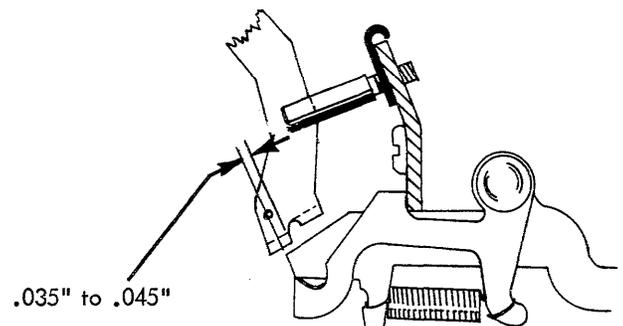


FIGURE 111. Keylever Pawl Overlap Adjustment

2. Keylever Pawl to Interposer Clearance

- a. Adjust the keylever pawl guide so that the lower edge is  $9/16$ " from the bottom of the operational bracket (Fig. 112).

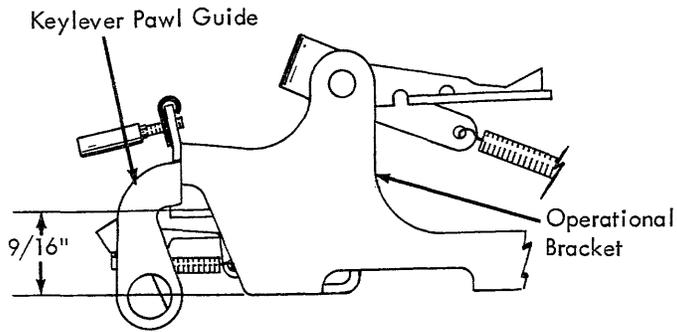


FIGURE 112. Interposer Height

- b. Position the keylever stop so that all keylevers clear their interposer  $.020$ " to  $.030$ " (Fig. 113).

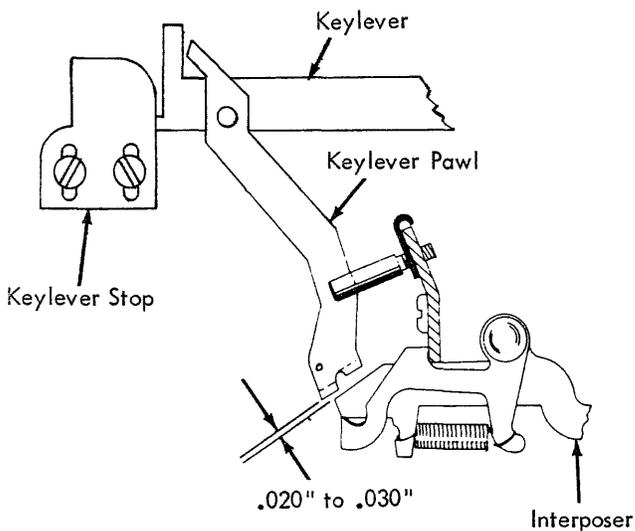


FIGURE 113. Keylever Pawl To Interposer Clearance

3. Operational Latch Height - The adjustable latch screws (Fig. 114) (eccentric stop on tab latch) for the backspace, spacebar, and tab operational latches should be adjusted so that the latches will pass under the cam follower lever with a clearance of  $.003$ " to  $.015$ " (Fig. 114B). The carrier return operational latch adjustable stop should be adjusted so that the latch will pass under the cam follower with  $.003$ " to  $.010$ " clearance (Fig. 115).

NOTE: Be sure that the cams are latched when this clearance is observed. The high side of the specification is preferred.

NOTE: The clearances may be observed by pulling the latches to the rear with a spring hook while the machine is at rest.

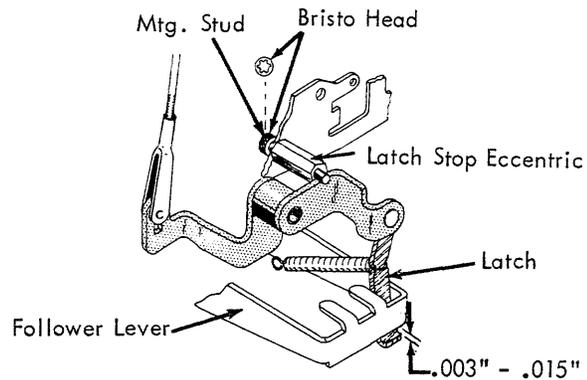


FIGURE 114A. Tab Latch Height

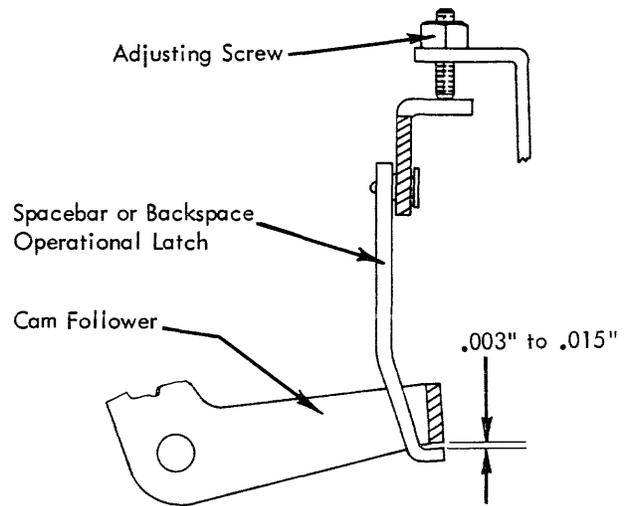


FIGURE 114B. Latch Height

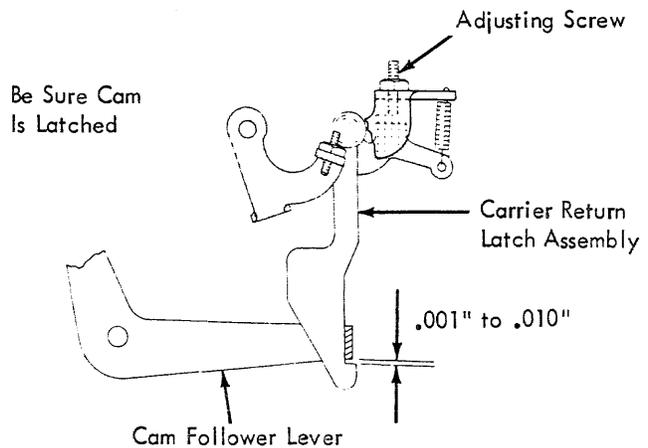


FIGURE 115. Latch Height (11 Inch.)

4. Interposer Adjusting Screws - Adjust the interposer adjusting screws so that a front to rear clearance of .015" to .020" exists between all the operational latches and their respective cam followers (Fig. 116).

NOTE: Machines which have the carrier return latch-spring loaded to the rear (under the cam follower) should be adjusted as follows:

- a. Hold the carrier return latch to the front against its interposer (the interposer should be latched at rest).
- b. Adjust the interposer adjusting screw for .035" to .045" between the latch and cam follower.
- c. Release the interposer and proceed with the next adjustment.

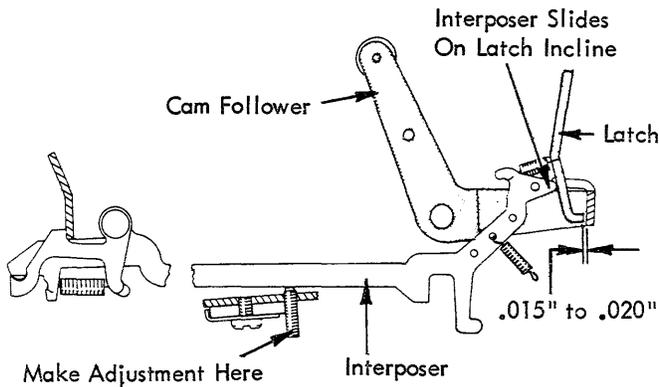


FIGURE 116. Interposer Adjusting Screw

NOTE: The operational interposer springs should be placed in the center hole at the rear of the interposer (Fig. 116).

The adjustment directly affects the timing between the cam release and the positioning of the operational latches under the cam follower. Excessive clearance can allow the cam follower to move down at the rear before the latch has moved fully under the follower.

The adjustment may be checked after operating the cams enough to move the cam followers down slightly at the rear. With the machine on its back the latches can be pushed against the cam followers to estimate the clearance.

CAUTION: If the cam followers are operated too far when this adjustment is being checked, the interposer restoring bail will force the interposers forward slightly and an erroneous adjustment will result. The keylever pawl to interposer clearance should be rechecked after this adjustment.

5. Cam Check Ring - Adjust the cam check ring eccentric (Fig. 117A) so that a clearance of .010" to .015" exists between the tip of the cam pawl and the teeth of the cam ratchet with the cam latched in the rest position (Fig. 117B). Keep the high part of the eccentric radially outward. The check ring mounting screws must be loosened before the adjustment can be made.

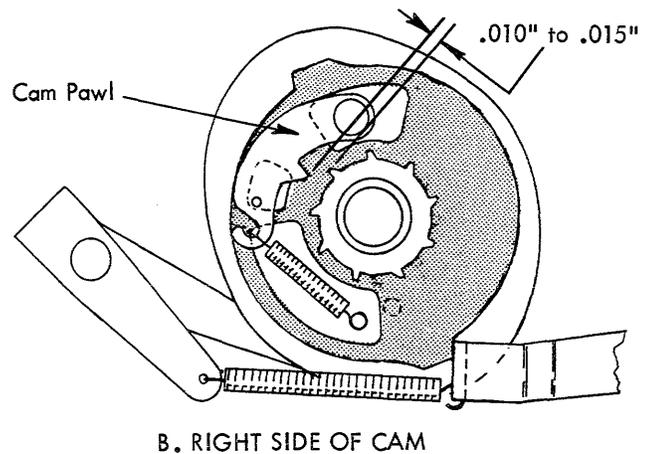
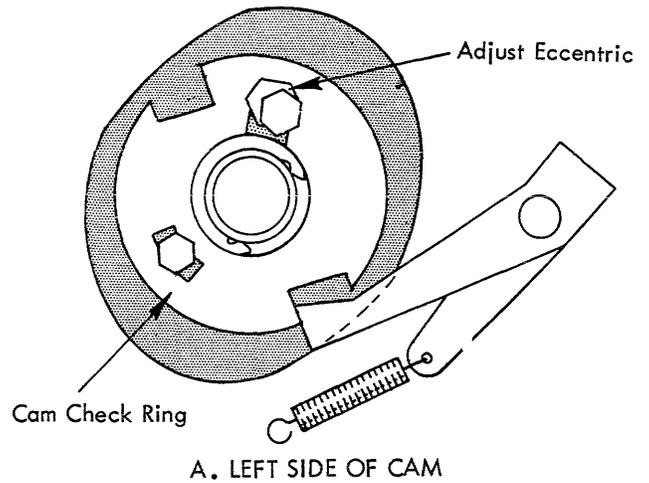


FIGURE 117. Cam Check Ring Adjustment

The adjustment insures that the pawl will clear the ratchet and that the check ring will latch positively at the completion of each cam operation.

6. Clutch Release Arm Stop Pad (Fig. 118) - Form the stop pads so that with the clutch release arm at rest (against its stop pad) the clutch release arm has a 3/4 bite on the latching surface of the clutch wheel. This should be observed from the rear of the machine.

Make certain that the interposers are latched forward and are not in contact with the clutch release arm when observing this adjustment.

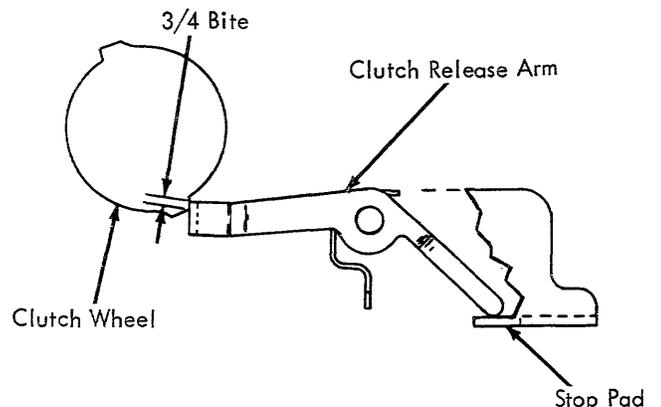


FIGURE 118. Stop Pad Adjustment

NOTE: The operational clutch ratchet must be positioned laterally on the operational shaft so that each clutch release arm will take an equal lateral bite on its respective clutch wheel. This insures that neither clutch release arm can slip sideways off its respective clutch wheel causing an unwanted cam operation. This condition is most serious on the carrier return/index cam as it will cause an index operation to occur each time the cam is released.

7. Clutch Release Arm (Fig. 119) - The lug at the bottom of each clutch release arm should be formed so that it clears the interposer lug by  $.025''$  to  $.035''$  on Carrier Return, Index and  $.035''$  to  $.045''$  on Tab, Backspace, and Spacebar.

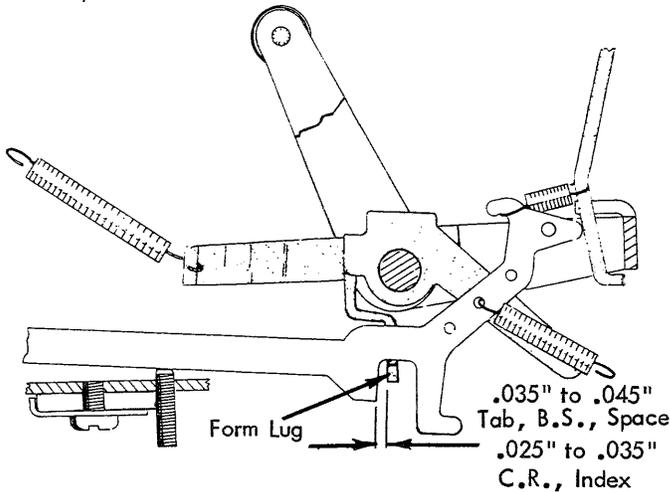


FIGURE 119. Clutch Release Arms Adjustment

NOTE: The interposers and cams must be latched when the adjustment is observed.

Insufficient clearance will cause the cams to be released too early in the rearward travel of the interposers; consequently the operational latch involved will not have sufficient bite on the cam follower lever as it is operated down at the rear. The operational latch may slip from beneath the cam follower and result in an incomplete operation. Excessive clearance could allow the interposer to reach the limit of its travel before the cam is released.

NOTE: The clearance may be judged with the use of the push end of the large spring hook. The end of the spring hook is approximately  $.035''$  thick.

8. Interposer Restoring Bail - Form the lug at each side of the restoring bail so that the interposers will be restored forward  $.010''$  to  $.030''$  past the latching point (Fig. 120) when either cam is operated. Be sure to check the interposers at each side and form the lug on the side being checked.

The adjustment insure positive relatching of the interposers without excessive overthrow. Excessive overthrow can cause an interposer to take an extra cycle.

NOTE: The lugs should be formed forward or back to obtain the adjustment. Forming the lugs forward increases the throw of the interposers. Too much forming will cause them to break.

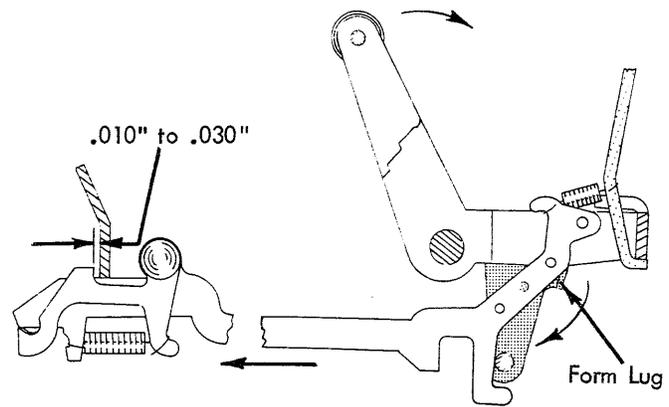


FIGURE 120. Interposer Restoring Bail Adjustment

#### OPERATIONAL MAGNET ASSEMBLY

1. Tab, Backspace, and Index Magnets (Fig. 121 & 122) -
  - a. Backspace Pivot Plate - Position, vertically, so that the armature (manually attracted) clears its yoke by  $.001''$  to  $.003''$  (all three screws must be loose). Position, horizontally, so that all armatures center their yokes.
  - b. Pivot Plate - Tighten the backspace pivot plate screw and position so that the left and right armatures clear their yokes by  $.001''$  to  $.003''$ .

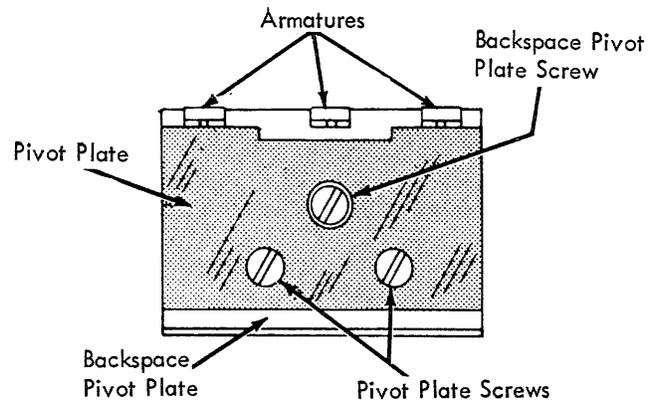


FIGURE 121. B/S Pivot Plate Location

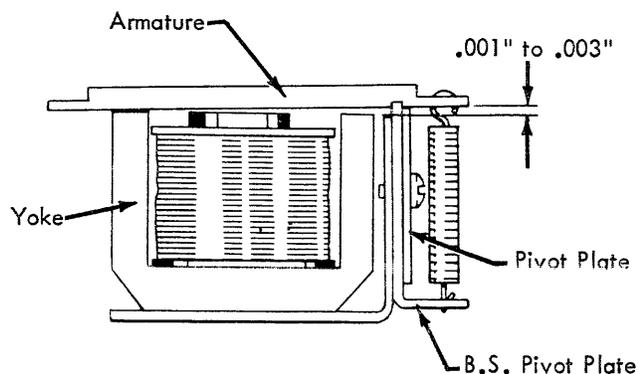


FIGURE 122. Backspace Pivot Plate

2. Carrier Return and Space Bar Magnet Pivot Plate (Fig. 123) - Position as follows:

- a. Vertically - so that the left and right armatures clear their yokes by .001" to .003".
- b. Horizontally - so that the armatures center in their guide slots.

Adjustments 1 and 2 provide free operation of the armatures and prevent binding or choke-off.

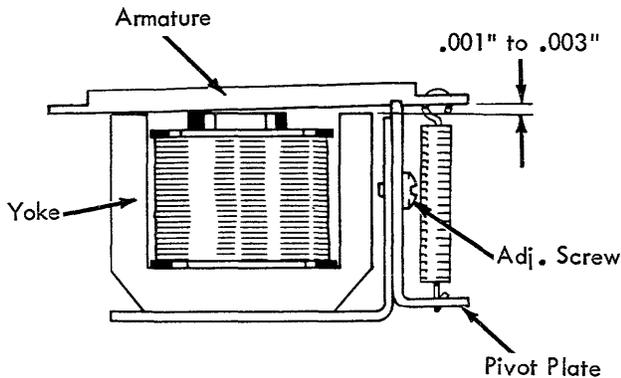


FIGURE 123. Pivot Plate

3. Armature Backstop (Fig. 124) - Position (armatures at rest) so that the armatures clear their yokes by .020" to .025".

This adjustment provides sufficient motion to unlatch the interposers and also insures the armatures will be attracted by the magnet coils when they are energized.

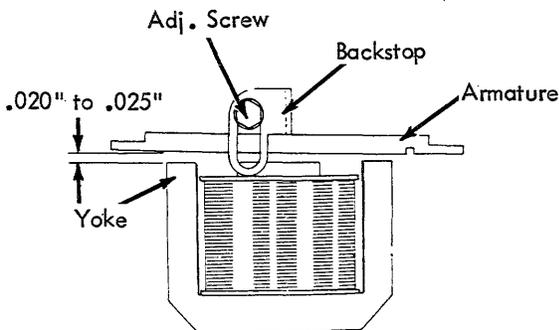


FIGURE 124. Armature Backstop

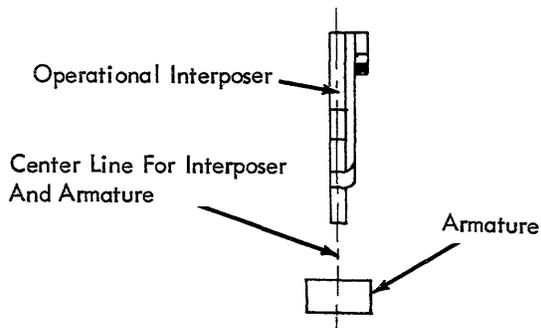


FIGURE 125. Left to Right

4. Magnet Unit Position - Position as follows:

- a. Left to Right - so that the armatures are directly beneath their corresponding interposers (Fig. 125).
- b. Front to Rear - so that the armature link holes are slightly to the rear of the interposer link holes (Fig. 126).

Having the trip link offset insures unlatching of the interposer since the link pulls downward and also to the rear.

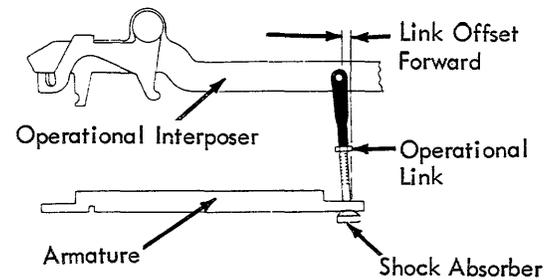


FIGURE 126. Front to Rear

5. Pull Link (Fig. 127) - Adjust the operational pull links so that a .002" to .010" clearance exists between the interposer latch bracket and the interposer at the point of relatching.

NOTE: Test this adjustment by manually attracting the armature and turning the operational shaft so that the interposer is being restored toward the front.

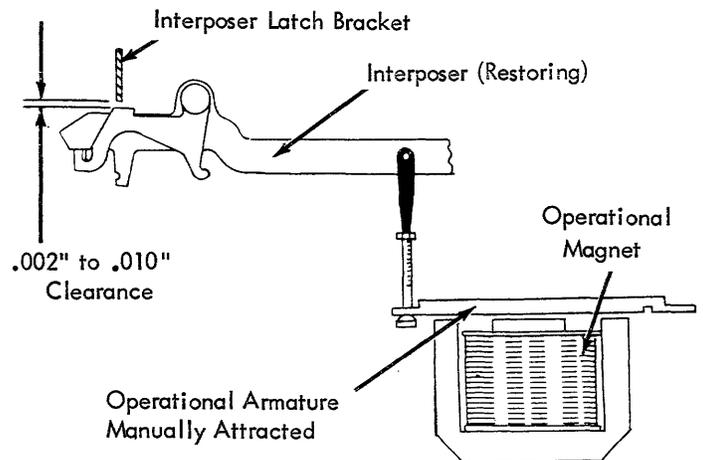


FIGURE 127. Check, Trip Link

With all parts at rest (Fig. 128) be sure a clearance exists between the pull link and the armature.

The pull link must be approximately 1/2 turn too long to insure that the armature is moving prior to picking up the load of the interposer. A trip link adjusted too short can cause an intermittent operation or complete failure to re-lease.

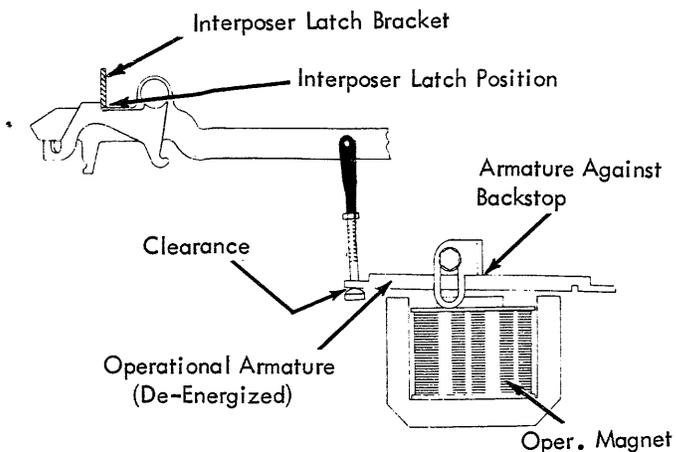


FIGURE 128. Trip Link

OPERATIONAL CONTACTS

1. The interposer switch shall be adjusted on its mounting bracket so that the top of the switch is flush with the bottom of the power frame (Fig. 129).

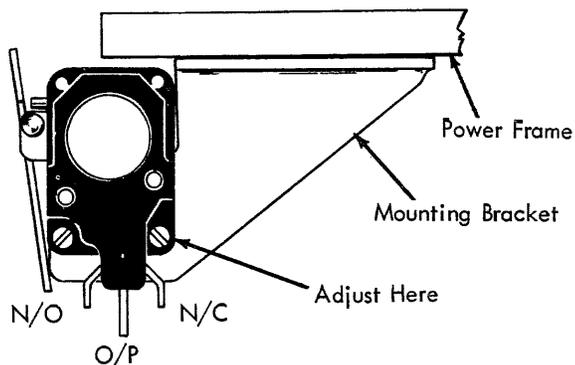


FIGURE 129. Operational Contacts

2. With the interposer tripped and to the rear, adjust the interposer switch mounting bracket, front to rear, so that the tripped interposer will transfer the switch contacts, then move the bracket an additional .015" to .025" (Fig. 130).

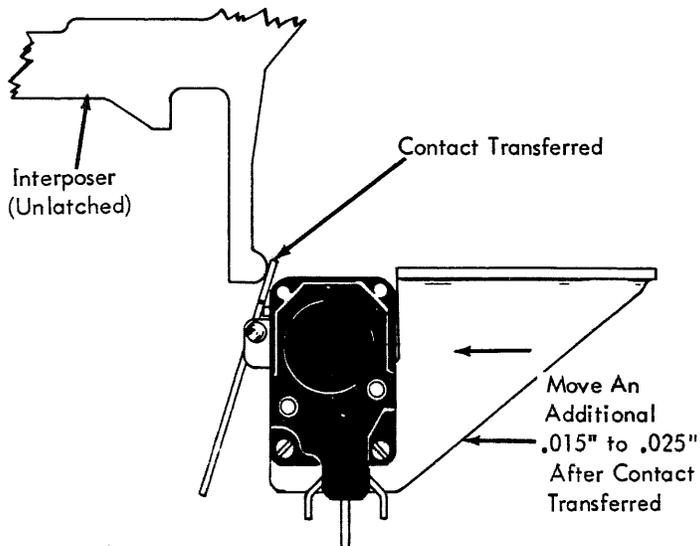


FIGURE 130. Contact Mounting Bracket

3. Adjust the interposer switch actuator latch for the following conditions.
  - a. So that it will clear the bottom of the interposer switch actuator by a maximum of .010" when the bottom of the actuator is moving toward the front of the machine (Fig. 131).

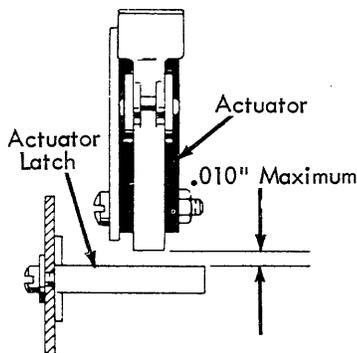


FIGURE 131. Interposer Switch Actuator

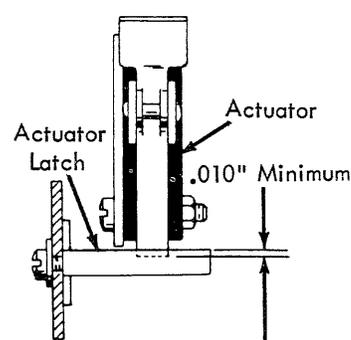


FIGURE 132. Interposer Switch Actuator

- b. So that the latch will have a minimum of .010" overlap on the back of the switch actuator and shall prevent the contacts from re-transferring until the check pawl reseats in the check ring (Fig. 132).

