

ANALYSIS GUIDE SERVICES INDEX



IBM Customer Engineering

Selectric I/O Printer

Machine Serial

CONTACT CHECKING ON DISPLAY

SET TO DISPLAY
PRES. START

CONT PRINTS
ONE "D" OR ONE
CONT "D" IS

None

kd Lock Cont.

1. C2 N/O F.T.M.
2. C5 N/C F.T.M.
3. CAR. RET INTLK
N/C F.T.M.

SPACE
ONCE OR CONT. CONT

1. SPACE CONT F.T.M.
2. C5 N/O F.T.M.

KEYBD.
LOCKED OR
NOT UNLOCKED

1. C2 N/C F.T.M.

HITIVE
KEYS

NO CARRIAGE
RETURN YES

YES KEYBD
LOCKED NO

NO CONT. OR
EXTRA CAR. RET.
AND
INDEX YES

1. KEYS LOCKED
CONTACT F.T.M.

1. C1 N/O F.T.M.
2. C1 N/