Operational Feedback Contact (C-5)

1. Contact Removed - Form the N/C support so that the O/P lifts the N/C point .002" to .005" (Fig. 133).

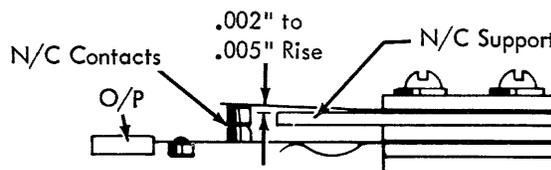


FIGURE 133. Contact Removed

2. Unit Installed - Position the O/P centrally over the auxiliary cam follower (Fig. 134).

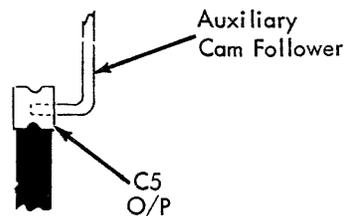


FIGURE 134. Contact Installed

CAUTION: If the contact assembly is mounted too far forward the backspace latch may operate the contact which can cause up to 30° difference in timing. This problem can only be seen by scoping.

3. Form the contact mounting bracket (up or down) for make and break times. Refer to the timing chart for timing.

MACHINE	C-5 N/C	
	BREAK	MAKE
1447	15 ± 10	105 ± 5
1052	15 ± 10	105 ± 5
1053	15 ± 10	105 ± 5
1062	15 ± 10	105 ± 5

Figure 135. Timing Chart

NOTE: Trip the Tab Interposer, turn the operational shaft until the cam just starts to turn. This is zero degrees.

### SPACEBAR MECHANISM

1. All print escapement and operational control adjustments must be correct before attempting adjustments of the spacebar.
2. Spacebar Latch Lever Screw - Adjust the screw so that .007" to .010" clearance exists between the escapement trigger and the escapement torque bar (Fig. 136A). Disconnect the escapement trip link before making this adjustment.

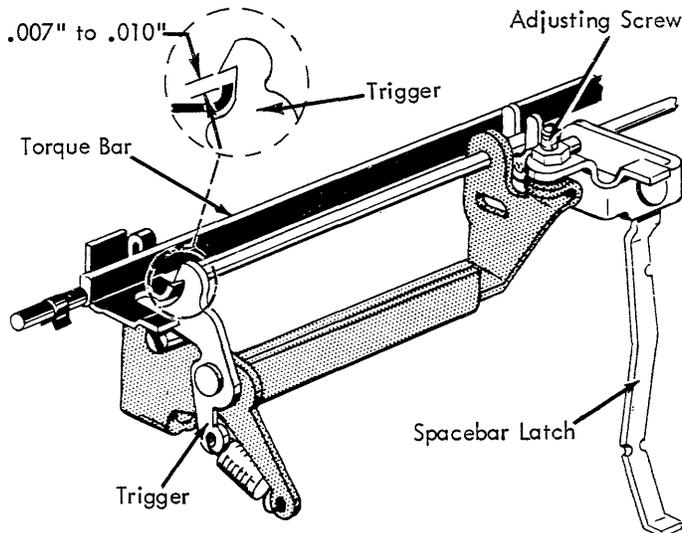


FIGURE 136A. Spacebar Latch Lever Screw (Long Carriage)

The trigger upstop should be moved up out of the way when making this adjustment. After completing the adjustment the upstop should be adjusted so that it clears the trigger lever by .001" to .005" (Fig. 136B).

This adjustment insures that the trigger will properly reset over the lug on the escapement torque bar at the completion of each spacebar operation. It also insures that there will be a maximum transfer of motion from the spacebar operational latch to the trigger lever assembly, thereby placing a sufficient amount of wear potential into the system (which is felt as trigger overthrow).

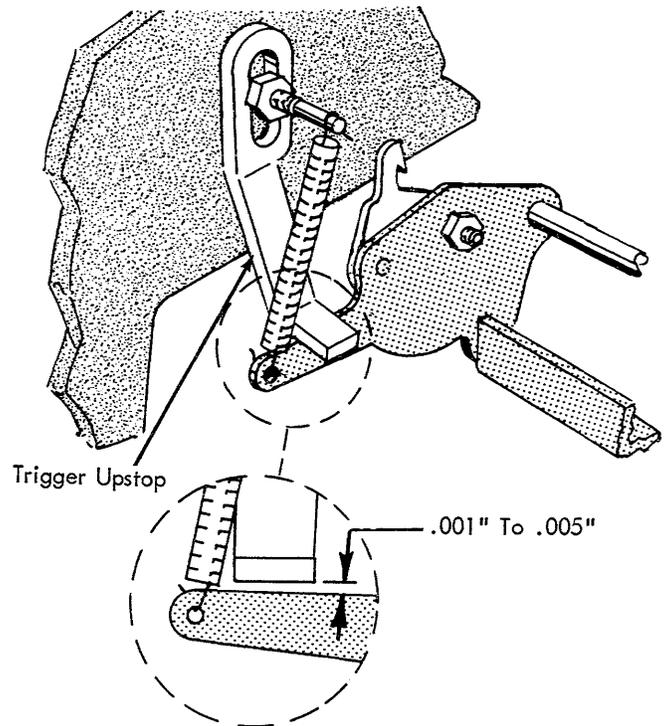


FIGURE 136B. Trigger Upstop

### BACKSPACE MECHANISM

1. Be sure the print escapement and operational control adjustments are correct before attempting backspace adjustments.
2. Tab Lever Stop - The rest position of the tab lever is controlled by a lug on the escapement bracket called the tab lever stop (Fig. 137). The stop should be formed front or rear so that a clearance of .001" to .003" exists between the vertical lug on the tab lever and the backspace pawl when the backspace pawl is bottomed in its rack.

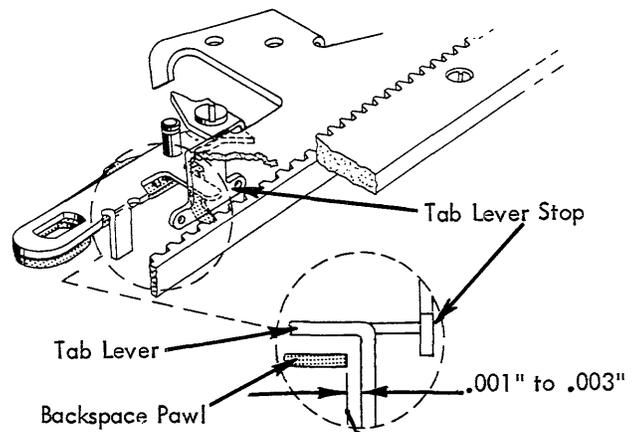


FIGURE 137. Tab Lever Stop Adjustment

The tab lever stop may be formed by inserting the T-bender from the upper right side. It will be necessary to force the tab torque bar to the rear in order to insert the T-bender.

This adjustment insures that the backspace pawl will not be prevented from bottoming in its rack during a backspace operation. The tab lever rest position also directly affects the adjustments of the tab mechanism. It determines how much motion must be provided to the tab lever to properly remove the backspace and escapement pawls from their racks during a tab operation.

3. **Backspace Rack** - With the backspace rack in the rest position, a clearance of .005" to .015" should exist between the working surfaces of the rack tooth and the backspace pawl (Fig. 138). Adjust the hexagon headed screw in the backspace bellcrank to obtain this condition.

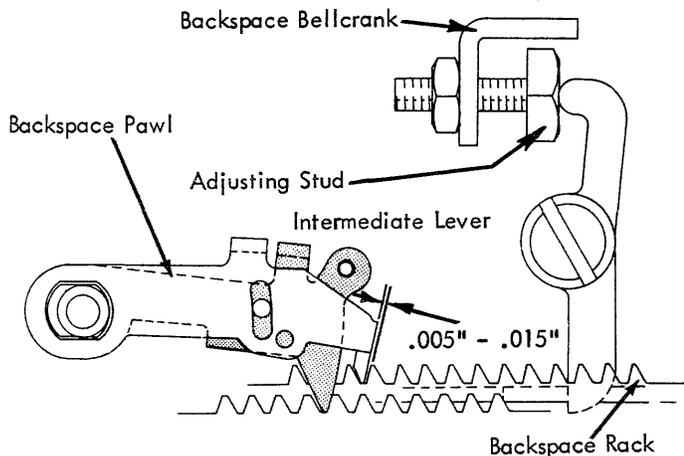


FIGURE 138. Backspace Rack Adjustment

The adjustment minimizes lost motion in the mechanism and insures that the backspace pawl will positively reset into the next rack tooth at the completion of a backspace operation. Excessive clearance can contribute to escapement problems as well as backspace failures by allowing the backspace pawl to hold the carrier against a backspace rack tooth. Partial spacing will result if the carrier alternates holding on the escapement pawl and the backspace pawl.

4. **Intermediate Lever** - With the backspace cam manually operated to the high point, the escapement pawl should just fail to drop into the preceding rack tooth causing the manual backspace operation to fail. Adjust the intermediate lever pivot screw forward or back in its elongated mounting hole to obtain this condition (Fig. 139).

The adjustment may be gauged by feeling the motion of the rack as it is manually moved from its rest position into contact with the backspace pawl. The movement should be equal to the adjustment clearance. The check should be made at both extreme positions of the carrier so as to include the difference in mainspring tension in the check. Check the resetting of the pawl at both positions by operating the backspace bellcrank manually and releasing it slowly.

The rear portion of the intermediate lever is supplied with the same amount of motion from the hexagon headed screw on the bellcrank regardless of any change in the front to rear position of the intermediate lever. Therefore, the difference in throw to the backspace rack is achieved, when changing the front to rear position of the intermediate lever, by increasing or decreasing the

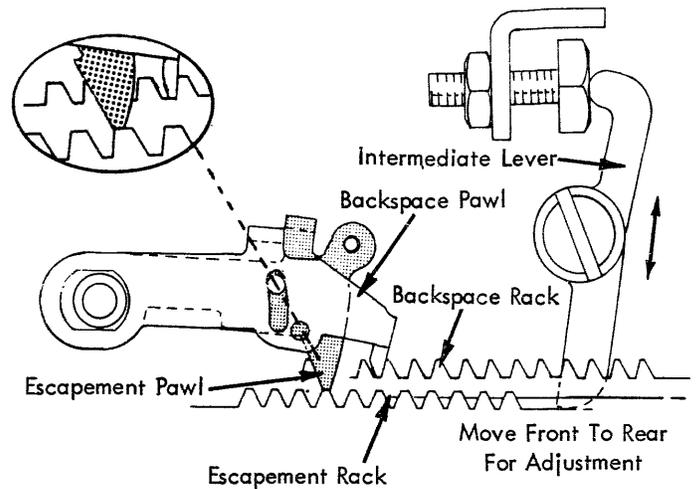


FIGURE 139. Intermediate Lever Adjustment

leverage or distance between the pivot point of the intermediate lever and the point of contact between the intermediate lever and the backspace rack. Moving the intermediate lever to the rear will increase the backspace rack motion.

During a powered backspace operation the carrier develops enough momentum (allowing the escapement rack to properly overthrow and drop into the preceding rack tooth) for a positive operation.

Too much motion to the backspace rack will cause double backspacing. Check the operation at both ends of the carriage so as to include the variation in the mainspring tension.

**CAUTION:** The rest position of the backspace rack should be checked and readjusted, if necessary, after any change in the front to rear position of the intermediate lever.

#### CARRIER RETURN MECHANISM

Be sure that the print escapement and operational control adjustments are correct before attempting the carrier return adjustments.

1. **Pawl Clearance** - Adjust the clutch latch eccentric so that the escapement pawl will clear the rack teeth by .005" to .020" when the latch is being held down by the keeper (Fig. 140).

The adjustment insures that the escapement pawl will not drag along the rack during a carrier return operation and that the pawl will be allowed to re-enter the rack quickly at the completion of the return operation.

2. **Clutch Latch Overthrow** - Use the following procedure to obtain the correct clutch latch overthrow and operational latch height.
  - a. **Carrier Return Lever** - Position the carrier return lever laterally on the latch actuating arm pin so that the carrier return latch will hang vertical without binding against its interposer. Be sure to tighten the locking screw in the lever onto the flat portion of the pin (Fig. 141).

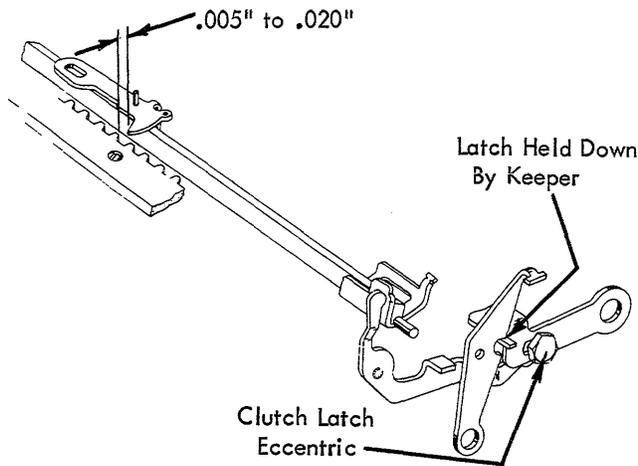


FIGURE 140. Pawl Clearance Adjustment

- b. Carrier Return Latch Arm Adjusting Screw (overthrow) - With the carrier return cam on the high point adjust the latch arm adjusting screw (Fig. 141) so that the clutch latch will overthrow the latching surface of the keeper by .030" to .040". Be sure that the platen and feed rolls are installed and the index selector lever is in the double index position when checking this adjustment.

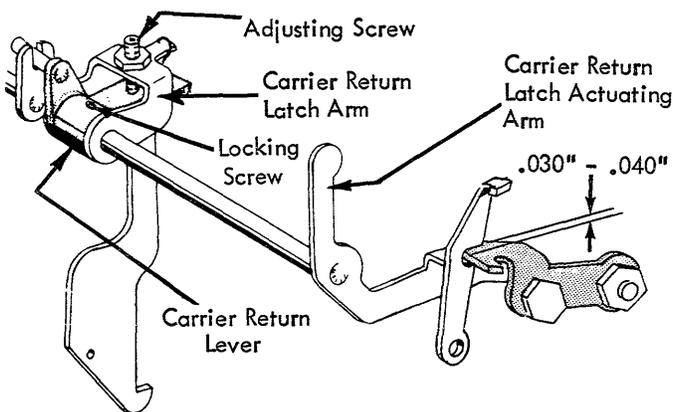


FIGURE 141. Clutch Latch Overthrow Adjustment

- c. Carrier Return Latch Actuating Arm Adjusting Screw (latch height) - With the carrier return cam latched in the rest position, adjust the screw so that the carrier return latch will pass under the cam follower by .001" to .010" (Fig. 142).

**CAUTION:** Any change in the carrier return latch height directly affects the front to rear position of the latch (with respect to the cam follower) when the machine is at rest. See adjustment #4 in the Operational Control Section.

**NOTE:** On a limited number of printers equipped with the early style carrier return mechanism, a carrier return latch actuating arm was used that did not have a flat surface machined on the left end of its pivot pin. These early production latch actuating arms should be replaced before attempting to make the carrier return adjustments. The flat surface machined on the left end of the pin is required

to establish the proper radial position of the carrier return lever on the pin (with respect to the latch actuating arm), and insures that the carrier return lever cannot slip on the pin.

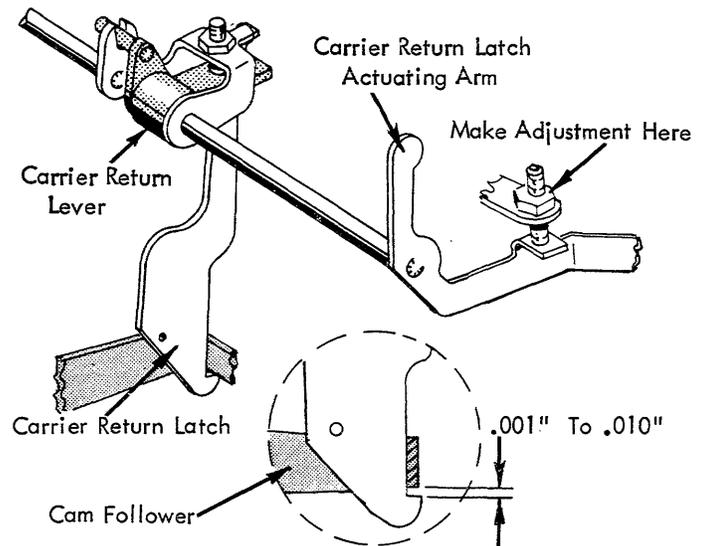


FIGURE 142. Carrier Return Latch Height

5. Carrier Return Shoe - Adjust the carrier return actuating arm bracket left or right so that the carrier return shoe overlaps the last 3 coils on the right hand end of the clutch spring. Covering the last 3 coils insures that all the coils of the spring will be used in the clutch operation (Fig. 143).

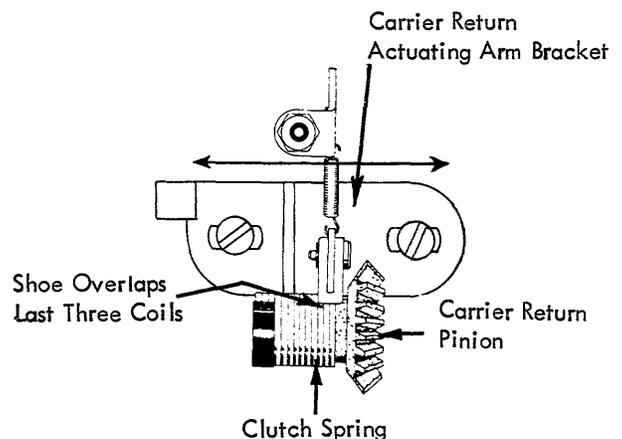


FIGURE 143. Carrier Return Shoe

6. Carrier Return Clutch Arm - Adjust the clutch arm on the carrier return clutch arm hub so that the formed lug which mounts the actuating arm stud will be horizontal when the machine is at rest (Fig. 144).
7. Shoe Clearance - The nylon shoe on the clutch actuating arm should clear the carrier return clutch spring by .015" to .020" when the machine is at rest (Fig. 144). Adjust the nut on the actuating arm stud to obtain the proper clearance.

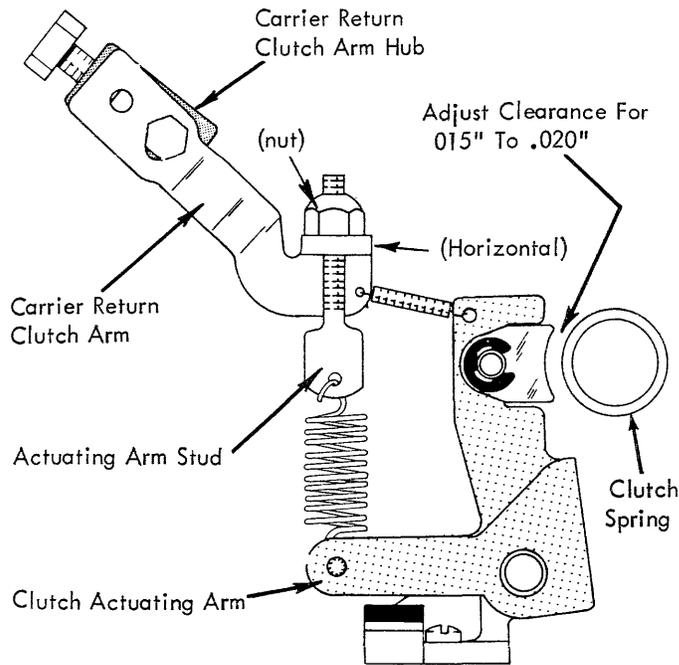


FIGURE 144. Carrier Return Actuating Arm Adjustment

NOTE: In no case should the shoe to clutch spring clearance be less than .015".

## 8. Overbank Adjustment

- a. Early - With the carrier held fully to the left against the margin stop, a clearance of .003" to .008" should exist between the working surfaces of the escapement pawl and the escapement rack tooth (Fig. 145). Adjust the left hand margin rack bushing to obtain this condition (Fig. 146).

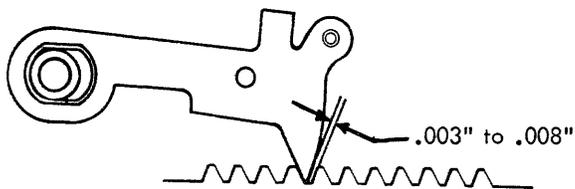


FIGURE 145. Escapement Pawl Check

The overbank adjustment insures that the escapement pawl will enter the correct escapement rack tooth when the carrier return clutch is unlatched at the left margin. The adjustment may be observed from the top with the platen and deflector removed and the left margin stop positioned toward the middle of the rack. The overbank may also be adjusted by adjusting the margin rack bushing to clear the nylon washer on the margin rack by .025" to .030" with the carrier resting at the left margin. The right hand margin rack eccentric should be loose when making this adjustment (Fig. 146) so that the left margin stop will be against the stop latch on the carrier. The .025" to .030" compensates for the .022" floating action in the escapement pawl. (The correct adjustment for the margin rack eccentric is covered under the Margin Control section.)

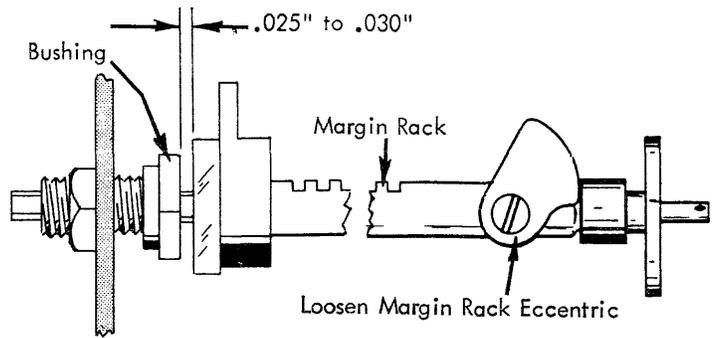


FIGURE 146. Overbank Adjustment

NOTE: Any change in overbank on machines equipped with this early style margin rack assembly will directly affect the clutch unlatching adjustment.

- b. Late - With the carrier resting at the left margin stop, adjust the margin rack overbank guide (Fig. 147) left or right on the margin rack to obtain a clearance of .001" to .005" between the stop latch on the carrier and the left hand margin stop. On machines equipped with a floating stop latch, the floating action of the latch must be removed, by pulling the latch to the right with a spring hook, before this clearance can be observed.

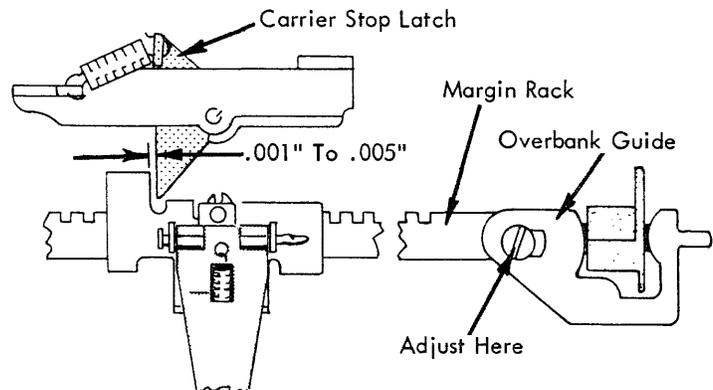


FIGURE 147. Margin Rack Overbank Guide Adjustment

The adjustment of the overbank guide on the margin rack determines the rest position of the margin rack. The adjustment insures that the left margin stop will set accurately when the stop is slid to the right against the margin stop latch on the carrier. In addition, the adjustment of the overbank guide, plus the amount of lateral motion that the guide permits the rack (due to the design of the guide) when the carrier moves into the left hand margin during a carrier return operation, automatically provides the carrier with the overbank required for proper escapement pawl re-entry at the completion of a carrier return operation.

9. Clutch Unlatching - With either style margin rack held to its extreme left position, the carrier return latch keeper should clear the latch by .005" to .015" at the unlatching point (Fig. 148). Check by manually holding the latch at the unlatching point while the machine is idling. Lengthen or shorten the carrier return unlatching link to obtain this clearance.

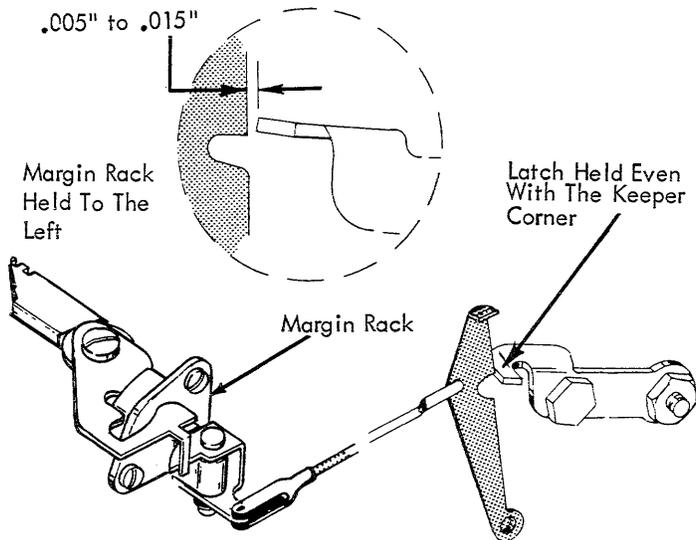


FIGURE 148. Clutch Unlatching Adjustment

NOTE: Should the clutch fail to properly latch (on machines equipped with the early margin rack) after the clutch unlatching adjustment has been completed, check the margin rack eccentric adjustment which is located in the Margin Control section. The eccentric may be holding the rack too far to the left restricting the margin rack motion thereby reducing the amount of bite that the latch may take on the keeper.

10. Torque Limiter - The torque limiter should transmit 1 to 2 pounds pull on the carrier as the carrier is unlatching the clutch at the left margin.

If a spring scale is available, the adjustment may be checked by holding against the carrier with the push end of the scale and allowing the carrier to slowly unlatch the clutch at the left margin.

If no scale is available, the torque may be estimated by holding the carrier while the clutch is engaged. The torque limiter should slip readily yet return the carrier positively without any hesitation when the carrier is released.

The adjustment is made by adjusting the eccentric stud in the torque limiter hub. If sufficient adjustment is not available at the eccentric, the torque limiter sprint may be shifted on the torque limiter hub by positioning the torque limiter spring clamp.

NOTE: The carrier return clutch arbor should have an end play of .004" to .006" between the torque limiter hub and the C-clip on the operational shaft. Adjust the play by positioning the torque limiter hub laterally on the shaft. The end play can be adjusted easily if the torque limiter spring is moved to the right, off the torque limiter hub.

11. Carrier Return Interlock Contact -

- a. Form the N/C support so that the O/P lifts the N/C contact .002" to .005" (Fig. 149).
- b. Form the N/O support so that the O/P clears the N/O contact .035" to .045" (Fig. 149).

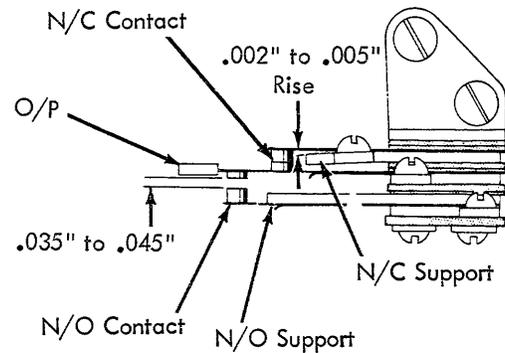


FIGURE 149. Carrier Return Interlock Inactive

- c. With the carrier return clutch latched, position the mounting bracket so that the N/O contact rises .010" to .020" from the N/O support (Fig. 150).

NOTE: The N/O contacts must remain closed during return of the carrier to the left margin.

Excessive rise on the contact straps will cause the contacts to bounce.

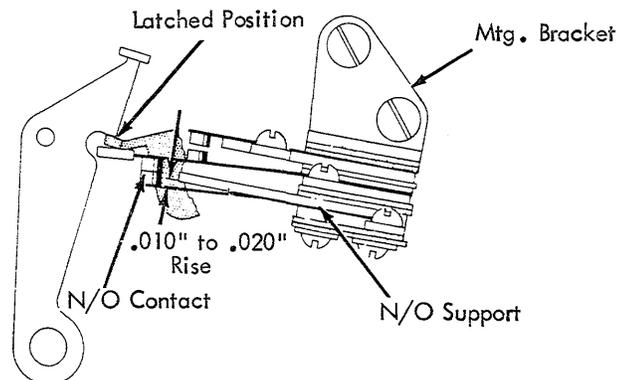


FIGURE 150. Carrier Return Interlock Active

#### INDEX MECHANISM

1. All operational control adjustments must be correct before any attempt is made to adjust the index mechanism.
2. Multiplying Lever Stop (Fig. 151) - Adjust the multiplying lever stop front or rear to produce .360" to .375" (approximately 3/8") motion to the index link when the carrier return/index cam is operated to its high point (platen removed).

NOTE: This adjustment may be measured with the Hooverometer and a feeler gauge. The handle of the Hooverometer is .375" wide.

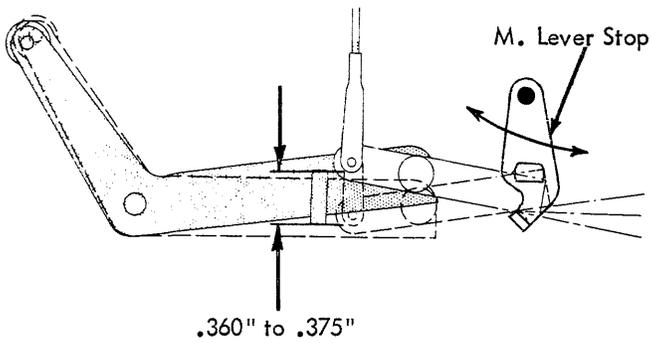


FIGURE 151. Multiplier Lever Stop (New Style)

Figure 152 illustrates the first level multiplier lever stop used on the new style index mechanism. This stop should be adjusted both horizontally and vertically. The stop is adjusted vertically so that the multiplier lever will operate above and below a horizontal position by an equal amount. The horizontal and vertical adjustments of the stop must be made alternately until both are correct.

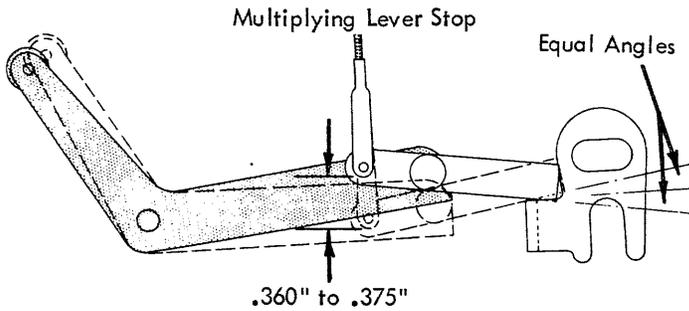


FIGURE 152. Multiplier Lever Stop (Early Level)

3. Index Link - Use the following procedure to adjust the index link:

- a. As a preliminary step, loosen the platen overthrow stop and move it to the rear (Fig. 153).

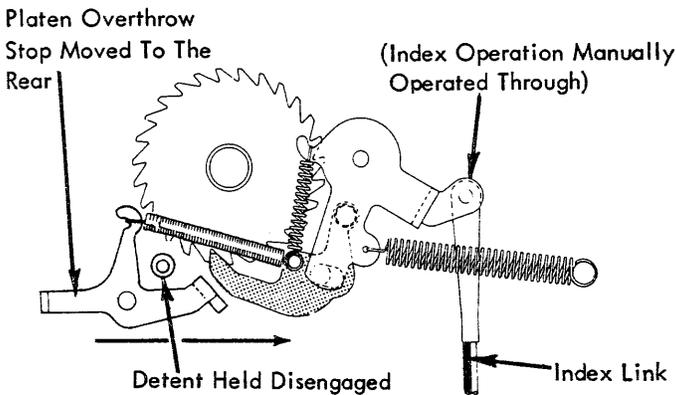


FIGURE 153. Index Link Adjustment

- b. With the platen installed, hold the detent roller disengaged from the platen ratchet with a spring hook while an index operation is manually cycled. At the completion of the operation allow the detent roller to re-enter the platen ratchet. If the index

link is properly adjusted the detent roller will seat between two ratchet teeth without causing any rotational motion to the platen. Adjust the link to obtain this condition.

- 4. Platen Overthrow Stop - With the index cam rotated to its high point, adjust the platen overthrow stop to clear the index pawl by .005" (Fig. 154).

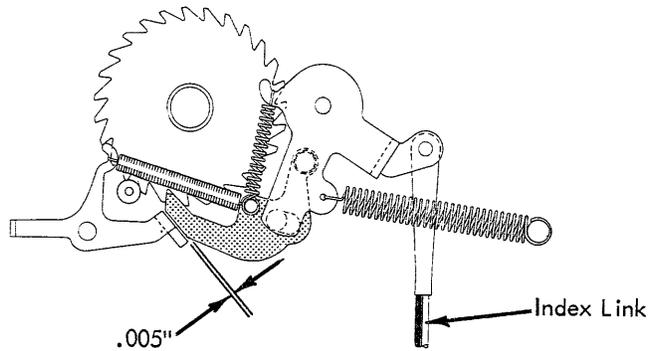


FIGURE 154. Platen Overthrow Stop

5. Index Selection Cam

- a. With the index cam latched at rest and the selection lever in the double line space position, adjust the selection cam front to rear so that the index pawl clears the platen ratchet by .015" to .050" (Fig. 155).

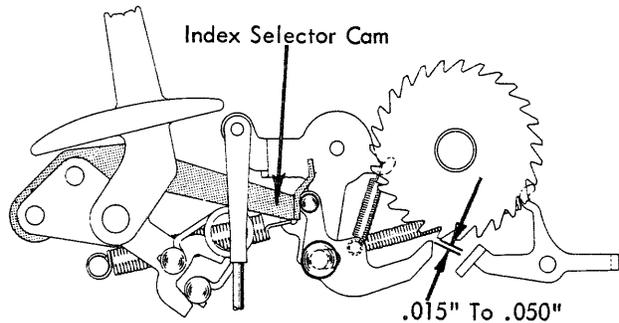


FIGURE 155. Index Selection Cam Adjustment

- b. Adjust the selection cam up or down so that the index pawl is centered on the cam surface with the selection lever in the single line space position (Fig. 156).

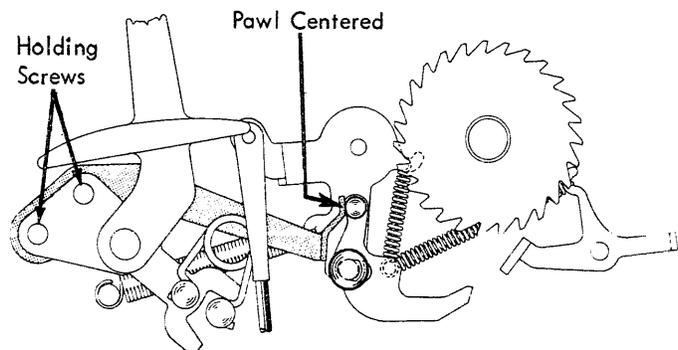


FIGURE 156. Vertical Adjustment of Index Selection Cam

## TABULATOR SET AND CLEAR MECHANISM

1. Tab Rack Bellcrank - Adjust the bellcrank (Fig. 158) attached to the left end of the tab rack so that an unset tab stop is centered between the tab lever pawl and the tab set lug on the escapement bracket (Fig. 157). Latch the tab lever to the rear to check this adjustment.

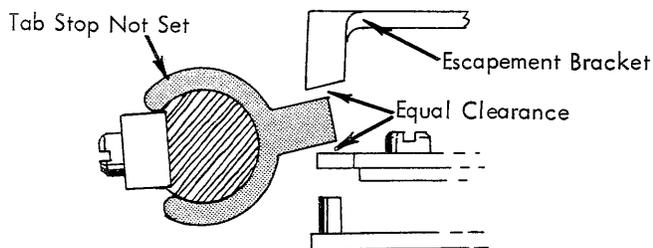


FIGURE 157. Tab Rack Bellcrank Adjustment

CAUTION: Be sure that the tab set and clear lever is fully seated on top of the two pivot pins on the left side of the powerframe.

2. Tab Set and Clear Link - Adjust the link so that the key-button is vertical.
3. Set and Clear Arm Stops - Form the stop lugs on the set and clear lever bracket (Fig. 158) so that they limit the movement of the arm just as the tab stop fully reaches its set or cleared position. Also, form the extension on the rear stop lug so the tab set and clear arm cannot pivot sideways out of engagement with the tab rack bellcrank.

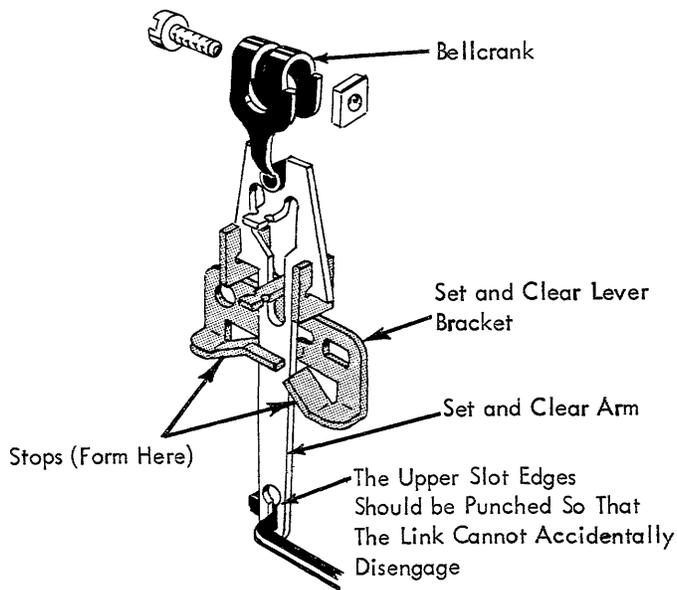


FIGURE 158. Set And Clear Arm Stops

NOTE: On the early style tab set and clear mechanism the stop lugs were anchored and adjusted by two screws on the outside of the powerframe.

4. Tab Rack Brake - Adjust the tab rack brake so that the tab rack will not flip past the rest position when released from either a set or clear position. The tab rack must return fully to the rest position when the keybutton is

released slowly. The brake is located just inside the powerframe at the left end of the tab rack. The brake should be formed, if necessary, to spring load the tab rack toward the RH side of the machine.

CAUTION: The index detent lever will rest against the tab rack with the platen removed. Be sure the lever is clear of the tab rack when the brake adjustment is checked.

5. Gang Clear Finger (Ref Fig. 159)

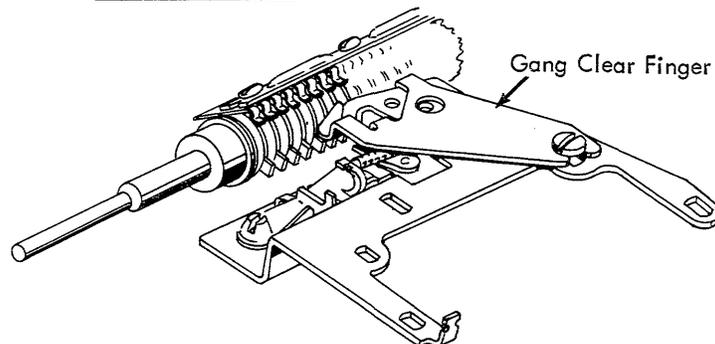


FIGURE 159. Gang Clear Finger

- a. Adjust the gang clear finger front to rear to obtain .001" to .020" clearance (Fig. 160) between its tip and the nearest tab stop when all the tab stops are set.
- b. Form the end of the gang clear finger to obtain a minimum of .001" clearance (Fig. 160) between the gang clear finger and the tab rack tube. Check for interference between the top of the gang clear finger and the underside of the tab set spring.

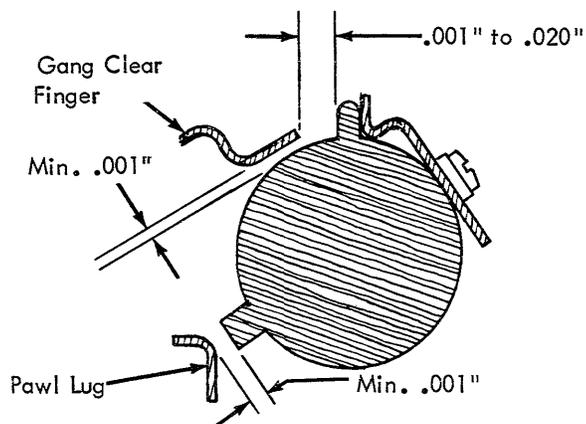


FIGURE 160. Gang Clear

- c. Check for a minimum of .001" clearance (Figure 160) between lugs on the rear of the escapement and backspace pawls and any set tab stop when the tab rack is rotated to the clear position and the pawls removed from the rack, as in a carrier return operation. If this clearance is not present, recheck tab rack position and pawl clearance adjustments.

NOTE: It will not always be possible to clear a single tab stop when two or more adjacent tab stops

are set. The gang clear finger can be moved right or left slightly to insure positive clearing of desired stop. The tab stop directly to the left may also be cleared or partially cleared.

### TABULATOR MECHANISM

1. Tab Lever Stop - Form the stop on the escapement bracket (Fig. 161) to obtain .001" to .003" clearance between the vertical lug on the tab lever and the backspace pawl when the tab lever is at rest and the backspace pawl is fully seated in its rack.

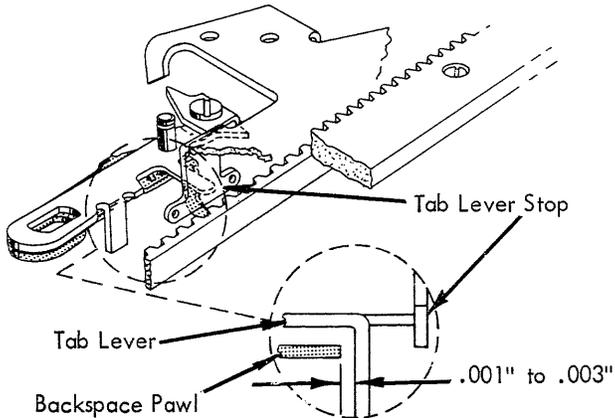


FIGURE 161. Tab Lever Stop

This small clearance insures that the backspace pawl will be allowed to bottom in its rack and that a minimum amount of tab lever motion will be required to remove both the backspace and escapement pawls from their racks during a tabulation operation.

2. Tab Lever Pawl - Adjust the pawl forward or back on the tab lever so that the tip of the pawl clears a SET tab stop by .035" to .045" with the tab lever at rest (Fig. 162).

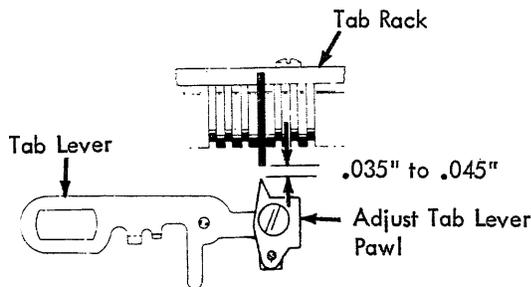


FIGURE 162. Tab Lever Pawl

The adjustment of the tab lever pawl has an effect on the amount of overlap between the tab stop and the pawl tip in the active position. It also directly affects the pawl clearance during tabulation. Unless the tab lever pawl is properly adjusted, correct pawl clearance cannot be obtained.

The adjustment of the tab lever pawl can be measured by using the push-end of the large spring hook. The push-end is approximately .035" thick.

3. Tab Rack - Adjust the tab rack left or right for a clearance of .005" to .020" between the tip of the tab lever pawl and a set tab stop with the tab lever latched out. This adjustment is made by the tab rack bushing on the RH end of the tab rack. The clearance may be observed by holding the carrier and latching the tab lever out.

NOTE: The head of the tab rack bushing should clear the tab rack plate by approximately 3/32" when the adjustment is complete. (Fig. 163).

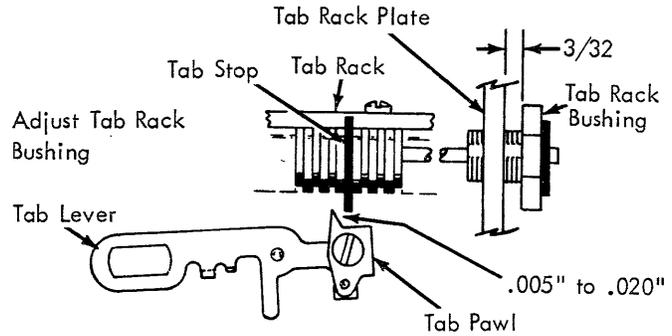


FIGURE 163. Tab Rack Bushing

The tab rack adjustment sets up a condition whereby the escapement pawl will be released into the escapement rack at the right time to safely engage the correct tooth. If the tab rack were too far to the left, the tab lever would contact the set tab stop sooner and release the escapement pawl into the rack earlier than it should. The pawl could enter the wrong escapement rack tooth and stop the carrier one space to the left of the desired stopping point. The carrier could stop one space too far to the right if the tab rack were adjusted too far to the right.

4. Pawl Clearance - The upright lug of the tab latch should be formed forward or back so that the tip of the escapement pawl clears the escapement rack teeth by .005" to .010" when the tab lever is latched to the rear.

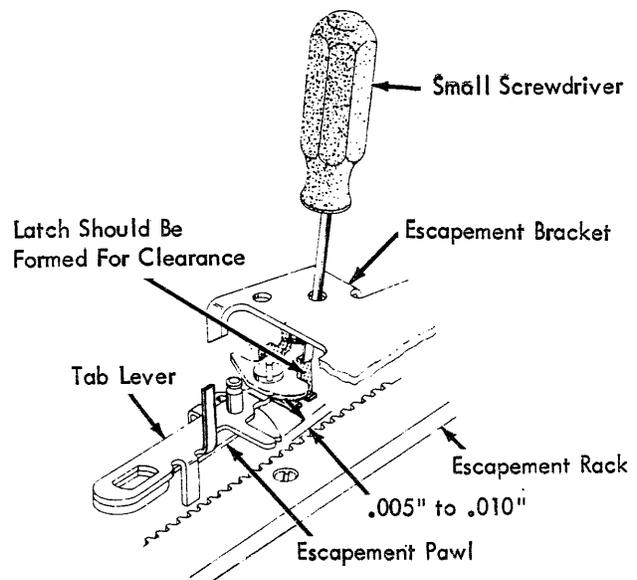


FIGURE 164. Pawl Clearance Adjustment

The adjustment insures that the escapement pawl will re-enter the rack quickly to minimize the chances of entering the wrong rack tooth. If excessive clearance is present, it is also possible that the tab keylever and associated parts might not have enough throw to positively latch the tab lever each time.

The upright lug of the tab latch may be formed with the 3" screwdriver by using it as a lever through the hole in the escapement bracket (Fig. 164). If excessive forming is required, recheck and refine the adjustment of the tab lever pawl.

5. Actuating Link (Fig. 165) - With the Tab/Sp/BS cam latched and the intermediate lever resting against its upstop, adjust the actuating link clevis so that the tab torque bar hangs vertically.

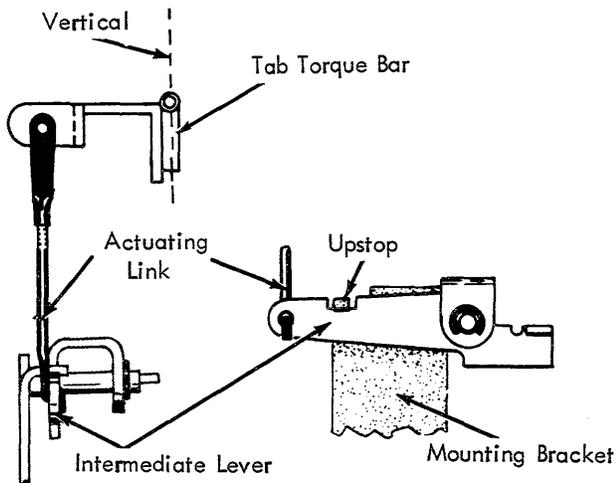


FIGURE 165. Actuating Link, 15" Machine

NOTE: On machines with the new style (Fig. 173) interlock contact form the upstop up out of the way.

6. Intermediate Lever Tab (Fig. 166) - With the tab interposer released and the Tab/Sp/BS cam on its high point, form the intermediate lever tab so that the tab lever pawl overthrows the tab latch by .005" to .010".

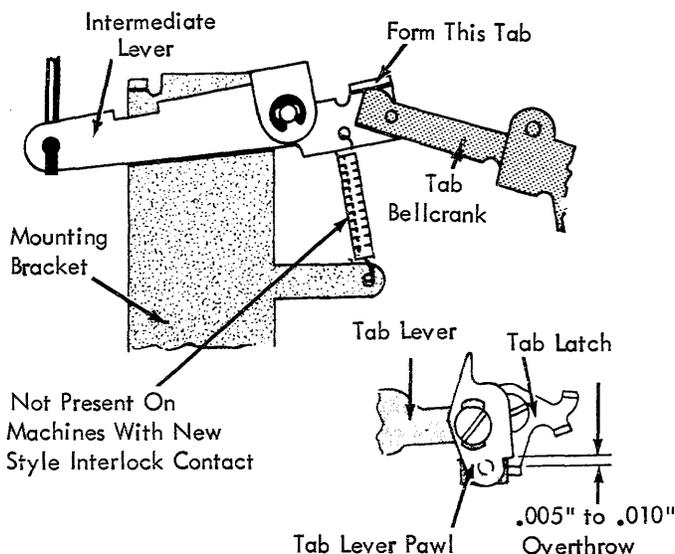


FIGURE 166. Intermediate Lever Tab

7. Tab Lever Overthrow Stop & Retaining Plate (Late) - (Fig. 167)

- a. Retaining Plate - with the carrier centered, adjust the retaining plate (Fig. 167) front to rear so a clearance of .001" to .002" exists between the raised area of the escapement bracket and the tab torque bar.
- b. Tab Lever Overthrow Stop - with the tab cam on its high point, form the lug on the rear of the retaining plate (Fig. 167) for a clearance of .005" to .010" between the tab lever trigger and this lug.

The adjustment of the retaining plate prevents lost motion in the torque bar which is caused by flexing.

The overthrow stop prevents the tab lever from overthrowing into the tab rack. If the tab lever does contact the tab rack the lever will be unlatched and an erroneous tab results.

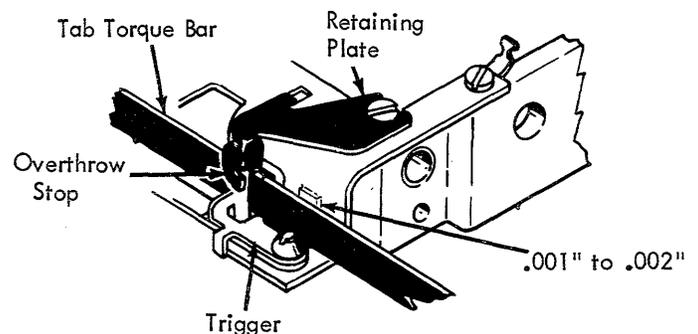


FIGURE 167. Tab Lever Overthrow Stop & Retaining Plate (New)

8. Torque Bar Overthrow Stud (Late) - With the tab cam on its high point, form the upright lug on the LH end of the tab torque bar for a clearance of .001" to .010" between this lug and the overthrow stud (Fig. 168).

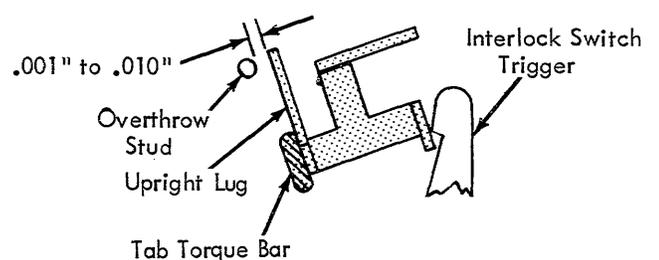


FIGURE 168. Torque Bar Overthrow Stud (New)

The overthrow stud serves two purposes. It assists the tab lever overthrow stop and also prevents the torque bar from rotating to a point at which the interlock trigger could get under the torque bar lug.

9. Lockout Lever (Fig. 169) (Early) - Position to clear the torque bar by .005" to .010" with the torque bar at rest.

NOTE: The position of the lockout lever must not choke off the motion of the tab lever during unlatching. On late level machines the tab lever trigger replaces the lockout lever and is not adjustable.

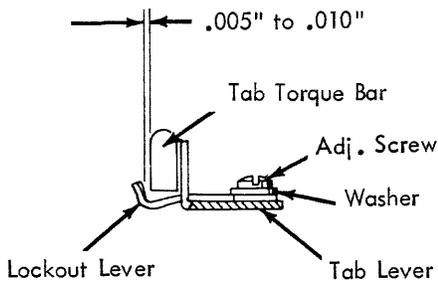


FIGURE 169. Lockout Lever (Early)

10. Tab Torque Bar Support (Early) (Fig. 170) - With the tab torque bar at rest, position the torque bar support (relative to the escapement plate) to clear the torque bar by .001" to .006".

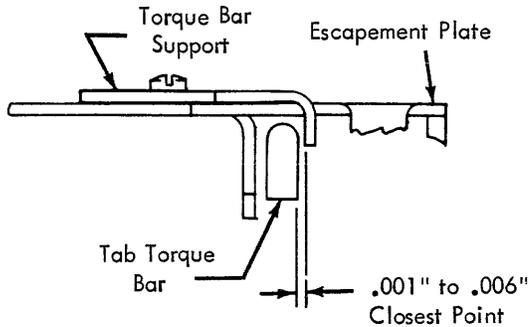


FIGURE 170. Tab Torque Bar Support (Early)

The purpose of the torque bar support is the same as the retaining plate.

11. Tab Lever Overthrow Stop (Early) (Fig. 171) - Adjust forward or back so that .005" to .015" clearance exists between the lug of the tab lever and the overthrow stop when the tab lever is latched to the rear.

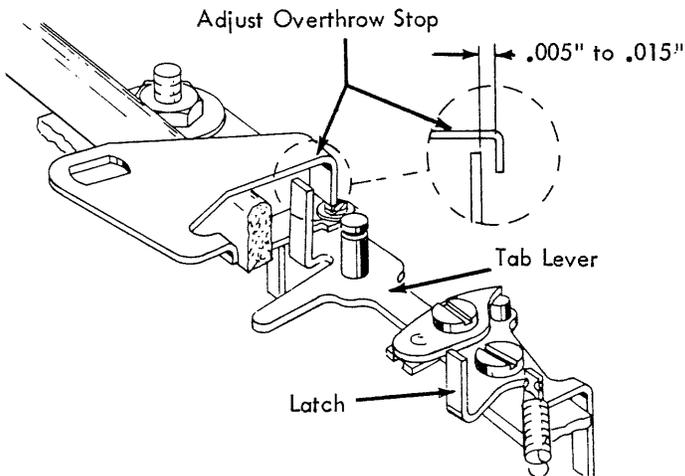


FIGURE 171. Tab Lever Overthrow Stop

12. Carrier Return/Tab Interlock (Fig. 172) - With the carrier return clutch latched, the upright lug of the tab latch should clear the end of the tab lever pawl by .005" to .025". The rear lug of the tab latch should be formed forward or back to obtain this condition.

The lug on the tab latch may be formed by using the push end of the large spring hook as a T-bender.

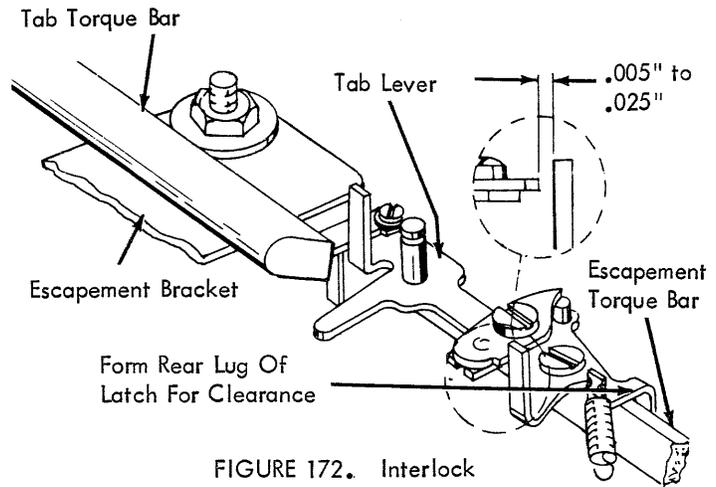


FIGURE 172. Interlock

The adjustment insures that the carrier return and tab cannot both be latched simultaneously. If both were allowed to latch, the tab lever pawl would lock against a set tab stop during the carrier return operation.

13. Tab Interlock Switch (Late) (Fig. 173) -

\* NOTE: Before proceeding with the following adjustments check the tab torque bar end play. It should be .002" to .004". It is adjusted by the retaining clips on the RH end of the torque bar.

- a. Tab Switch Trigger - with the tab torque bar in the rest position, form the horizontal lug on the left end of the tab torque bar, so that .010" to .015" exists between the tab switch trigger and its latching surface (Fig. 173).
- b. Tab Interlock Switch Bracket - adjust by its mounting screws for two conditions:

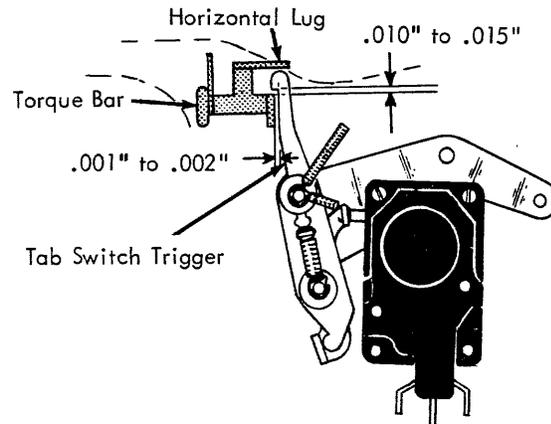


FIGURE 173. Tab Interlock Switch (Late)

1. Up and Down - so the tab torque bar is vertical in the rest position. The tab torque bar linkage must not interfere with the rest position of the tab torque bar.
2. Front to Rear - so a .001" to .002" clearance (Fig. 173) exists between the tab switch trigger and the rear edge of the tab torque bar extension. This clearance insures that the tab interlock switch is not partially activated in the rest position.

14. Tab Interlock Contact (Early) -

- a. Form (in circled area) the actuating wire (left or right) so that it contacts the actuating arm near the right angle bend (Fig. 174).
- b. With the tab interposer released and the Tab/Sp/BS cam on its high point, position the mounting bracket (front to rear) so that the actuating arm overlaps (.040" minimum) the actuating wire (Fig. 174). This insures that the actuating wire does not get above the actuating arm.

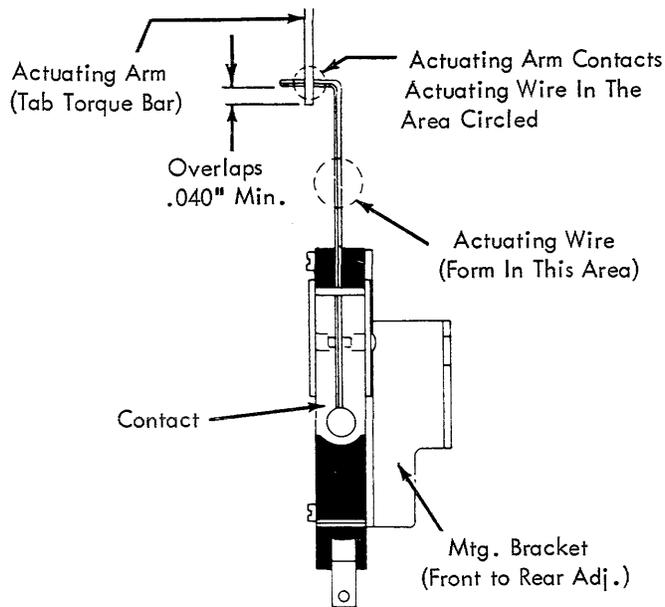


FIGURE 174. Interlock Contact (Early)

- c. As the tab torque bar restores, position the mounting bracket (up or down) so that the contact actuating wire travels .031" to .062" after the contact transfers (Fig. 175). This is done to insure that machine vibration does not cause the contact to transfer.

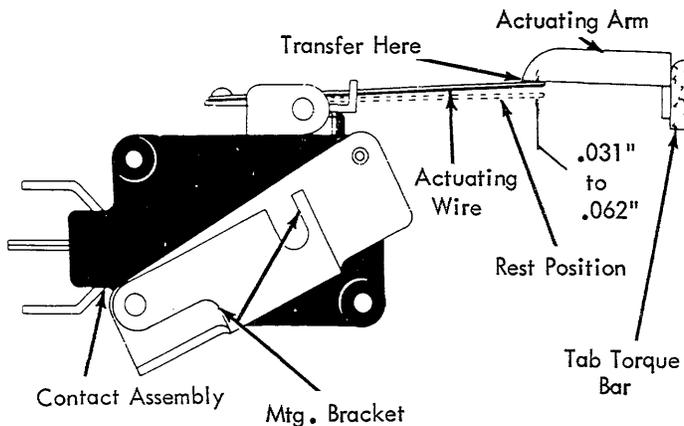


FIGURE 175. Interlock Contact

NOTE: During initiation of a tab operation, the switch must transfer (up position) before the Tab/Sp/BS cam reaches its high point. Torque bar bounce must not retransfer the contact while the tab lever is latched out.

MARGIN CONTROL MECHANISM

1. Margin Rack Overbank Guide - With the carrier resting at the left hand margin, adjust the overbank guide (Fig. 176) left or right on the margin rack to obtain .001" to .005" clearance between the margin stop and the margin stop latch on the carrier when the margin rack is in its rest position (Fig. 176). When observing this clearance remove the floating action of the margin stop latch by pulling the stop latch to the right with a spring hook.

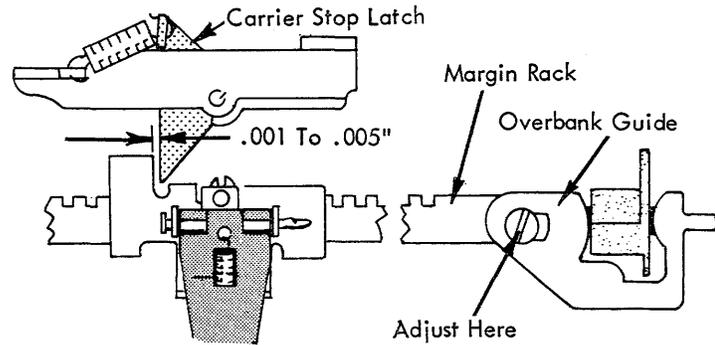


FIGURE 176. Margin Rack Overbank Guide

The adjustment insures that the left margin stop will set accurately when the stop is slid to the right against the margin stop latch on the carrier.

NOTE: Machines equipped with an old style margin rack use an eccentric plate mounted on the right end of the margin rack to control the rest position of the rack. Use the same procedure indicated above to obtain the .001" to .005" clearance between the margin stop and the stop latch on the carrier.

2. Margin Rack

a. Early

1. With all parts at rest, loosen the fluted screw in the margin release lever and rotate the margin rack (within the release lever) to a level position (Fig. 177). Then tighten the fluted screw.

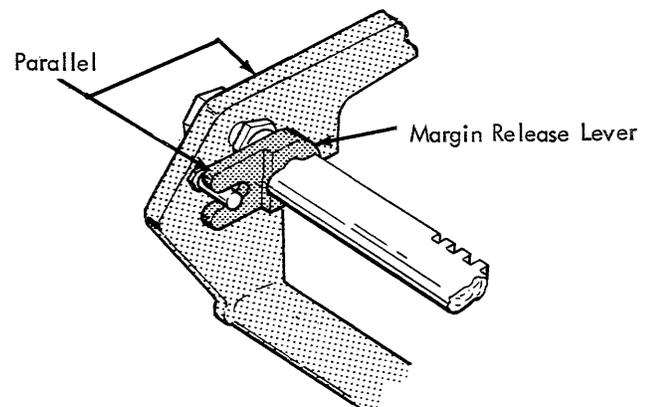


FIGURE 177. Margin Rack (Early)

b. Late - Position the left hand margin release lever:

1. Laterally so that  $1/32''$  of the rolled pin on the margin release lever (Fig. 178).
2. Radially so that the margin rack will be horizontal.

3. Margin Stop Final Stop

- a. Early - Form the lug on the final stop (which is welded to the bottom side of the margin rack) to obtain a clearance of  $.001''$  to  $.010''$  between the final stop and the margin stop with the margin stop pin fully seated in the extreme left tooth of the margin rack.
- b. Late - Position the margin set lever stop (Fig. 178) left or right on the margin rack so that it will clear the margin stop by  $.001''$  to  $.010''$  when the margin stop pin is fully seated in the extreme left hand tooth of the margin rack.

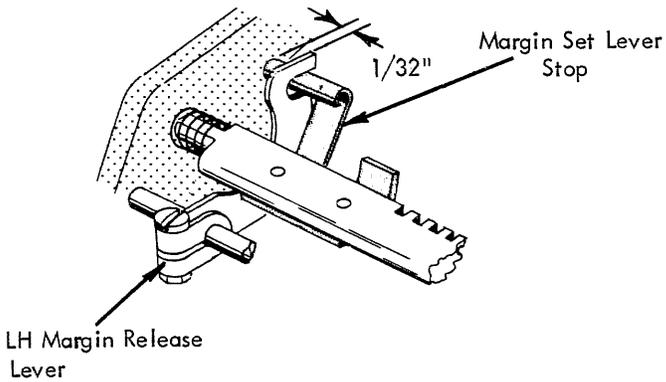


FIGURE 178. Margin Rack (Late)

4. Bell Ringer Bail Adjusting Plate (New) (Fig. 179) - Position the adjusting plate so that the bellringer bail is parallel to the margin rack.

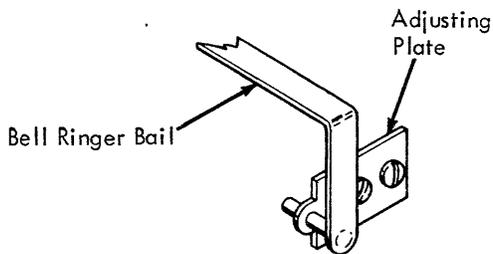


FIGURE 179. Bell-Ringer Bail Adjusting Plate

5. Bellringer Bail Lever

- a. Early - With the carrier positioned away from the right hand margin stop, adjust the bell bail lever located on the left end of the bellringer bail to have  $.005''$  to  $.020''$  clearance with the bellclapper bellcrank lever when the bail is at rest against the bail stop (Fig. 180). The bail stop is located at the right end of the bail.

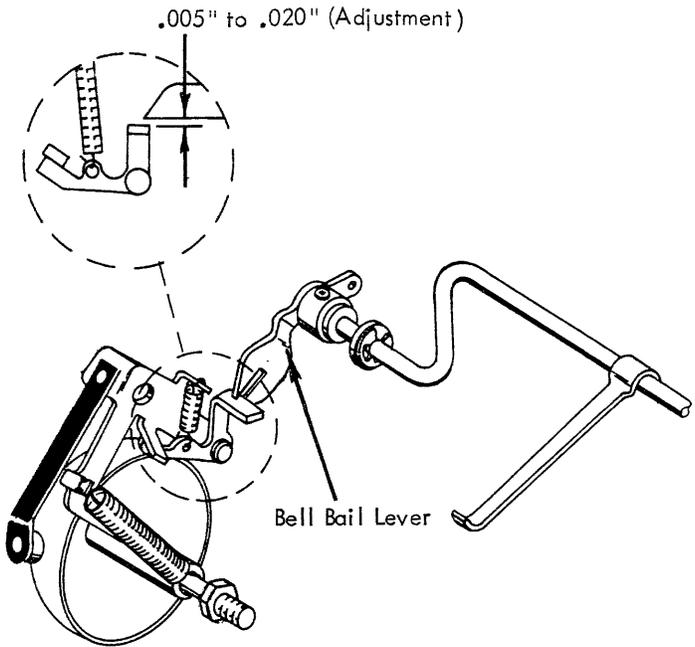


FIGURE 180. Bell Bail Lever (Early Style)

- b. Late - With the carrier positioned away from the right hand margin stop, adjust the bell bail lever located on the left end of the bellringer bail so that when the bottom portion of the lever is allowed to contact the underside of the bell clapper bellcrank lever a clearance of  $.005''$  to  $.020''$  will exist between the bellringer bail and the bellringer bellcrank (Fig. 181).

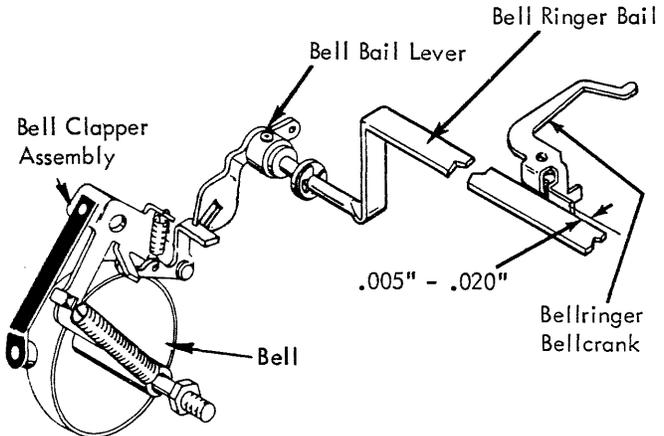


FIGURE 181. Bell Bail Lever (Late Style)

- c. Machines Without Bell - The bail stop located at the right end of the bail should be adjusted so the bellringer bail is not moved until the bellringer bellcrank begins to rise on the final ramp of the line lock bracket.

NOTE: When adjusting the bellringer bail lever be sure to maintain  $.002''$  to  $.004''$  end play in the bellringer bail.

6. Line Lock Bracket - Adjust the line lock bracket up or down so that the bellringer bellcrank will ride  $1/16''$  to  $5/64''$  from the bottom as the carrier moves into the line lock position. (Fig. 182A).

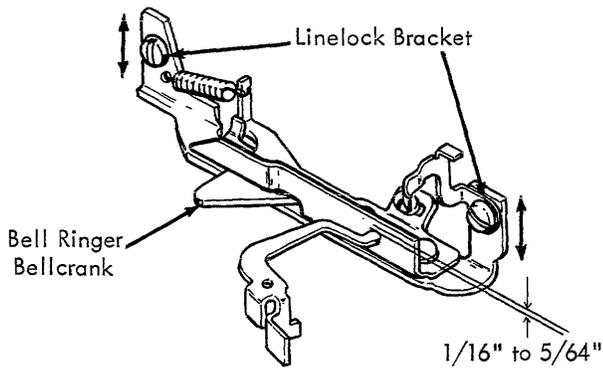


FIGURE 182A. Line Lock Bracket

The adjustment insures that the bellringer bellcrank will remain in contact with the camming surface of the line lock bracket throughout the line lock operation. It also insures that the bellringer bellcrank will ride back over the line lock bracket if the carrier is returned from a position to the right of the right hand margin.

7. Bell Clapper Bellcrank Lever - The bell should ring one space before the bellringer bellcrank moves onto the front surface of the line lock bracket.

The adjustment is obtained by forming the lug on the bell clapper bellcrank that acts as a stop for the bell clapper bellcrank lever (Fig. 182B). The forming adjustment changes the amount of bite between the bail lever and the bell clapper bellcrank lever.

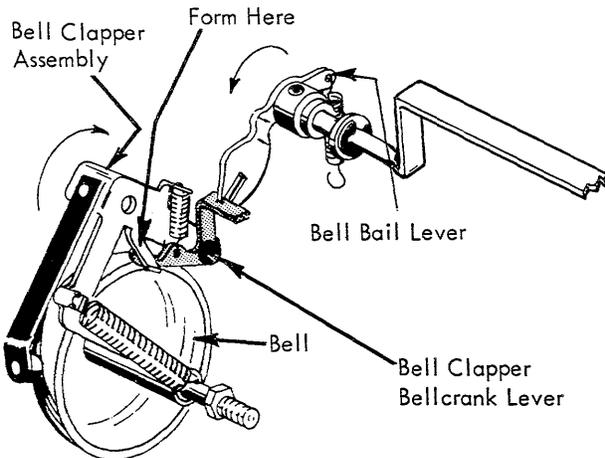


FIGURE 182B. Bell Clapper Bellcrank Lever

8. Line Lock Bracket Adjustable Plate (Fig. 183) - Position, with the carrier in the next to last space, to a point where the inclined surface just begins to deflect the bellringer bellcrank.

Last Column Contacts (Fig. 184) (Early)

- a. Form the N/O support so that the N/O contact clears the O/P by .020" to .030".
- b. Position (carrier in next to last space) the contact actuator on the bellringer bail so that it just touches the O/P. When positioning the actuator, all back lash must be held out of the actuator to line lock bracket linkage.

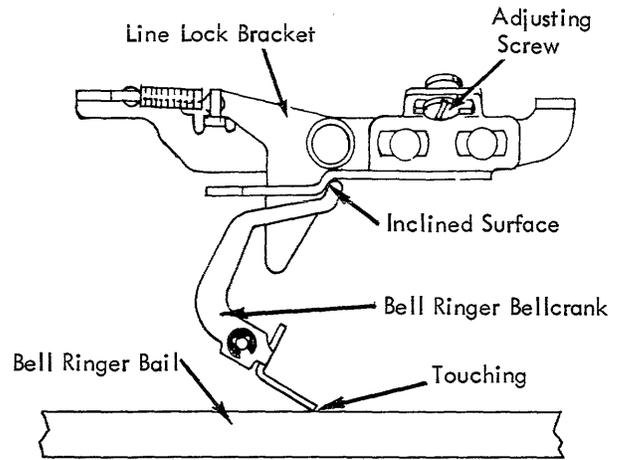


FIGURE 183. Line Lock Bracket

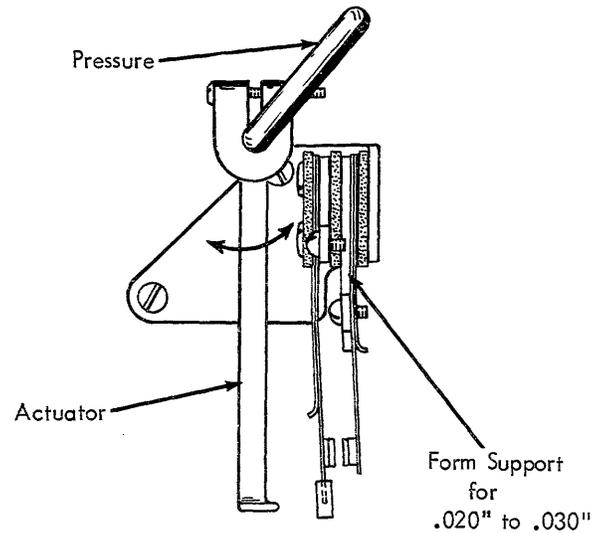


FIGURE 184. Last Column Contact Adjustment (Early)

NOTE: To place the carrier in the next to last space, proceed as follows:

1. Space to the right until the carrier pointer lines up with the mark on the RH margin set lever.
2. Backspace two spaces.
- c. As the carrier moves from the next to last to last space, check for the following conditions (Fig. 185).
  1. The contact transfer must be complete (and without bounce) within one space.
  2. N/C contact must break.
  3. O/P must lift the N/O contact sufficiently to insure reliable make.

Last Column Contact (Late) (Fig. 186) -

1. With the carrier in the next to last space position the contact actuator on the bellringer bail so that the actuator just touches the O/P. When positioning the actuator, all back lash must be held out of the actuator to line lock bracket linkage.

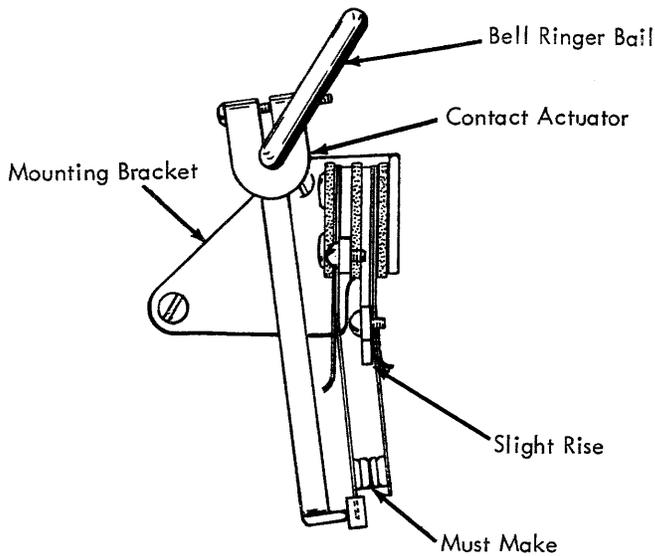


FIGURE 185. Last Column Contact

2. As the carrier moves from the next to last space to the last space, the contact transfer must be complete.

NOTE: To place the carrier in the next to last space, proceed as follows:

1. Space to the right until the carrier pointer lines up with the mark on the RH margin set lever.
2. Backspace two spaces.

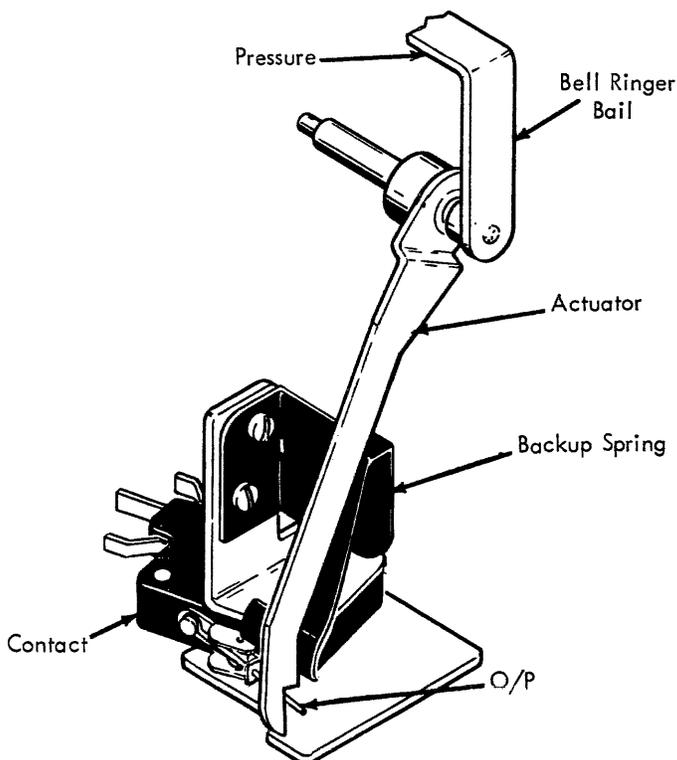


FIGURE 186. Last Column Contact (New)

## PAPER FEED MECHANISM

NOTE: For pin feed platen machines use adjustments 7, 8 and 10 only.

1. Before any paper feed adjustments are attempted, the position of the platen MUST be correct.
2. Paper Feed Braces - (early paper feed mechanism only) - With the feed roll tension springs disconnected the adjustable braces fastened to the paper feed mounting arms should be adjusted all the way forward without deflecting either the feed roll actuating shaft or the carriage tie rod (Fig. 187).

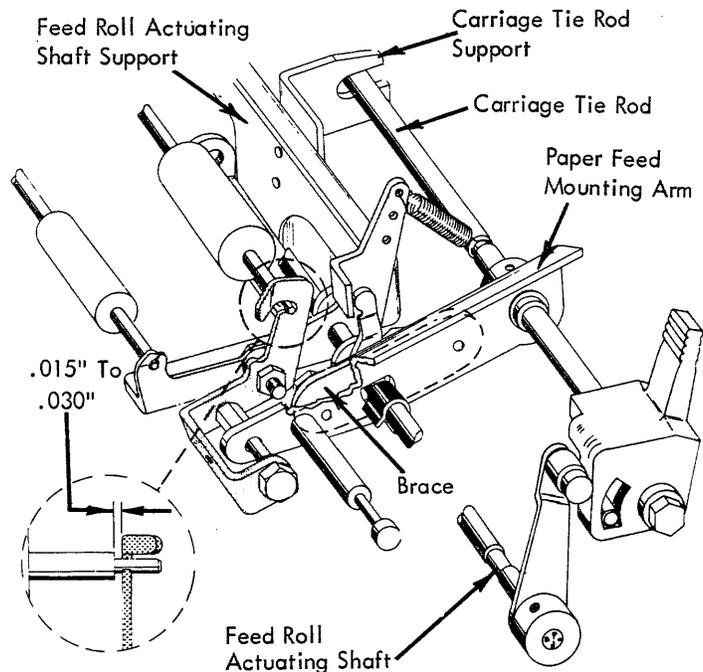


FIGURE 187. Paper Feed Mechanism

### 3. Paper Feed Supports

- a. Early Paper Feed Mechanism - With the feed roll tension springs disconnected, the vertical supports for the carriage tie rod and the feed roll actuating shaft should be adjusted to just touch the bottom of each shaft (Fig. 187). The feed roll actuating shaft support should be loose when the tie rod support is adjusted.
  - b. Late Paper Feed Mechanism - With the feed roll tension springs disconnected, the center support bracket (Fig. 188) should be positioned so that the forward lug just touches the underside of the feed roll shaft while the rear lug just touches the top of the carriage tie rod. The center support bracket should not bow the copy control shaft.
4. Feed Roll Tension - Place the feed roll tension springs in the hole of the front feed roll arms that will provide -2 to 2-1/2 pounds tension measured at the front feed roll pivot points.

5. Feed Roll Side Play

- a. Early - The left and right hand paper feed mounting arms should be adjusted to provide the rear feed roll shafts with an end play of .015" to .030" when the feed rolls are against the platen (Fig. 187).
- b. Late - The left and right hand front feed roll arm assemblies should be adjusted to give end play to the feed roll shafts that will not permit them to contact the sides of the openings in the deflector but will permit them to roll freely (Fig. 188). Not Shown.

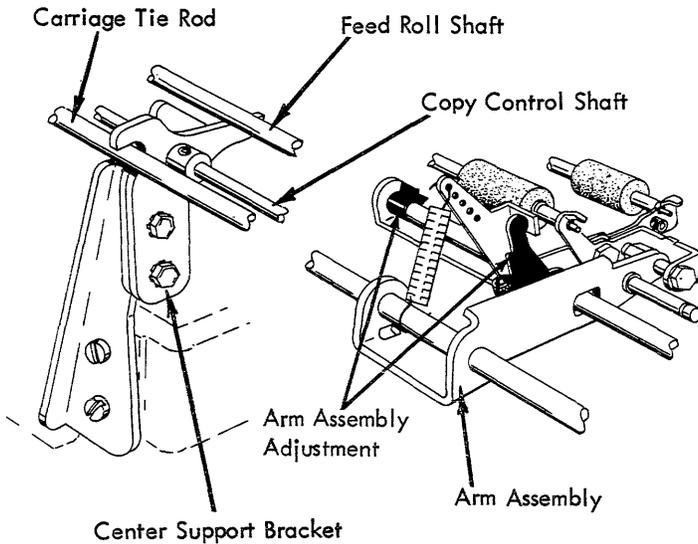


FIGURE 188. Center Support Bracket

6. Feed Roll Adjustment

- a. Early - Adjust the eccentrics with the high points to the rear so that three tab cards inserted between the platen and the rear feed rolls will cause a clearance of .008" to .012" between the front feed rolls and the platen (Fig. 189). The clearance should be equal on both ends of the feed roll.

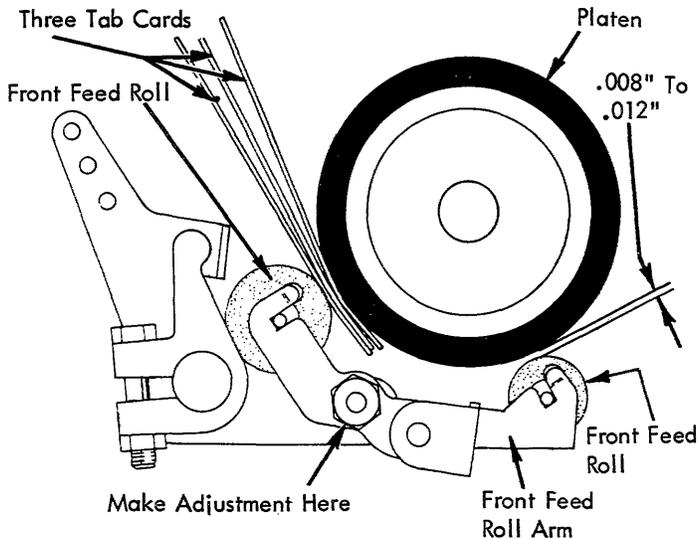


FIGURE 189. Feed Roll Adjusting Eccentrics (Old Style)

- b. Late - The front feed roll adjusting arms should be adjusted as follows: When two tab cards are placed between the front feed rolls and the platen, the rear feed rolls should clear the platen (Fig. 190). When one tab card is placed between the front feed rolls and the platen, the rear feed rolls should touch the platen.

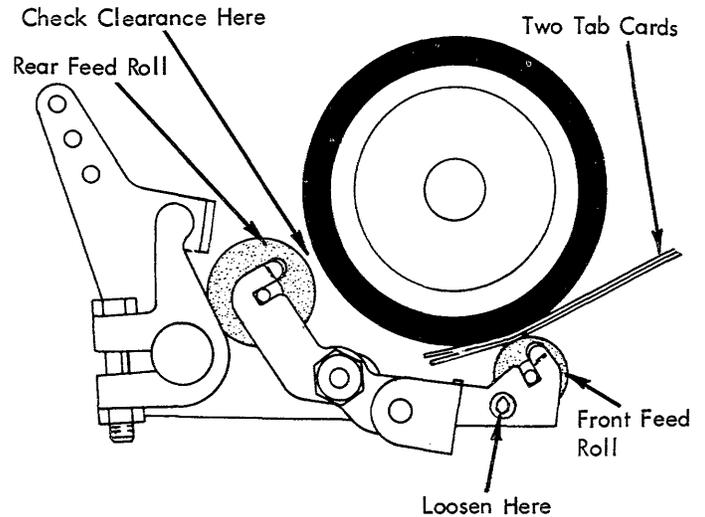


FIGURE 190. Feed Roll Adjusting Arm (New Style)

- 7. Paper Release - Adjust the feed roll release arm (Fig. 191) to obtain a release clearance of .055" to .065" between the rear feed roll and the platen.

Excessive clearance can cause interference between the front feed roll and the carrier; whereas insufficient clearance will not permit straightening of thick paper packs.

NOTE: The clearance should be the same at each end of the feed roll. The clearance can be equalized by adjusting either the left or right feed roll release lever (Fig. 191).

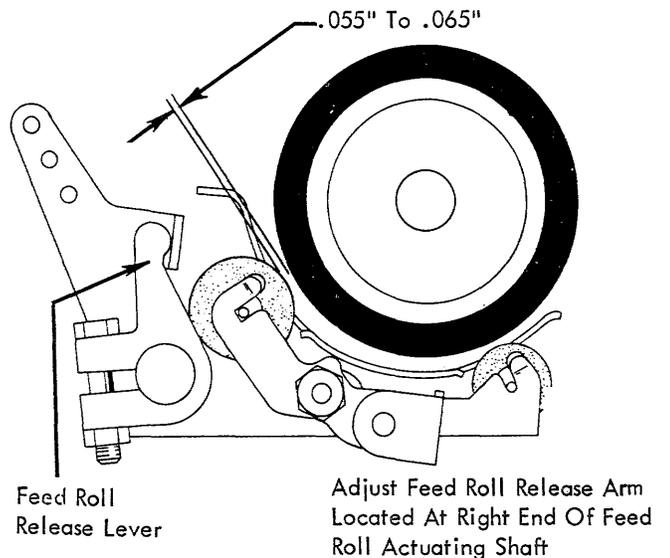


FIGURE 191. Paper Release Adjustment

8. Deflector - Position the deflector by forming the deflector supporting tabs on the front and rear feed roll arms so that a clearance of .010" to .020" exists between the front and rear of the deflector and the platen (Fig. 192). Three tab cards inserted between the platen and the deflector (at the front and rear) should provide a slight drag. No drag should be felt when one tab card is inserted.

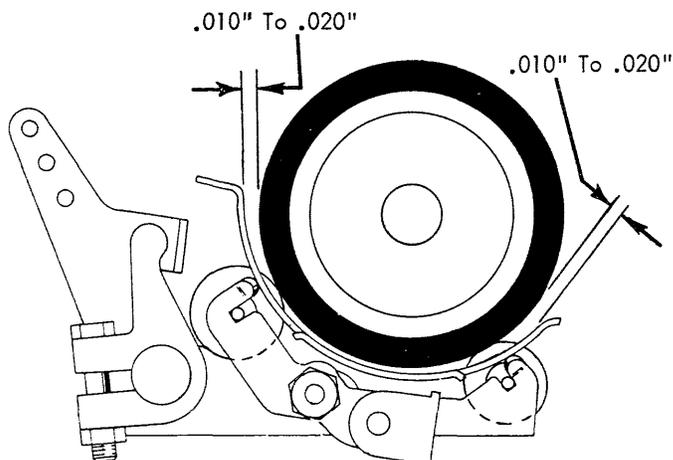


FIGURE 192. Deflector Adjustment

9. Paper Bail

- a. Bail Shaft - The shaft should be positioned in the right hand bail arm so that each arm can be pulled forward the same distance from the platen before the entire bail begins to move.

The adjustment insures that both bail rollers will have equal pressure against the platen.

CAUTION: Be sure that neither bail arm is deflected left or right after the bail shaft is tightened.

- b. Bail Stop - The lugs that stop the rearward movement of the paper bail arms should be formed to obtain a .005" to .010" clearance between the lugs and the bail arms when the copy control lever is at its extreme rear position.

The adjustment prevents interference between the bail arms and the line gage card holder when the platen is removed.

10. Line Gage Card Holder

- a. Adjust the line gage card holder forward or back for a .005" to .010" clearance with the platen.
- b. The vertical adjustment should be such that the graduated edge is parallel to and .002" to .005" below the feet of the typed characters when viewed from the operator's position.
- c. Adjust the card holder left or right so that the point of a letter "V" will align with the mark in the middle of the line gage card holder.

NOTE: On pin feed platen machines, the graduations on the left hand card holder should be lined up with the bottom of a series of V's.

FABRIC RIBBON MECHANISM

1. Centering Springs - With the ribbon reverse interposer centered, form the lugs of the ribbon feed plate for .003" to .005" clearance in the centering spring loops (Fig. 193).

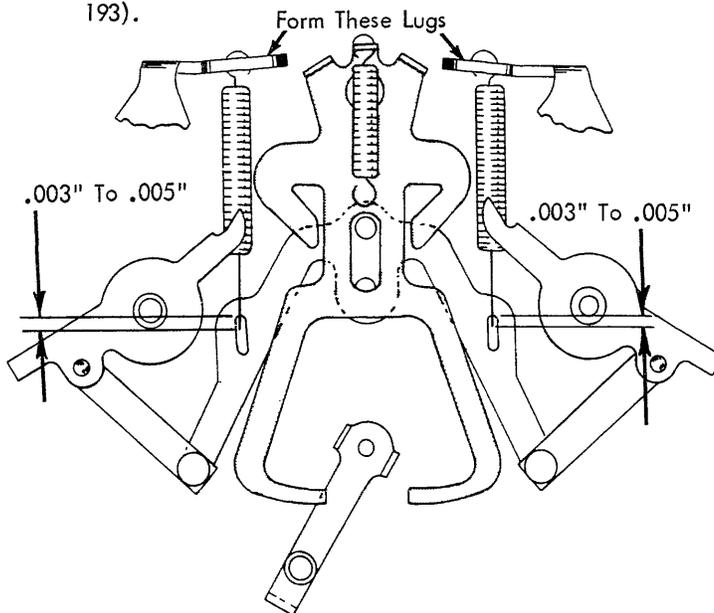


FIGURE 193. Centering Springs Adjustment

The adjustment insures that the springs are not extended when at rest and that they will properly restore the mechanism after a reverse operation.

2. Ratchet Brake Spring - Form the left and right ratchet brake springs so that each will hold its ratchet in position after the ratchet has been manually rotated far enough to fully actuate the reverse mechanism (Fig. 194).

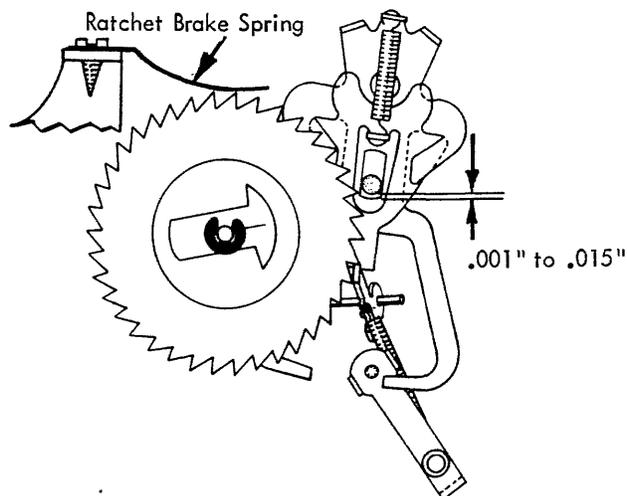


FIGURE 194. Ribbon Feed Plate Adjustment

The ratchets should be checked alternately with the cartridge removed. The check as described is merely a method of testing for the correct braking action of the springs and has little to do with the reversing action.

3. Ribbon Feed Plate - With the ribbon mechanism set for a reversing operation and the ribbon cam at its high

point, adjust the ribbon feed plate forward or back so that the ribbon feed pawl holds the reverse interposer within .001" to .015" of its total travel (Fig. 194).

The adjustment not only insures sufficient throw for a reversing operation, but also gives optimum ribbon feed results by determining the rest and active positions for the pawl.

**CAUTION:** After completing the adjustment, manually cycle a character to check that two teeth feed is obtained plus .005" to .020" overthrow.

Be sure that the feed pawl does not contact the interposer lever as the pawl is manually reversed from side to side.

4. Cartridge Guides - Form the ribbon feed plate lug that guides the cartridge into position so that the ribbon spools are centered in the holes of the cartridge and there is .001" to .010" lateral movement of the cartridge.
5. Ribbon Lift Guide Plate - Adjust the plate as low as possible without causing a change in the ribbon lift guide height as the ribbon lift lever is moved from the low lift to the high lift position (Fig. 195). The ribbon lift cam should be at the low point when the check is made.

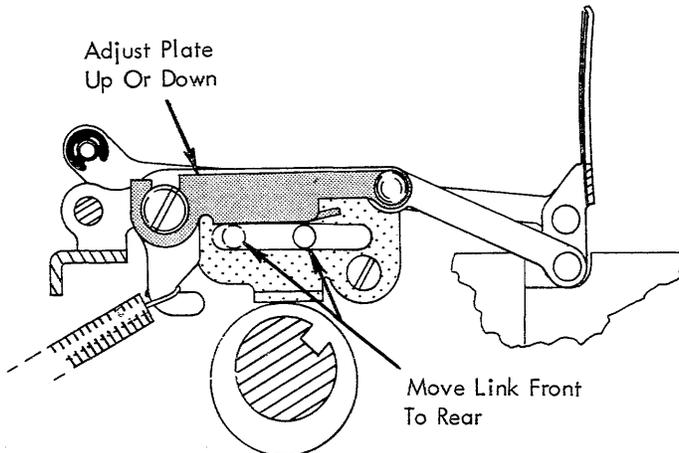


FIGURE 195. Ribbon Lift Guide Plate Adjustment

6. Ribbon Lift Control Link - Adjust the link forward or back by means of the clevis so that the underscore will strike the ribbon 1/16" from the bottom edge. The ribbon lift lever must be in the high lift position when the check is made.

**CAUTION:** Do not adjust the link so short that it chokes off in the front end of the cam follower slot as the ribbon lift lever is moved into the high lift position.

7. Ribbon Lift Lock - Adjust the ribbon lift lock so that it will positively hold the ribbon lift guide in the load position. The lock is located under the right front corner of the carrier.
8. Stencil Lockout (Fig. 196) - With the lift lever in stencil position and the cam follower on the high point of the ribbon feed cam, form the ribbon feed latch for .010" clearance with the lug on the cam follower.

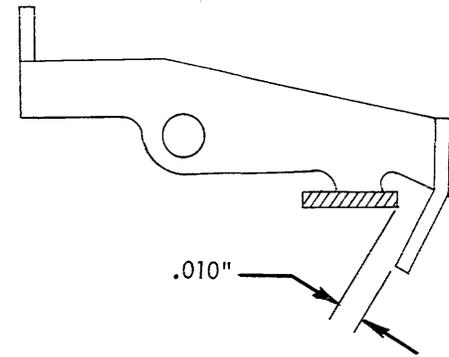


FIGURE 196. Stencil Locking

## RIBBON SHIFT MECHANISM

### 1. Magnet Adjustments (2 Magnet) -

- a. With the armatures energized, position the hinge plates so that the armatures clear the magnet yokes by .003" to .005" (Fig. 197).

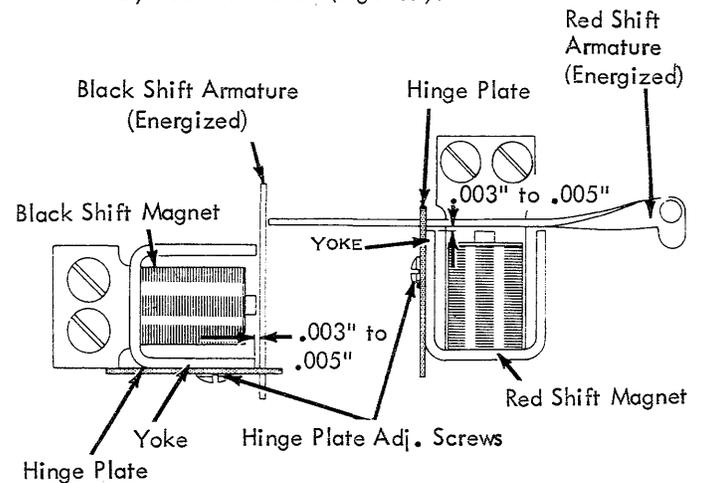


FIGURE 197. Hinge Plates

- b. With the armatures energized, position the armature stops so that the armatures clear the magnet yoke by .003" to .005" (Fig. 198).

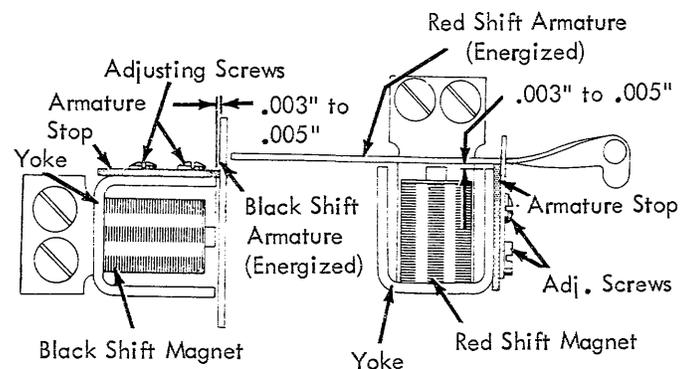


FIGURE 198. Armature Stops

2. Black Shift Magnet - With the black shift magnet armature energized and the red shift magnet armature de-energized, position the black shift magnet for a clearance of .010" between the black and red shift armatures (Fig. 199).

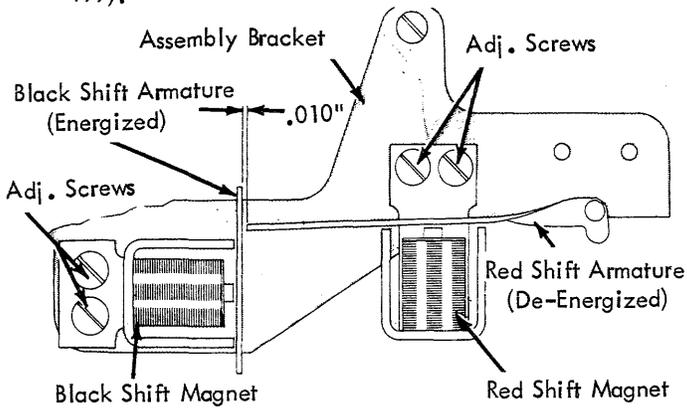


FIGURE 199. Magnet Positioning

NOTE: With the red shift armature energized and the black shift armature de-energized, the black shift armature must overthrow the red shift armature by .003" to .006" (Fig. 200).

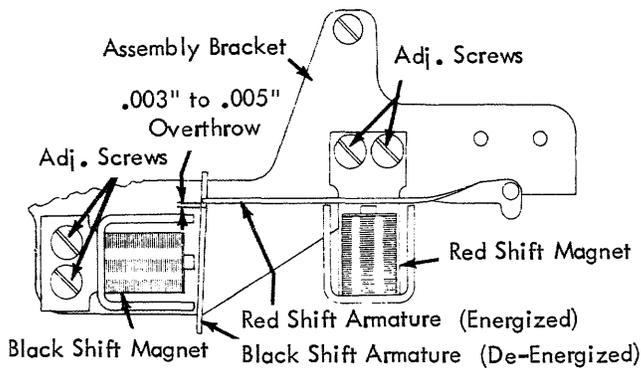


FIGURE 200. Black Shift Armature Overthrow

3. Magnet Adjustments (1 Magnet) (Fig. 201) - With the red shift magnet armature energized, position the hinge plate and armature stop so that the armature clears the yoke (both inner and outer poles) by .003" to .005".

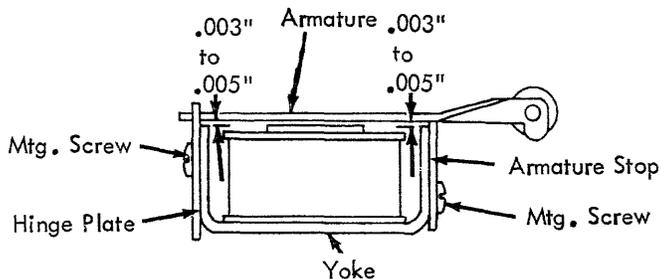


FIGURE 201. Magnet Adjustments (1 Magnet)

4. Pivot Arm (Fig. 202) - With the manual ribbon lift lever in the black position, form the pivot arm extension (up or down) so that the latch does not drag when moved from the latched to the unlatched position.

NOTE: Position the pivot arm bracket so that the highest and lowest characters print equidistant from the top and bottom of the red portion of a black and red ribbon.

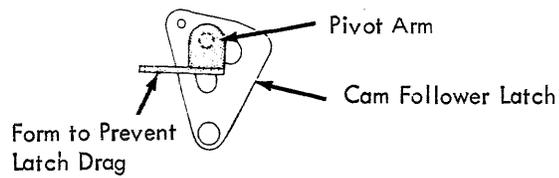


FIGURE 202. Pivot Arm

5. Right Hand Pulley (Fig. 203 & 204) - With the red shift armature energized, position the right hand pulley pivot to obtain .002" to .005" clearance between the stud and follower latch slot.

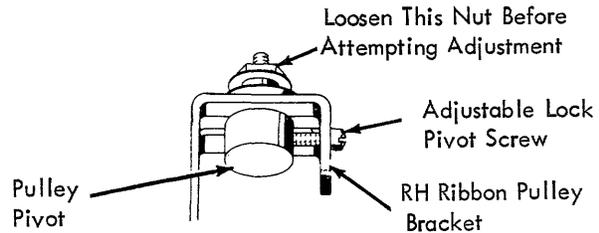


FIGURE 203. Right Hand Pulley

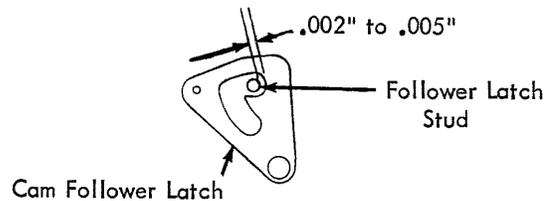


FIGURE 204. Cam Follower Latch

NOTE: The pulley nut must be loosened before adjusting the pivot screw.

6. Red Shift Armature Backstop (Fig. 205 & 206) - With the armature de-energized, position the red shift armature backstop to obtain .002" to .005" clearance between the stud and the follower latch slot.

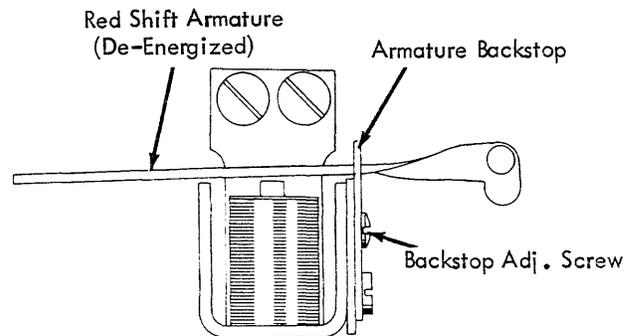


FIGURE 205. Red Shift Armature Backstop

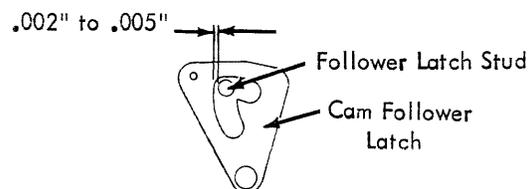


FIGURE 206. Cam Follower Latch

## INDEX SELECTION SOLENOIDS

1. Adjust the solenoid core for .020" plunger to core air gap by holding the plunger against the guide, turn in the core until the plunger just begins to rise, back off the core 1/2 turn and tighten the lock nut (Fig. 207).

NOTE: Be sure the links are not interfering during this adjustment.

2. Adjust the rear index selection solenoid link so the air gap on the rear solenoid will be .120" to .130" with the front plunger sealed (Fig. 207).
3. Adjust the front index selection solenoid link so the air gap on the front solenoid will be .120" to .130" with the rear plunger sealed (Fig. 207).

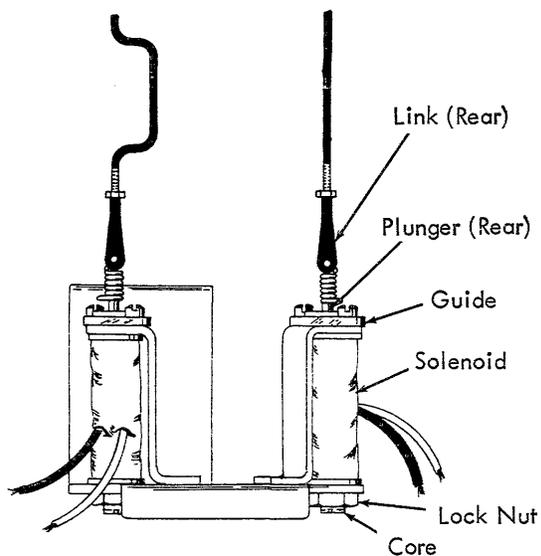


FIGURE 207. Index Solenoid Adjustments'

REMOVAL	
CYCLE CLUTCH AND CYCLE SHAFT REMOVAL . . . . .	1
BELT REPLACEMENT . . . . .	2
ROTATE SPRING REPLACEMENT . . . . .	4
LOWER BALL SOCKET AND TILT RING REMOVAL . . . . .	4
ROTATE TAPE REPLACEMENT . . . . .	5
TILT TAPE REPLACEMENT . . . . .	6
ROTATE SELECTION DIFFERENTIAL REMOVAL . . . . .	6
TILT SELECTION DIFFERENTIAL REMOVAL . . . . .	7
DIFFERENTIAL PLATE REMOVAL . . . . .	7
SELECTOR BAIL REMOVAL . . . . .	8
PRINT MAGNET ASSEMBLY REMOVAL . . . . .	9
LATCH PUSHER REMOVAL . . . . .	9
SHIFT MAGNET ASSEMBLY REMOVAL . . . . .	10
BACKSPACE RACK REMOVAL . . . . .	10
SHIFT ARM REMOVAL . . . . .	10
OPERATIONAL CAM CHECK PAWL . . . . .	10
ESCAPEMENT CAM FOLLOWER REMOVAL . . . . .	10
OPERATIONAL CAM FOLLOWER . . . . .	11
OPERATIONAL CONTACT REMOVAL . . . . .	11
OPERATIONAL MAGNET ASSEMBLY REMOVAL . . . . .	11
OPERATIONAL LATCH BRACKET REMOVAL . . . . .	12
SHIFT CAM REMOVAL . . . . .	13
OPERATIONAL SHAFT REMOVAL . . . . .	13
OPERATIONAL INTERPOSER BRACKET REMOVAL . . . . .	13
CARRIER SHOE REMOVAL . . . . .	13
CARRIER AND ROCKER REMOVAL . . . . .	14
CYCLE CLUTCH PULLEY REMOVAL . . . . .	15
CORD REPLACEMENT . . . . .	15

## CYCLE CLUTCH AND CYCLE SHAFT REMOVAL

1. Remove the covers.
2. Position the carrier to the extreme right.
3. Remove the degree wheel pointer (#1, Figure 1).
4. Remove the degree wheel (#2, Figure 1).
5. Remove the gear guard (#3, Figure 1).
6. Remove the left dust cover (not shown).
- \* 7. Remove the two screws (#1, Figure 2) that hold the contact plate to the frame. Remove the contact assembly and hold it to the front with a rubber band.
8. Remove the two pivot screws (#1, Figure 3).
9. Remove the front screw from the C1 - C2 contact assembly (#1, Figure 4) and swing the assembly down out of the way of the bearing plate.
10. Remove the cycle-clutch check pawl and spring (#1, Figure 5).
11. Remove the three bearing-plate screws (#2, Figure 4).
12. Remove the bronze intermediate gear (#3, Figure 4).
13. Remove the C1 - C2 cams (#4, Figure 4) and the cycle shaft gear (behind the C1 - C2 cams).
14. Remove the bearing plate (#5, Figure 4) by prying it away from the frame (front end first) with a screwdriver and sliding it off the cycle shaft.
15. Force the positive bail down with a screwdriver (#2, Figure 5), making sure all the latches are under the bail. Insert a bristol wrench through the lower left bearing plate mounting hole (#2, Figure 4) over the top of the bail to hold it down.
 

Note: Do not remove the positive bail restoring spring.
16. Remove the cycle shaft, pushing the Negative 5 and Rotate 2 links out of the way with a spring hook pusher end. The pusher-restoring-bail arms will easily bend to the left to allow removal.
17. Remove the shims from the old shaft and put them on the new one. Be sure the flexible nylon shim is the first one put on.
 

Note: The number of shims may vary with the new shaft to maintain .002" - .004" end play.

\* Not present on all printers.

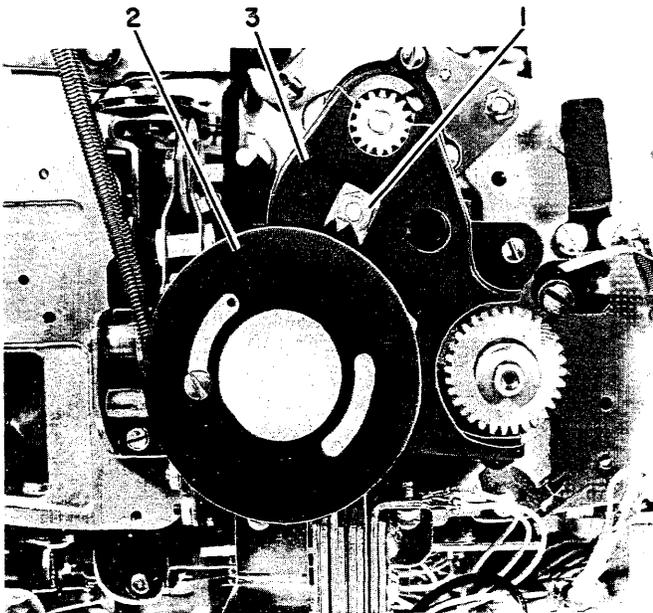


FIGURE 1. Cycle Clutch and Cycle Shaft Removal

18. The following adjustments should be checked after the cycle-shaft is replaced:
  - a. Idler Gears
  - b. Cycle Shaft End Play
  - c. Cycle-Clutch Spring
  - d. Cycle-Clutch Latch Bite
  - e. Damper Spring
  - f. Filter Shaft Timing
  - g. Print Shaft Timing
  - h. C1 and C2 Contact Timing

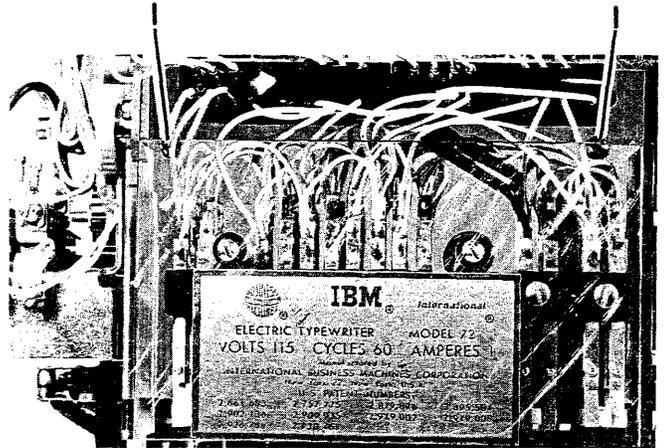


FIGURE 2. Cycle Clutch and Cycle Shaft Removal

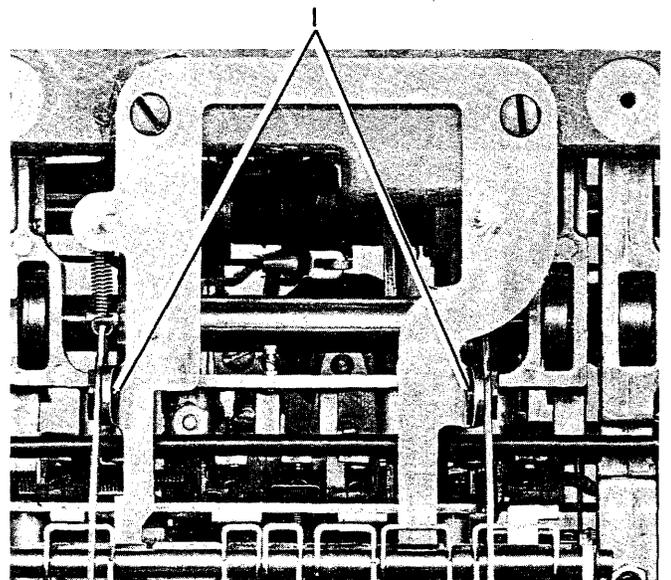


FIGURE 3. Cycle Clutch and Cycle Shaft Removal

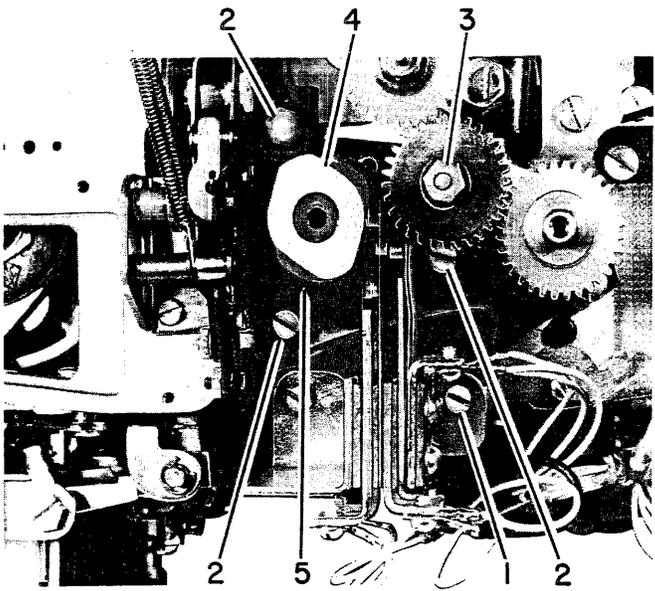


FIGURE 4. Cycle Clutch and Cycle Shaft Removal

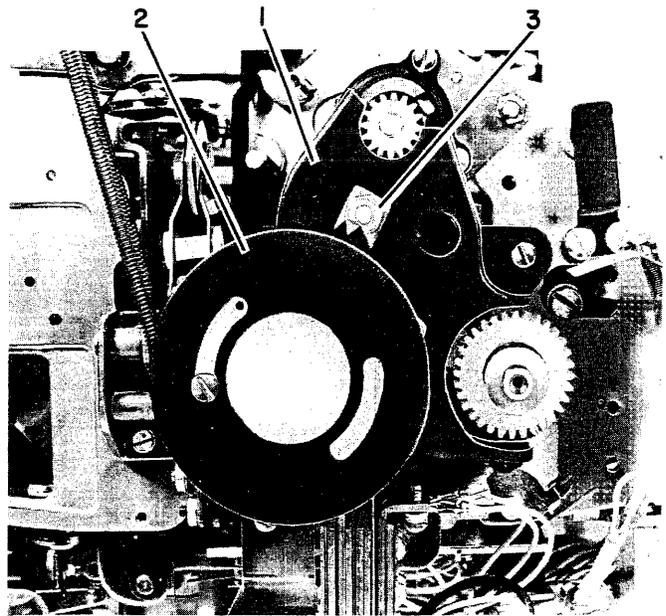


FIGURE 6. Belt Replacement

**BELT REPLACEMENT**

1. Position the carrier to the extreme right.
2. Remove the degree-wheel pointer (#3, Figure 6).
3. Remove the degree-wheel (#2, Figure 6).
4. Remove the gear guard (#1, Figure 6).
5. Remove the left dust cover (not shown).
- \* 6. Remove the two screws (#1, Figure 7) that hold the plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.

7. Remove the cycle-clutch check pawl and spring (#1, Figure 8).
8. Remove the front screw from the C1 and C2 contact assembly (#1, Figure 9) and swing the assembly down.
9. Remove the bronze intermediate gear (#3, Figure 9).
10. Remove the three bearing plate screws (#2, Figure 9) and remove the bearing plate.
11. Cut the old belt and remove it from the machine.
12. Force the positive bail down with a screwdriver (#1, Figure 11) making sure all the latches are under the bail.

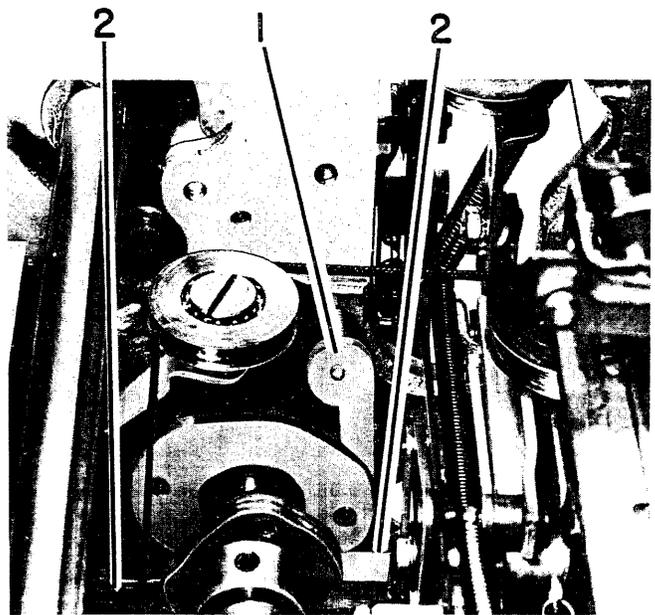


FIGURE 5. Cycle Clutch and Cycle Shaft Removal

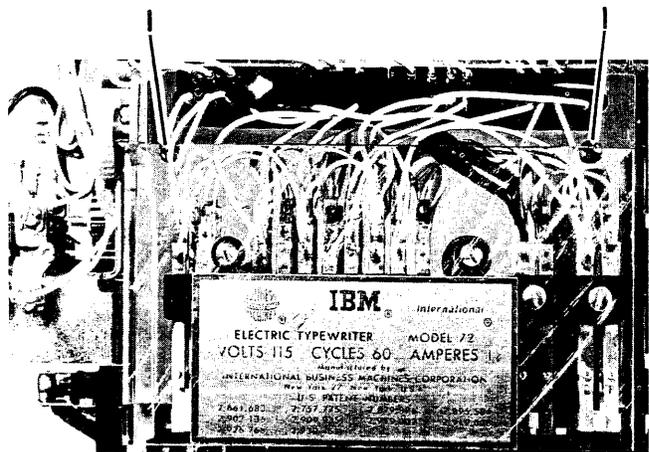


FIGURE 7. Belt Replacement

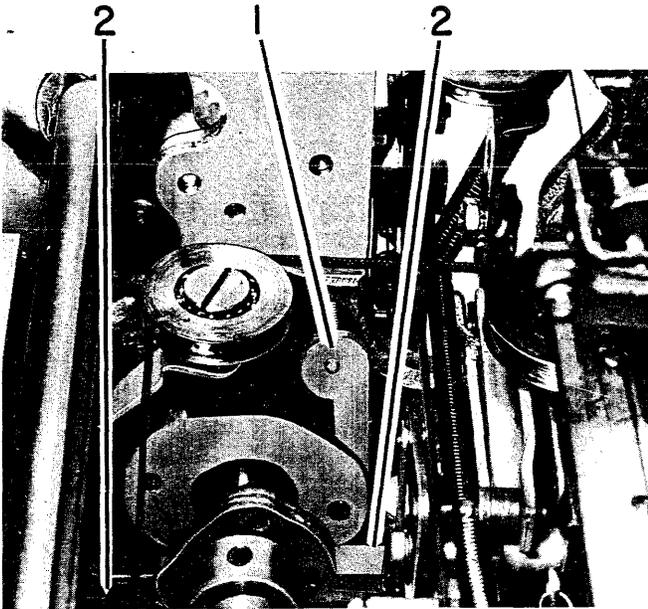


FIGURE 8. Belt Replacement

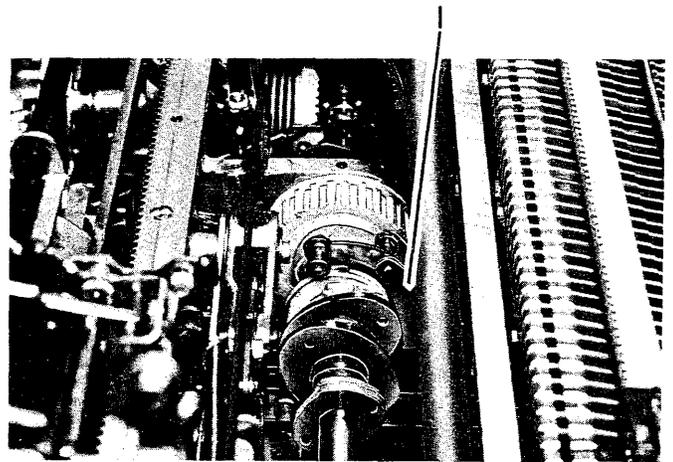


FIGURE 10. Belt Replacement

Insert a bristol wrench through the lower left bearing plate mounting hole over the top of the bail to hold it down.

13. Loosen the two cycle-clutch latch-bracket mounting screws (#1, Figure 10). Slip the new belt through the bearing plate hole, around the shaft, and over across the cycle shaft to the cycle-clutch latch (Figure 11). Work it between the latch and the cycle-clutch sleeve.
14. Loosen the motor mount and slip the belt over the centrifugal clutch.

15. The following adjustments should be checked after the belt is replaced:
  - a. Idler gears
  - b. Damper spring
  - c. Filter shaft timing
  - d. Print shaft timing
  - e. C1 and C2 contact timing
  - f. Cycle clutch latch bracket height

\* Not present on all printers.

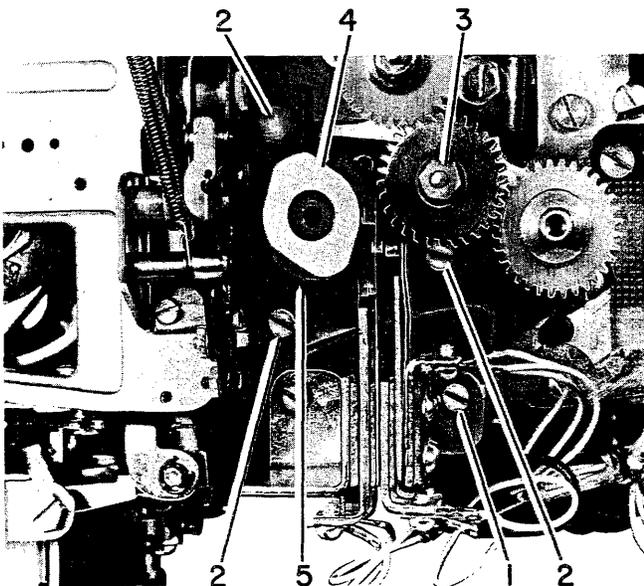


FIGURE 9. Belt Replacement

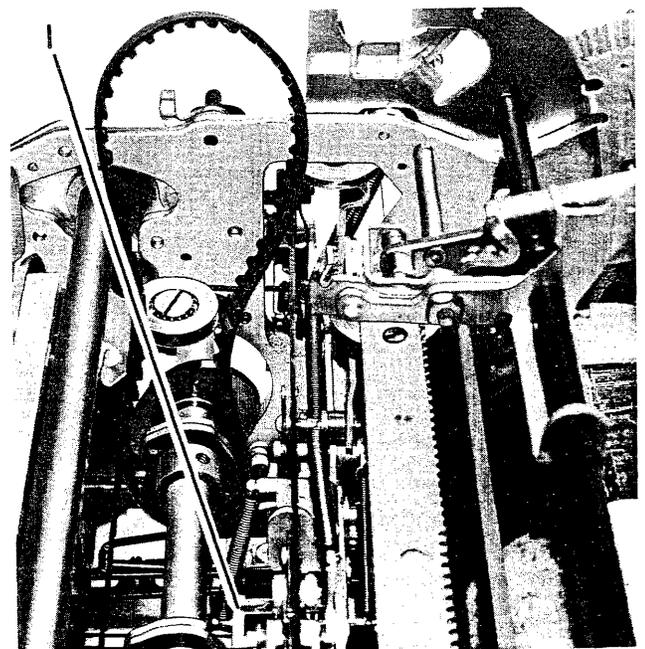


FIGURE 11. Belt Replacement

## ROTATE SPRING REPLACEMENT

1. Remove the left dust cover.
2. Remove the ribbon cartridge.
3. Center the carrier over the camshaft.
- \* 4. Remove the two screws (#1, Figure 12) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
5. Remove the two nuts (#1, Figure 13), one on newer machines, immediately to the right of the yoke on the carrier, remove the black clip from under the nut (#2, Figure 13) and gradually remove the tension from the rotate spring.
6. a. On older machines, back out the two screws (#1,

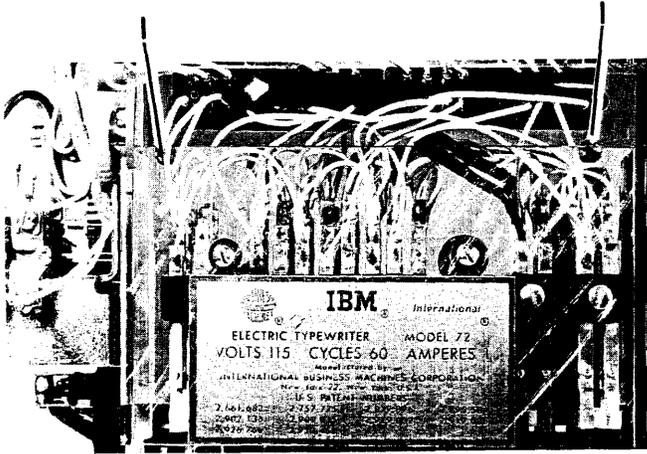


FIGURE 12. Rotate Spring Replacement

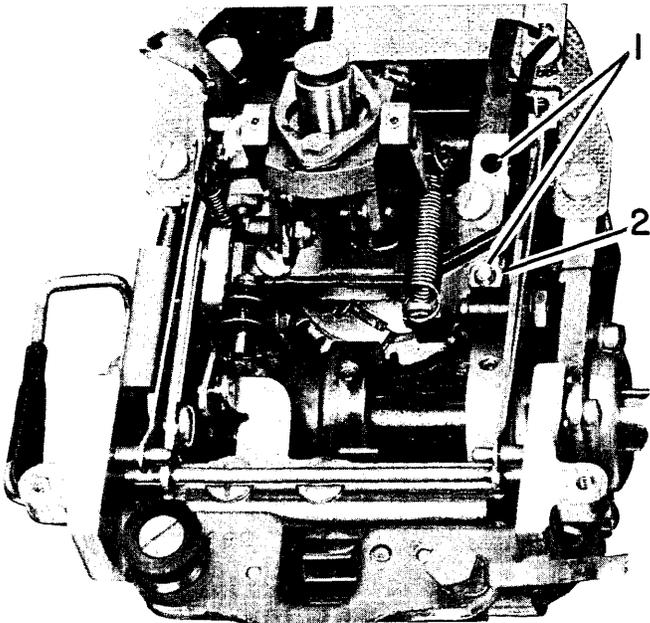


FIGURE 13. Rotate Spring Replacement

Figure 14) on the right 1/4" and remove the screw on the left, which is under the cycle shaft (#2, Figure 14).

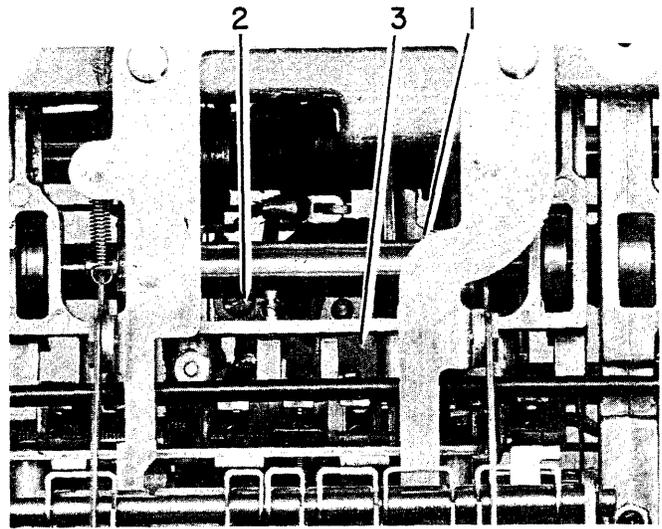


FIGURE 14. Rotate Spring Replacement

- b. On newer machines, remove the lower right and left screws and back out the upper right screw 1/4" (Figure 14).
7. Remove the striker and rotate-spring retaining plate (#3, Figure 14). The rotate spring can now be removed. Note: In newer machines there may be a spring clip (PN 1141238) that prevents the spring from being trapped in the pulley notch. If not, one should be added on re-assembly.
8. The following adjustments should be checked after the rotate-spring is replaced:
  - a. Rotate spring tension
  - b. Typehead homing
  - c. Damper spring

\* Not present on all printers.

## LOWER BALL SOCKET AND TILT RING REMOVAL

1. Remove the left dust cover and ribbon cartridge. Center the carrier over the cycle shaft.
2. Shift into upper case.
3. Remove the two screws (#1, Figure 12) that hold the print contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
4. Half cycle a 0-rotate 1-tilt character. Note which position the tilt detent is in for replacement and be sure the machine is still in upper case.
5. Loosen the two setscrews (#1, Figure 15).
6. Remove the two pivot pins (#2, Figure 15).
7. Remove the tilt ring (#3, Figure 15) and remove the ball joint.
8. Loosen the rotate pulley setscrew (#1, Figure 16).
9. Use the butt end of a small spring hook as a follower to push out the lower ball socket (#2, Figure 16). Note: This prevents the wedge from being lost. When replacing the socket be sure the pin is pointing toward the front-left and right-rear corners.
10. The following adjustments should be checked after the lower ball socket and tilt ring is replaced.
  - a. Tilt detenting
  - b. Typehead homing
  - c. Tilt ring
  - d. Upper ball socket

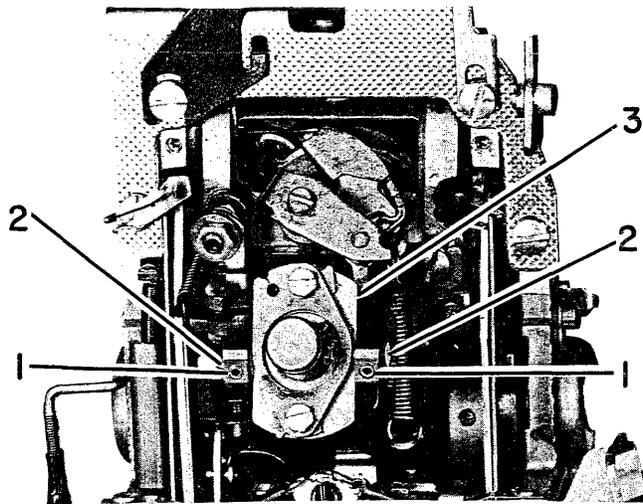


FIGURE 15. Lower Ball Socket and Tilt Ring Removal

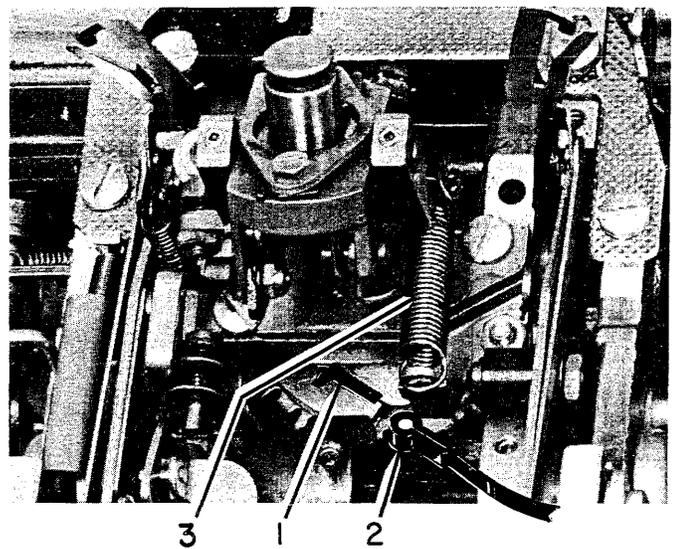


FIGURE 17. Rotate Tape Replacement



FIGURE 16. Lower Ball Socket and Tilt Ring Removal

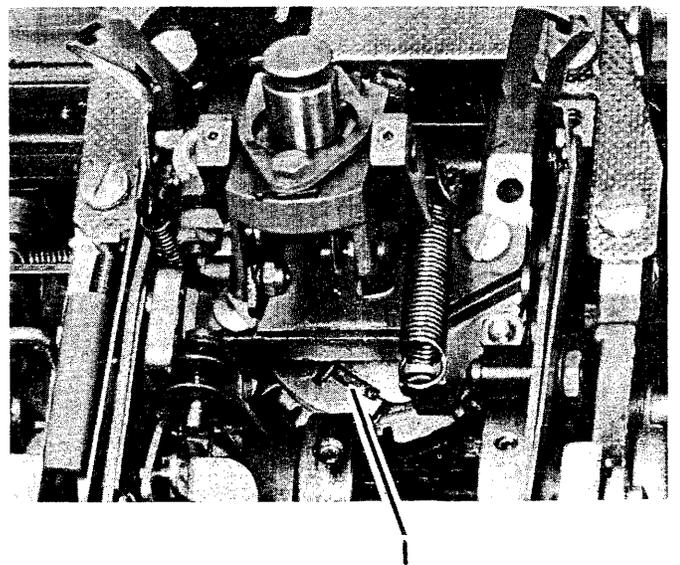


FIGURE 18. Rotate Tape Replacement

#### ROTATE TAPE REPLACEMENT

1. Remove the left and right dust covers.
2. Position the carrier 3" from the left frame.
3. Remove the broken pieces of tape from the machine.
4. Disconnect the tilt-pulley tension spring (#3, Figure 17).
5. Pull the tilt ring toward the front of the machine and turn the rotate pulley until the T-slot is accessible (#1, Figure 17).
6. Insert the rotate tape, eyelet first (#2, Figure 17), be-

tween the rotate pulley and the right side of the yoke from beneath the ribbon mechanism.

7. Pull the tape through and insert the T-tip of the tape into the T-slot of the pulley (#1, Figure 18).
8. Thread the tape around the rotate-arm pulley, top to front, keeping it under the carrier-return cord, around the shift-arm pulley, and anchor it to the carrier.
9. Connect the tilt-pulley spring. (Gear type with open end to the rear.)
10. Restore the 2 pounds of rotate-spring tension.
11. Check the typehead homing adjustment.

## TILT TAPE REPLACEMENT

Note: Photos and procedures are for Gearless Tilt. Gear type may vary slightly.

1. Remove the left and right dust covers.
2. Position the carrier 3" from the left frame.
3. Half cycle a zero rotate, 0 Tilt character (to lock rotate spring tension).
4. Remove the broken pieces of tape from the machine.
5. Place the eyelet on the tilt pulley bellcrank (#1, Figure 19).
6. Thread the tape around the left tilt-arm pulley, right tilt-arm pulley, and take up the slack in the tape.
7. Withdraw the rotate detent, turn the head counter-clockwise to relieve the rotate-tape tension, tilt the head to the front, and restore the detent.
8. Remove the tape retaining pin from the carrier and insert the tilt tape, keeping it on top of the rotate tape.
9. Restore the typehead to the rest position.
10. Check the tilt detent adjustment. (R.H. Tilt Pulley)

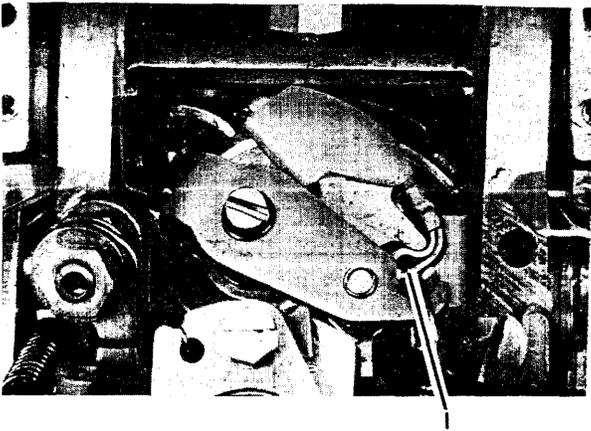


FIGURE 19. Tilt Tape Replacement

## ROTATE SELECTION DIFFERENTIAL REMOVAL

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls, and paper deflector.

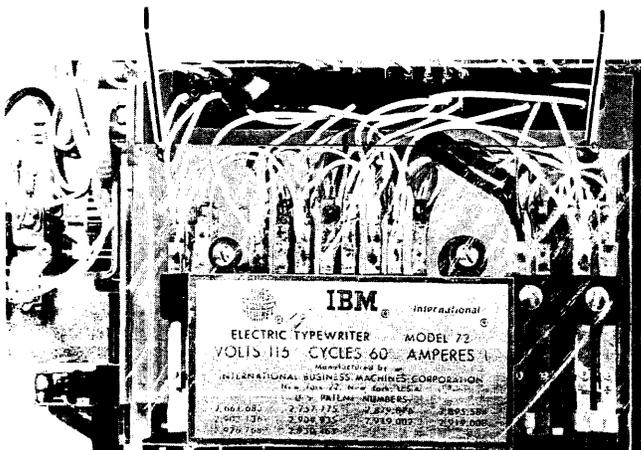


FIGURE 20. Rotate Selection Differential Removal

- \* 3. Remove the two screws (#1, Figure 20) that hold the plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
4. Disconnect the rotate link at both ends and remove it (#1, Figure 21).
5. Remove the latch-bail spring (#2, Figure 21).
6. Remove the motor.
7. Remove the rotate-latch springs (#1, Figure 22).
8. Remove the check-latch spring (#2, Figure 22).
9. Remove the guide-bracket mounting stud and screw (#3, Figure 22).

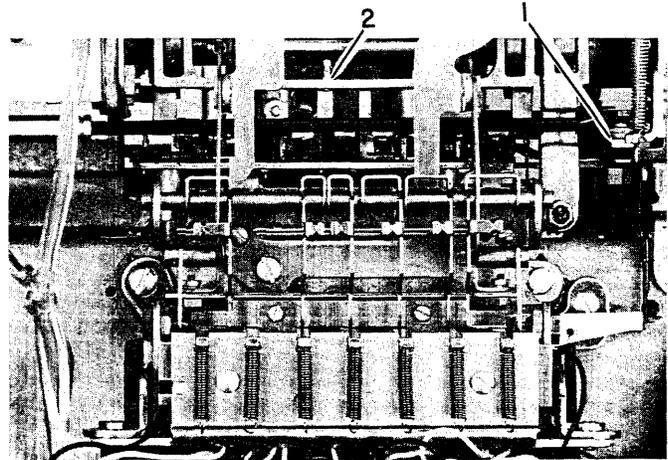


FIGURE 21. Rotate Selection Differential Removal

10. Remove the balance-arm mounting stud (#1, Figure 23).
11. Disconnect the minus-five bail drive link from the right end of the balance arm (#2, Figure 23).
12. Disconnect the tilt-differential spring (#3, Figure 23).
13. Rotate the cycle shaft until the cam followers are on the low points of the cams.
14. Remove the rotate-differential assembly.
15. The following adjustments should be checked after the rotate-selection-differential assembly is replaced:
  - a. Typehead homing
  - b. Rotate latch clearance
  - c. Rotate differential guides

\* Not present on all printers.

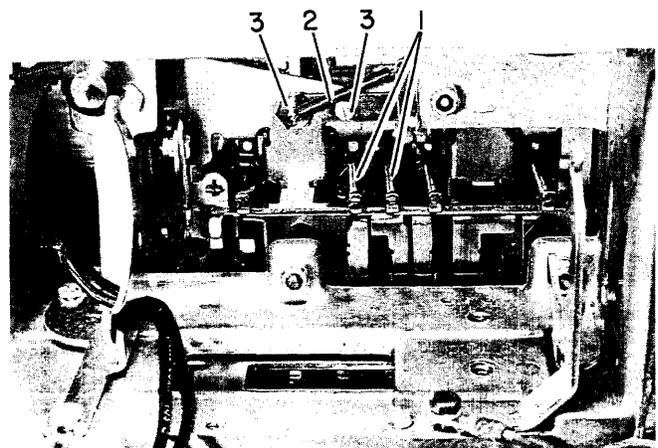


FIGURE 22. Rotate Selection Differential Removal

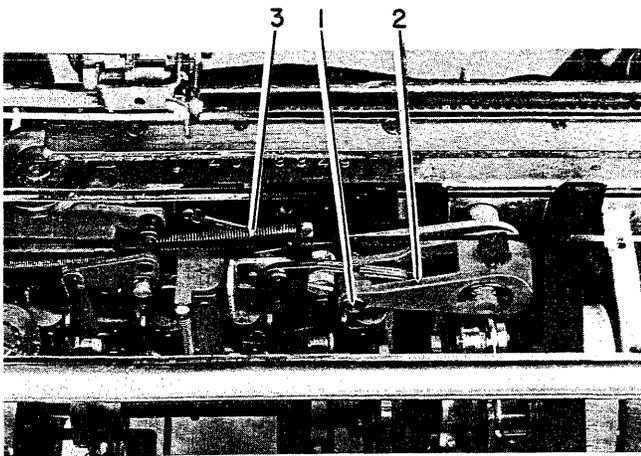


FIGURE 23. Rotate Selection Differential Removal

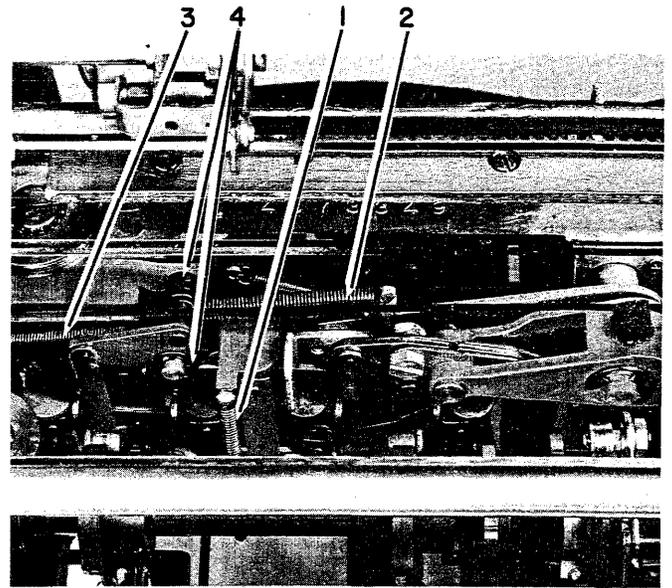


FIGURE 25. Tilt Selection Differential Removal

#### TILT SELECTION DIFFERENTIAL REMOVAL

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls, and paper deflector.
3. Remove the motor.
4. Remove the tilt-latch springs (#1, Figure 24).
5. Remove the positive bail spring (#1, Figure 25).
6. Remove the tilt-differential spring (#2, Figure 25).
7. Remove the rotate-arm spring (#3, Figure 25).
8. Remove the two C-clips and remove the tilt-differential assembly (#4, Figure 25).
9. The following adjustments should be checked after the tilt-differential assembly is replaced:
  - a. Tilt detenting
  - b. Tilt latch clearance
  - c. Rotate differential guides

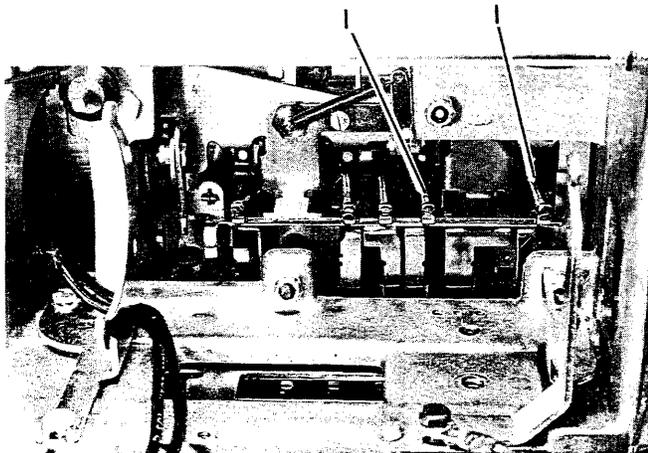


FIGURE 24. Tilt Selection Differential Removal

#### DIFFERENTIAL PLATE REMOVAL

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls, and paper deflector.
- \* 3. Remove the two screws (#1, Figure 27) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
4. Unhook the check-latch-link spring (#1, Figure 28).
5. Remove the rotate-arm link (#2, Figure 28).
6. Scribe the position of the pusher-arm plate to the power frame and remove the four mounting screws (#3, Figure 28).
7. Remove the positive bail spring (#4, Figure 28).
8. Carefully remove the pusher-arm-plate assembly.
9. Remove the motor.
10. Remove all latch springs (#1, Figure 29).

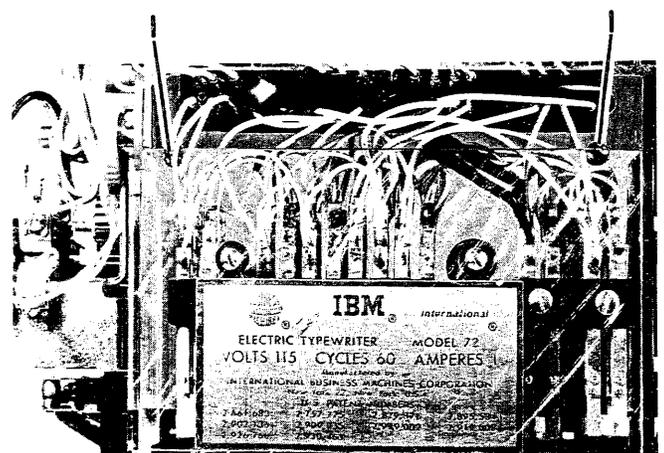


FIGURE 27. Differential Plate Removal

11. Remove all latch links (#2, Figure 29).
12. Remove the left-hand motor mount (#3, Figure 29).
13. Remove the four differential mounting nuts (#4, Figure 29). Note: Do not lose the wedge in the lower-left mounting stud.
14. Complete the Cycle-Shaft Removal section.
15. Remove the cycle-clutch latch bracket (#1, Figure 30).
16. Remove the C-clip from the negative latch link (#2, Figure 30).
17. Remove the C-clip from the tilt-link stud (#3, Figure 30).
18. Remove the rotate-arm spring (#4, Figure 30).
19. Detach the check-latch clevis (#5, Figure 30).
20. Remove the differential-bracket assembly.
21. The following adjustments should be checked after the differential-plate is replaced:
  - a. Rotate differential guides
  - b. Tilt differential guides
  - c. Rotate latch clearance
  - d. Tilt latch clearance
  - e. Tilt detenting
  - f. Typehead homing

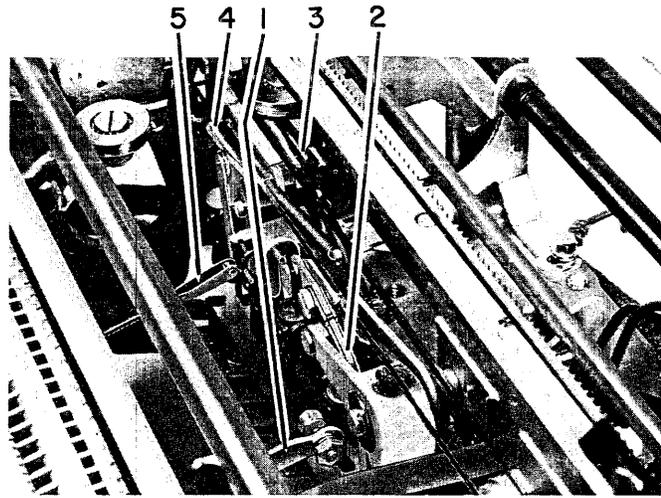


FIGURE 30. Differential Plate Removal

\* Not present on all printers.

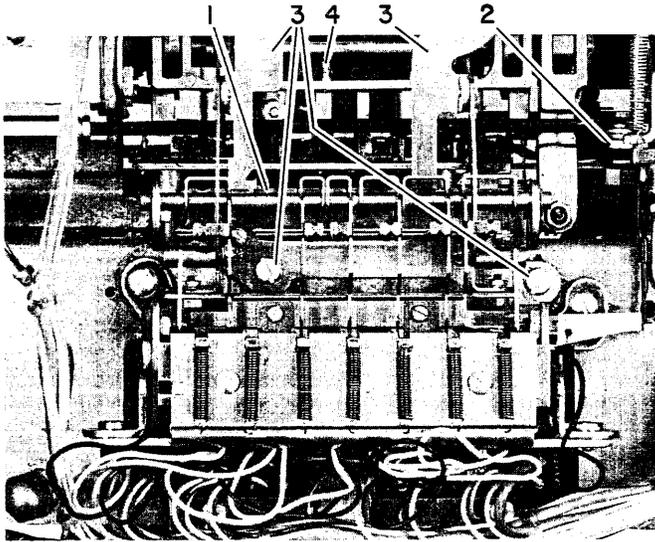


FIGURE 28. Differential Plate Removal

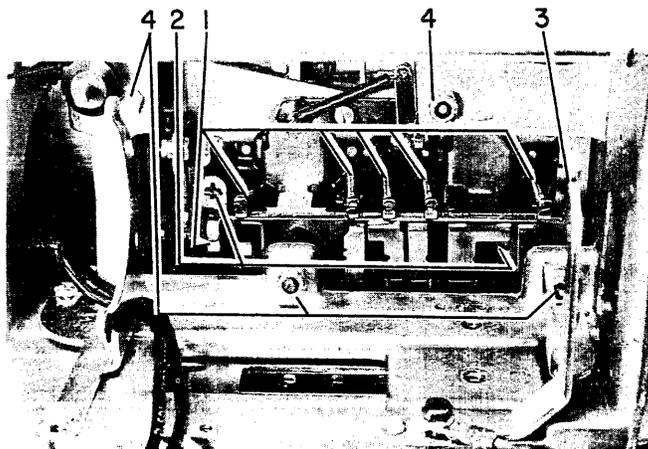


FIGURE 29. Differential Plate Removal

#### SELECTOR BAIL REMOVAL

- \* 1. Remove the two screws (#1, Figure 31) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
2. Scribe the power frame, remove the four mounting screws (#1, Figure 32) and carefully remove the pusher-arm assembly.
3. Remove the positive bail spring (#2, Figure 32) and pull the bail down.
4. Remove all the C-clips from the positive bail shaft (#1, Figure 33).
5. Swing the retainer (not shown) on the outside of the power frame out of the way and pull the bail shaft out.
6. Work the bail assembly out through the bottom of the machine.
7. The following adjustments should be checked after Selector-Bail is replaced.
  - a. Latch clearance
  - b. Bail down-stop

Not present on all printers.

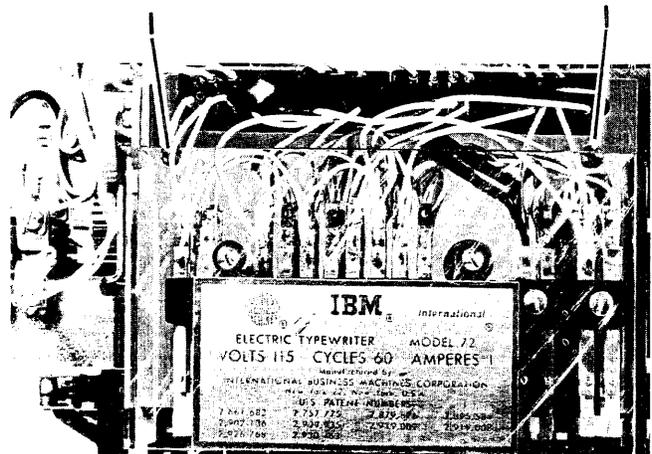


FIGURE 31. Selector Bail Removal

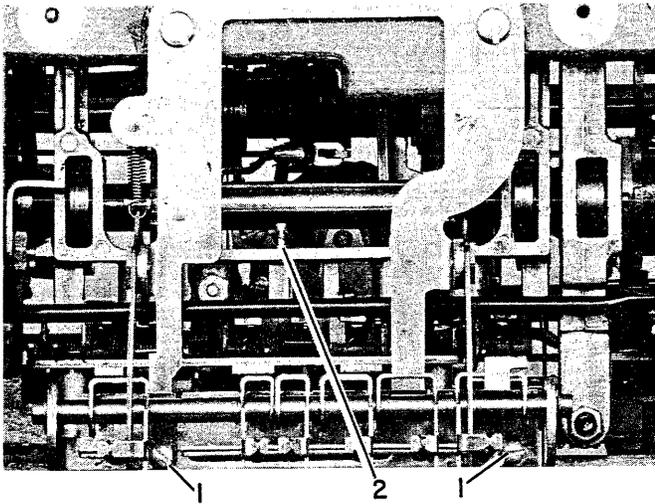


FIGURE 32. Selector Bail Removal

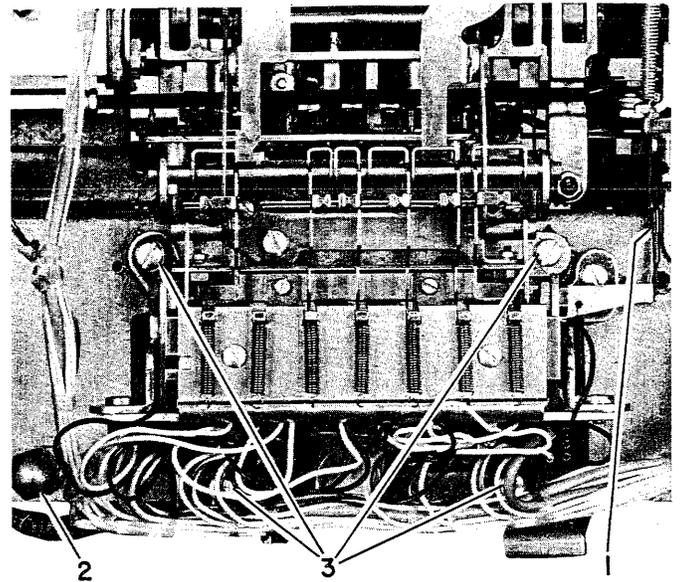


FIGURE 34. Print Magnet Assembly Removal

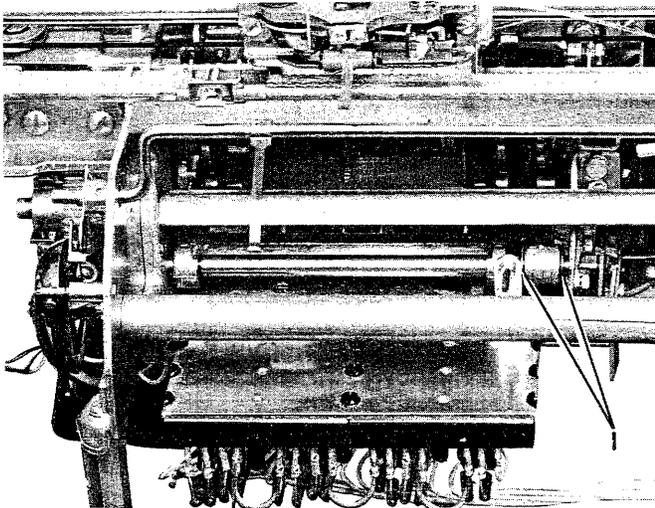


FIGURE 33. Selector Bail Removal

#### PRINT MAGNET ASSEMBLY REMOVAL

1. Disconnect the cycle-clutch trip link (#1, Figure 34).
2. Remove the support leg in the lower left corner (#2, Figure 34).
3. Remove the four mounting screws (#3, Figure 34).
4. Carefully remove the magnet assembly.

#### LATCH PUSHER REMOVAL

- \* 1. Remove the two screws (#1, Figure 35) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
2. Disconnect the pusher springs (#1, Figure 36).
3. Remove the C-clip on the end of the shaft (#2, Figure 36) and remove the shaft until the desired pusher is free.
4. The following adjustments should be checked after a latch-pusher is replaced.
  - a. Latch to pusher clearance
  - b. Latch-pusher to armature clearance

\* Not present on all printers.

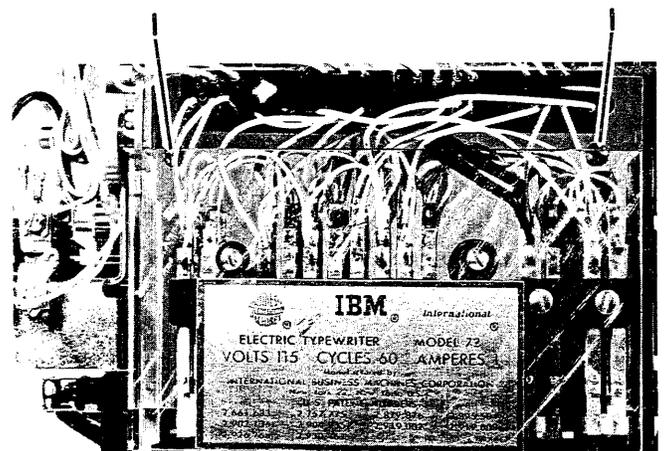


FIGURE 35. Latch Pusher Removal

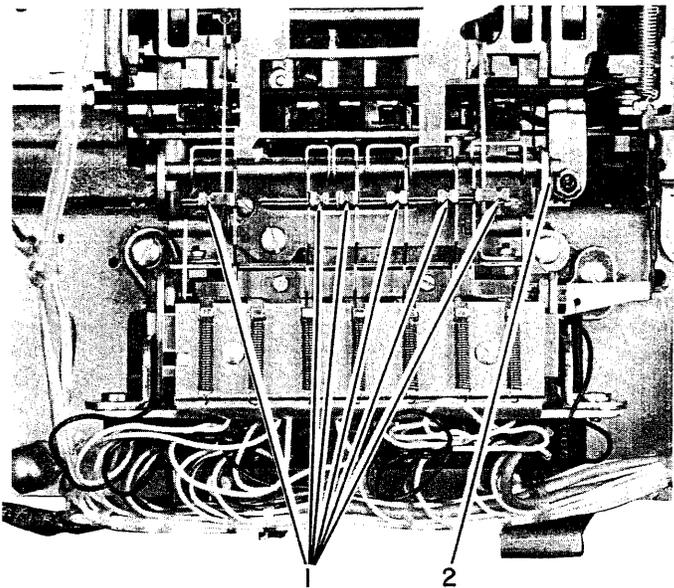


FIGURE 36. Latch Pusher Removal

#### SHIFT MAGNET ASSEMBLY REMOVAL

1. Remove the spring from the hold armature (#1, Figure 37).
2. Loosen the front mounting stud (#2, Figure 37).
3. Loosen the rear mounting screw (#3, Figure 37).
4. Slide the assembly forward and remove it.
5. The following adjustments should be checked after the shift magnet assembly is removed:
  - a. Shift-magnet assembly adjustments

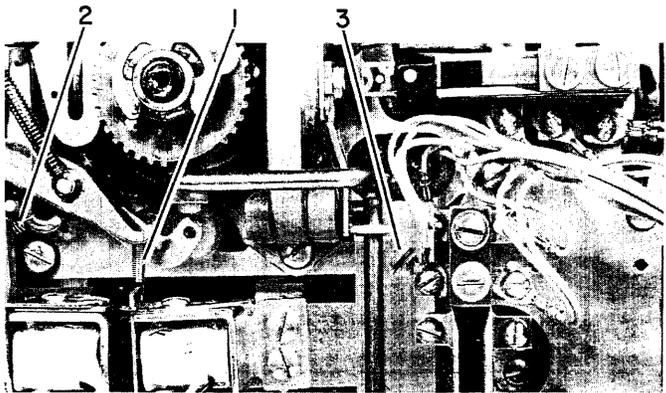


FIGURE 37. Shift Magnet Assembly Removal

#### BACKSPACE RACK REMOVAL

1. Remove the motor.
2. Remove the backspace-rack spring (#1, Figure 38).
3. Remove the three backspace-rack mounting studs (#2, Figure 38), one of which is not shown, and remove the rack.
4. The following adjustments should be checked after the backspace rack is replaced:
  - a. Tab-lever stop
  - b. Backspace rack
  - c. Intermediate lever

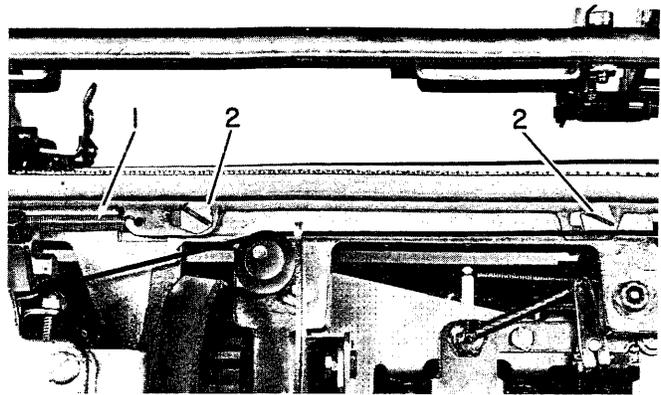


FIGURE 38. Backspace Rack Removal

#### SHIFT ARM REMOVAL

1. Position the carrier to the left and remove the right dust cover.
2. Remove the shift-contact assembly (#1, Figure 39).
3. Remove the shift-arm brace (#2, Figure 39).
4. Loosen the setscrews that hold the shift-arm pivot (#3, Figure 39).
5. Rotate the head counterclockwise, remove the tape from the shift-arm pulley, and put it on the tilt pulley.
6. Remove the shift-arm pivot and arm.
7. The following adjustments should be checked after the shift-arm is replaced:
  - a. Typehead homing
  - b. Shift contact adjustments

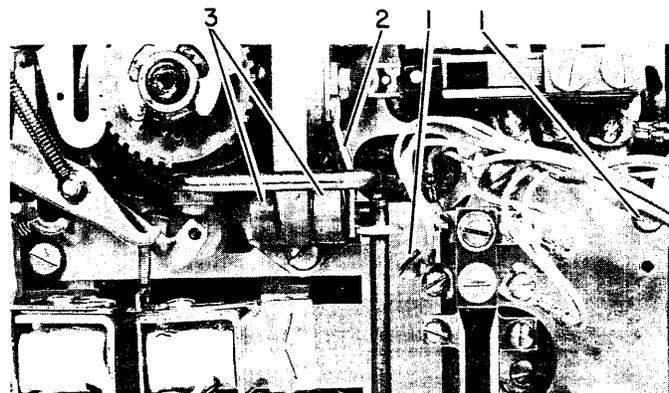


FIGURE 39. Shift Arm Removal

#### OPERATIONAL CAM CHECK PAWL AND ESCAPEMENT CAM FOLLOWER REMOVAL

1. Position the carrier to the left and remove the right dust cover.
2. Disconnect the escapement link (#1, Figure 40).
3. Remove all C-clips from the check pawl shaft (#2, Figure 40).
4. Slide the shaft to the left until the desired part is free.  
Note: Remove springs only as necessary.

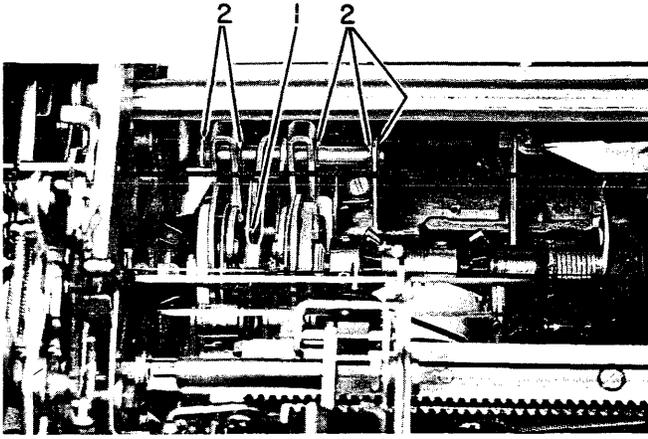


FIGURE 40. Operational Cam Check Pawl and Escapement Cam Follower Removal

#### OPERATIONAL CAM FOLLOWER REMOVAL

1. Remove the C-clips from the cam-follower pivot shaft (#1, Figure 41).
2. Remove the auxiliary cam-follower spring (#2, Figure 41).
3. Work the shaft to the right until the desired part is free.

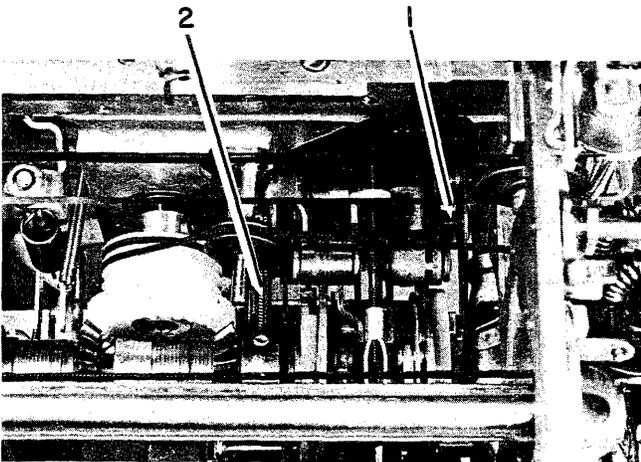


FIGURE 41. Operational Cam Follower Removal

#### OPERATIONAL CONTACT REMOVAL

1. Remove the right rear mounting leg (#1, Figure 42).
2. Remove the two mounting screws (#2, Figure 42) and remove the contact assembly.

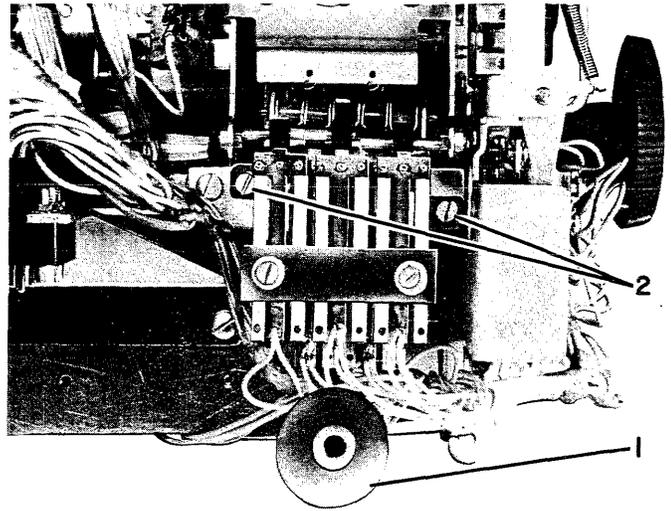


FIGURE 42. Operational Contact Removal

#### OPERATIONAL MAGNET ASSEMBLY REMOVAL

1. Perform the Shift-Magnet-Assembly Removal.
2. Remove the actuator-arm spring (#1, Figure 43).
3. Remove the two mounting screws (#2, Figure 43).
4. Remove the actuator-arm pivot screw (#3, Figure 43).
5. Remove the armature-link clevises (#4, Figure 43).
6. Remove the mounting screw (#1, Figure 44).
7. Remove the nut (#2, Figure 44) and carefully remove the magnet assembly.

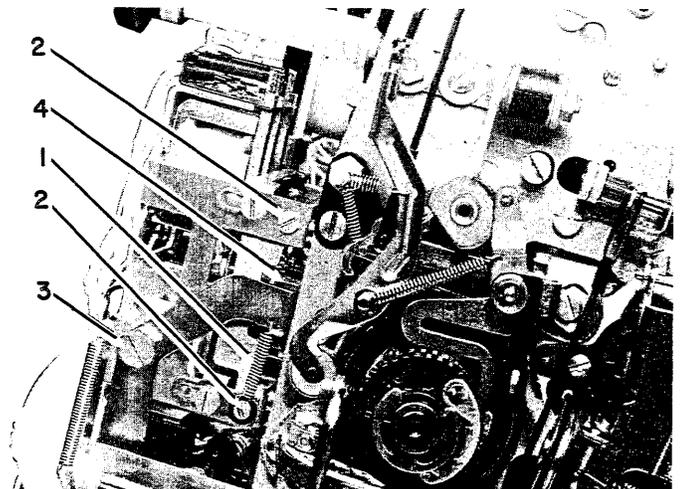


FIGURE 43. Operational Magnet Assembly Removal

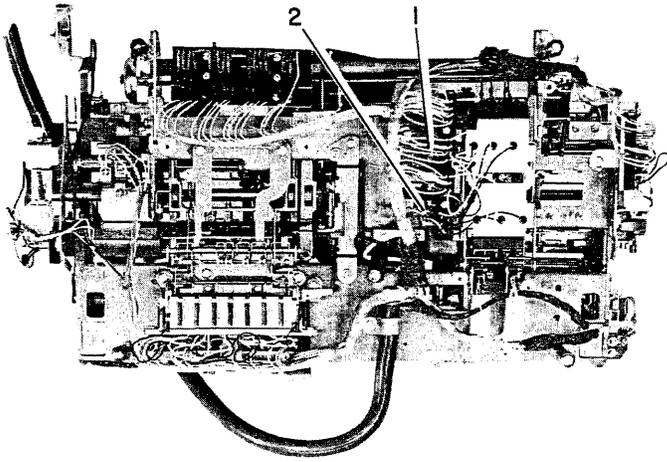


FIGURE 44. Operational Magnet Assembly Removal

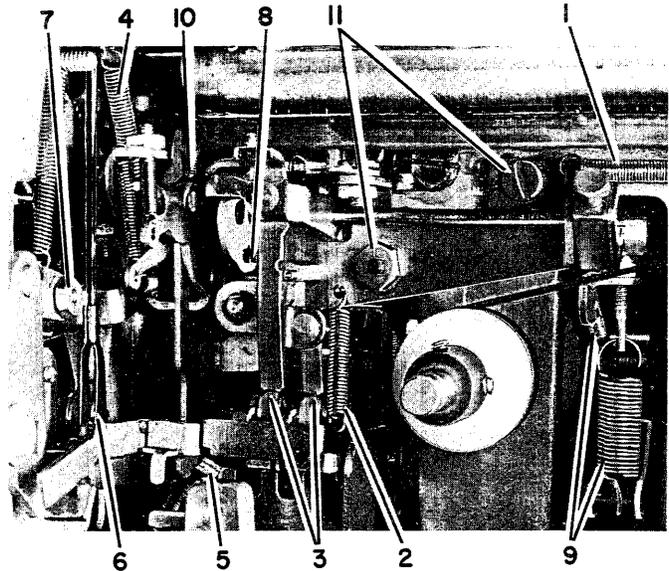


FIGURE 46. Operational Latch Bracket Removal

### OPERATIONAL LATCH BRACKET REMOVAL

1. Remove the feedback-contact-assembly bracket by loosening the two screws (#1, Figure 45).
2. Remove the mainspring and hub (#2, Figure 45).  
Caution: Care must be used when unwinding and removing main spring.
3. Disconnect the backspace-latch spring (not shown).
4. Remove the back plate (#3, Figure 45).
5. Disconnect the backspace-rack spring (#1, Figure 46).
6. Disconnect the cam-follower spring (#2, Figure 46).
7. Disconnect the spacebar and tab-latch springs (#3, Figure 46).
8. Disconnect the tab-bellcrank link clevis (not shown).
9. Disconnect the detent spring (#4, Figure 46).
10. Disconnect the carrier-return latch spring (#5, Figure 46).
11. Remove the index-selection link (#6, Figure 46).
12. Remove the carrier-return eccentric by removing the eccentric nut (#7, Figure 46).
13. Remove the escapement link (#8, Figure 46).
14. Disconnect the carrier-return actuating spring and carrier-return actuating-arm spring (#9, Figure 46).
15. Remove the escapement-torque-bar restoring spring (#10, Figure 46).
16. Remove the two mounting screws (the left one is not visible) and one nut (#11, Figure 46).
17. Work the operational-latch bracket out of the machine.
18. The following adjustments should be checked after the operational-latch-bracket is replaced:
  - a. C5 and C6 timing
  - b. Mainspring tension
  - c. Trigger guide
  - d. Escapement link
  - e. All operational latch clearances
  - f. Carrier return
  - g. Backspace

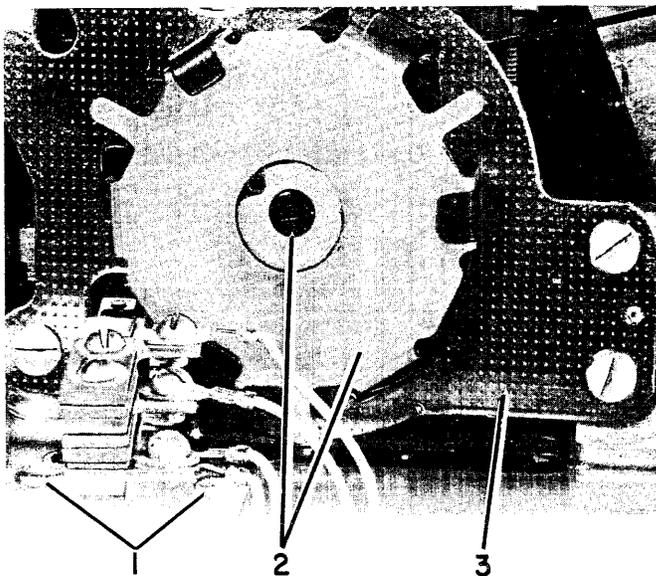


FIGURE 45. Operational Latch Bracket Removal

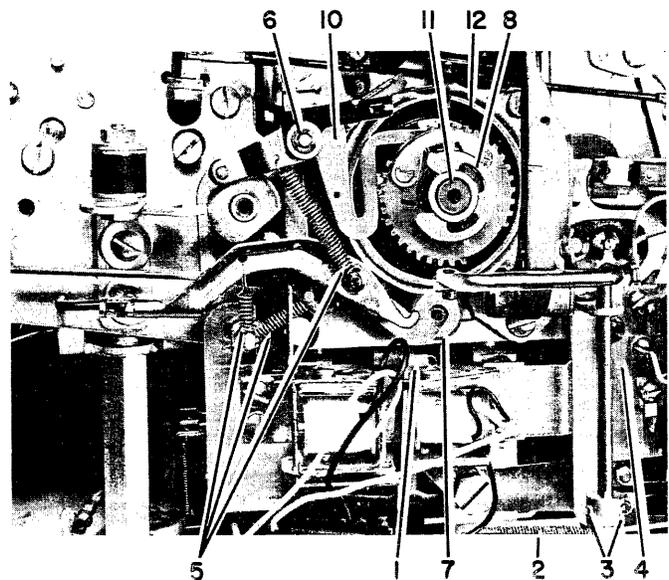
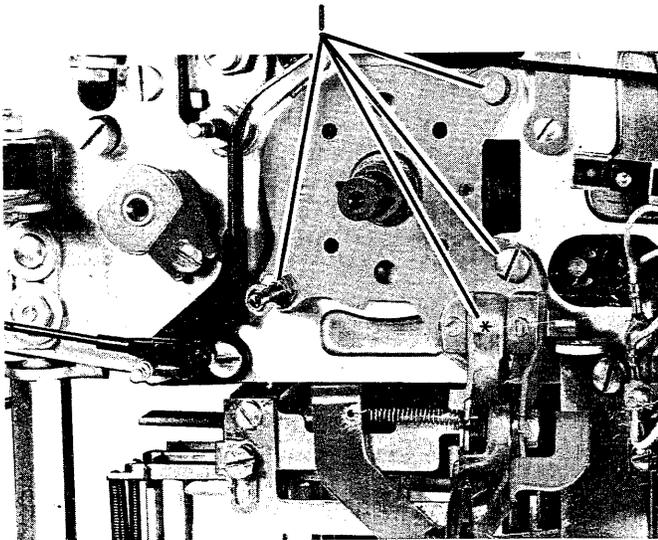


FIGURE 47. Shift Cam Removal

## SHIFT CAM REMOVAL

1. Turn the typehead counterclockwise and remove the relaxed rotate tape from the shift-arm pulley and put it around the tilt pulley.
2. Remove the lower-case armature spring (#1, Figure 47).
3. Remove the cam-follower spring (#2, Figure 47).
4. Loosen the setscrews and remove the cam follower arm (#3, Figure 47).
5. Remove the shift-magnet assembly (#4, Figure 47).
6. Remove the three springs (#5, Figure 47).
7. Remove the interlock C-clip (#6, Figure 47).
8. Remove the detent (#7, Figure 47).
9. Remove the C-clip from the shaft and remove the ratchet (#8, Figure 47).
10. Remove the shift-release arm (#10, Figure 47).
11. Remove the shift-clutch spring (behind the ratchet).  
Note: Observe the spring position for replacement.
12. Remove the shift arbor (#11, Figure 47).  
Note: Do not rotate the shaft backward.
13. Remove the shift cam (#12, Figure 47).
14. The following adjustments should be checked after the shift-cam is replaced.
  - a. All shift mechanism adjustments
  - b. Shift magnet assembly
  - c. Upper and lower case typehead homing



\* Screw is hidden behind Rotate Arm

FIGURE 48. Operational Shaft Removal

## OPERATIONAL SHAFT REMOVAL

1. Complete the Shift-Cam Removal.
2. Remove the two lugs and two screws from the bearing mounting plate (#1, Figure 48) and slide the plate off.
3. Disconnect escapement link.
4. Work the operational shaft to the right until it clears the cycle clutch pulley hub, then lift shaft out the top.
5. The following adjustments should be checked after the operational shaft is replaced.
  - a. All shift mechanism adjustments
  - b. Shift magnet assembly
  - c. Upper and lower case typehead homing
  - d. Gear mesh

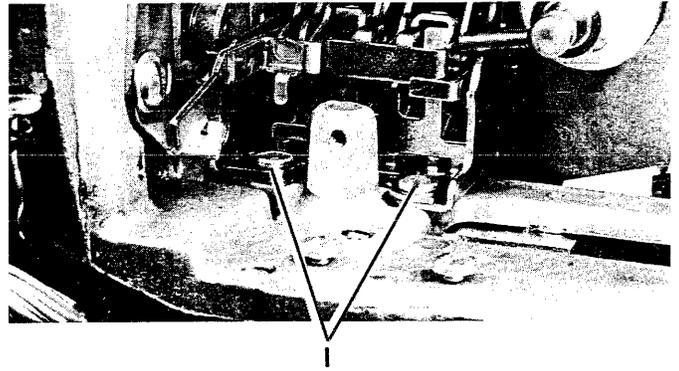


FIGURE 49. Operational Interposer Bracket Removal

## OPERATIONAL INTERPOSER BRACKET REMOVAL

1. Complete the Shift-Cam Removal.
2. Complete the Operational-Magnet Removal.
3. Complete the Operational-Shaft Removal.
4. Complete the Operational-Latch-Bracket Removal.
5. Remove the six (two shown) mounting screws (#1, Figure 49).
6. Remove the C5 auxiliary cam follower.
7. Remove the key-lever pawl guides from the operational-interposer bracket (not shown).
8. Work bracket assembly out through rear of machine.
9. The following adjustments should be checked after the operational-interposer-bracket assembly is replaced:
  - a. All shift mechanical adjustments
  - b. Shift magnet assembly
  - c. Upper and lower case typehead homing
  - d. Gear mesh
  - e. Operational latch pivot pin eccentric
  - f. Escapement trigger guide
  - g. Mainspring tension
  - h. Keylever pawl to interposer clearance
  - i. Operational latch height
  - j. Backspace rack
  - k. Pawl clearance
  - l. Clutch latch overthrow
  - m. Carrier return actuating arm
  - n. Multiplying control lever

## CARRIER SHOE REMOVAL

1. Remove the two card-holder screws (#1, Figure 50).
2. Remove the two escapement-bracket screws (#2, Figure 50).

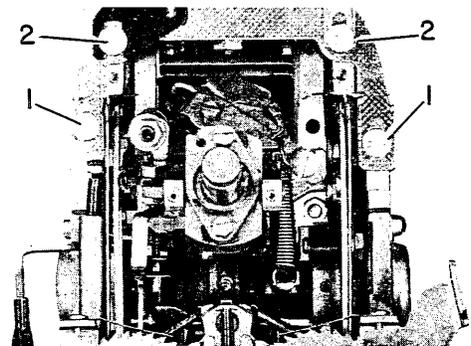


FIGURE 50. Carrier Shoe Removal

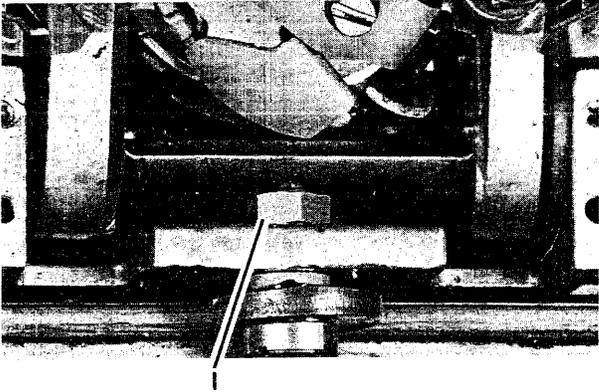


FIGURE 51. Carrier Shoe Removal

3. Work the carrier out from under the escapement bracket to the right.
4. Remove the nut from the carrier-shoe stud and remove the shoe (#1, Figure 51).
5. The following adjustments should be checked after the carrier-shoe is replaced.
  - a. Carrier shoe
  - b. Escapement bracket
  - c. Tab

#### CARRIER AND ROCKER REMOVAL

1. Remove mounting screws (#1, Figure 52).
2. Remove card holders (#1, Figure 53).
3. Disconnect ribbon lift spring (#3, Figure 53).
4. Release rotate spring tension (#4, Figure 53).
5. Remove tilt pulley spring (#5, Figure 53).
6. Remove tape anchor screw (#6, Figure 53).
7. Remove tapes (#7, Figure 53).
8. Remove tape wiper (#8, Figure 53) if present.
9. Remove escapement bracket mounting screws (#10, Figure 53).
10. Remove transport spring bracket screw (#1, Figure 54) (Early printers only)
11. Remove print shaft gear (not shown).
12. Remove print shaft (#11, Figure 53).
13. Remove carrier and rocker assembly.

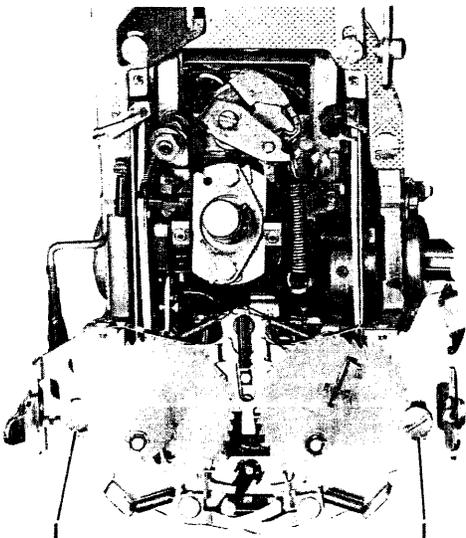


FIGURE 52. Carrier and Rocker Removal

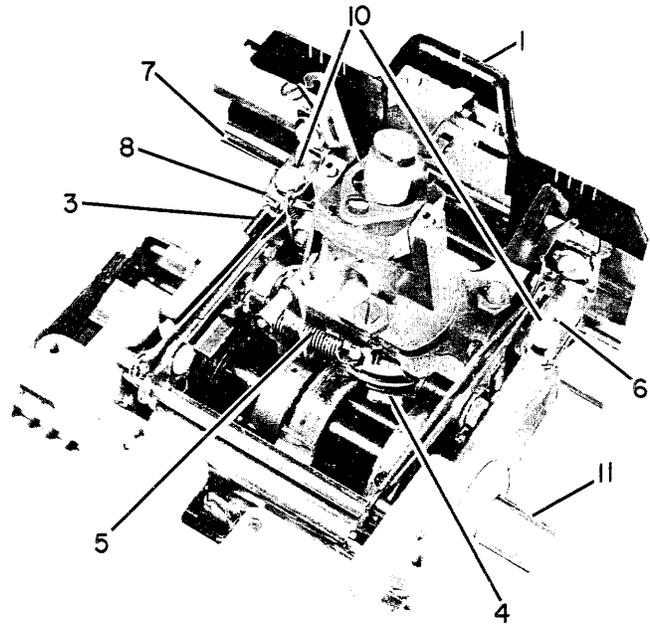


FIGURE 53. Carrier and Rocker Removal

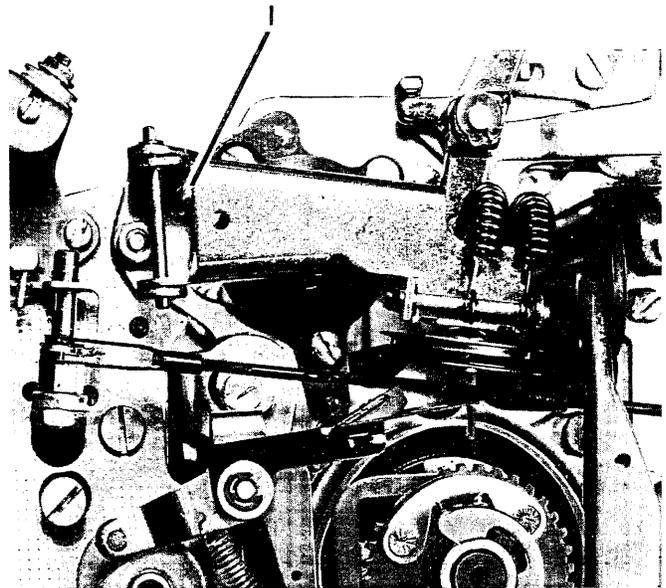


FIGURE 54. Carrier and Rocker Removal

NOTE: If rocker removal is necessary, complete the following steps:

14. Remove anvil striker (#1, Figure 55).
15. Remove rotate spring, cage and pulley (#2, Figure 55).
16. Remove tape guide (#3, Figure 55).
17. Remove "C" clip on rocker shaft (#4, Figure 55).
18. Loosen rocker shaft set screw and remove rocker shaft (#5, Figure 55).
19. Check carrier and rocker and alignment adjustments after reassembly.

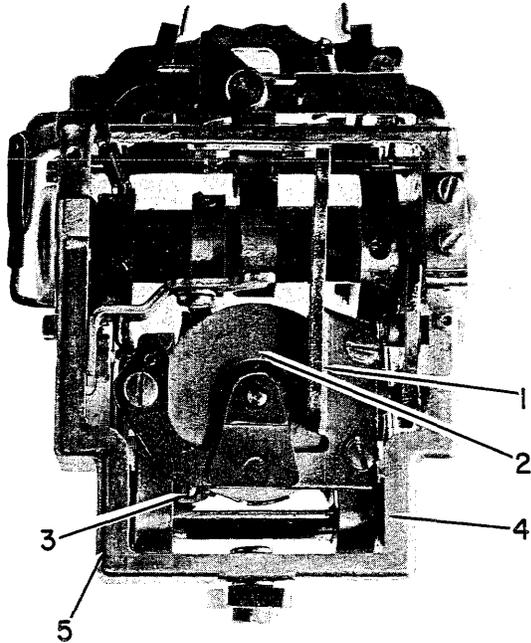


FIGURE 55. Carrier and Rocker Removal

#### CYCLE CLUTCH PULLEY REMOVAL

1. Perform the Cycle-Clutch and Cycle-Shaft removal.
2. Remove the "C" clip from the rotate bellcrank pivot pin (#1, Figure 56).
3. Disconnect the rotate link from the rotate bellcrank (not shown).
4. Remove "C" clip and remove pivot pin (#2, Figure 56).
5. Push down on the rotate balance arm (#3, Figure 56) and lift up on the rotate bellcrank until the two are clear of each other and then remove the bellcrank.
6. Remove the cycle-clutch-latch spring (not shown).
7. Remove the bottom latch screw, loosen the top latch screw and slide the latch up and out (#4, Figure 56).
8. Take the belt off the pulley and remove the pulley (#5, Figure 56).
9. The following adjustments should be checked after the cycle-clutch pulley is replaced.
  - a. Latch height
  - b. Cycle shaft end play

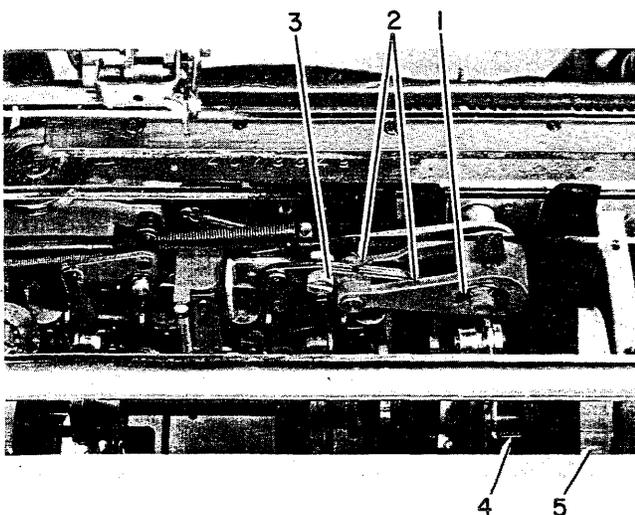


FIGURE 56. Cycle Clutch Pulley Removal

- c. Idler gears
- d. Cycle-clutch spring
- e. Cycle-clutch latch bite
- f. Damper-spring
- g. Filter shaft timing
- h. Print shaft timing
- i. C1 and C2 contact timing

#### CORD REPLACEMENT

NOTE: Remove the main spring.

1. With the carrier to the extreme right, feed the carrier return cord around the pulleys and connect to cord drum (#1, Figure 62).
2. Connect carrier return cord to carrier using long nose pliers and spring hook (#2, Figure 62).
3. Disconnect clutch unlatching link (#1, Figure 63).
4. Manually latch the clutch and turn the machine by hand until the carrier is pulled fully to the left.
5. Connect the escapement cord to the drum with about 1 turn of the cord on the drum (#2, Figure 63).
6. Connect the end of the cord to the carrier and then place it on the pulleys (#3, Figure 63).
7. Connect the clutch unlatching link.
8. Replace and adjust the main spring (5 turns) with the carrier resting at the extreme RH margin.

#### CORD ADJUSTMENT

A time saving method of transport card adjustment may be accomplished by tying a knot in the end of the cord as close to the hook as possible.

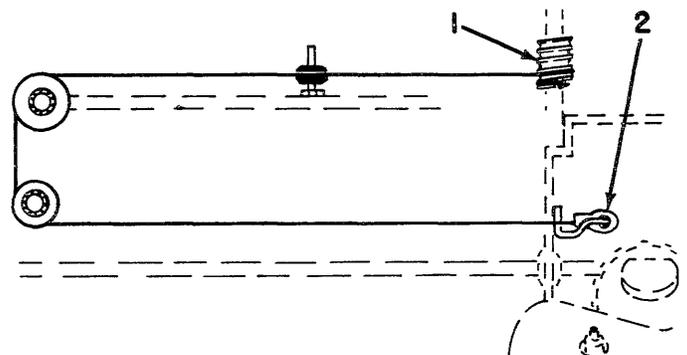


FIGURE 57. Carrier Return Cord Replacement

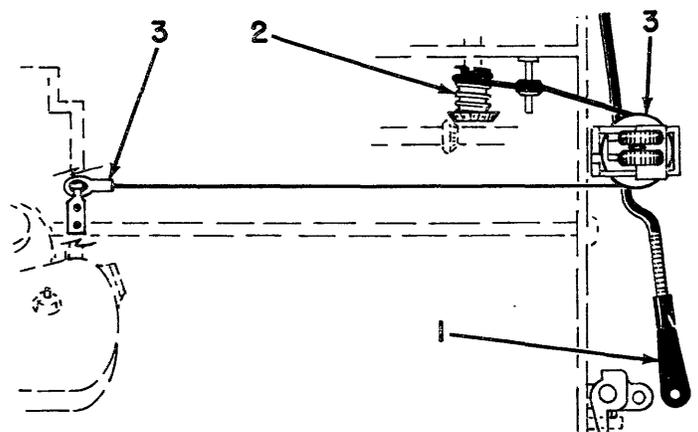


FIGURE 58. Escapement Cord Replacement

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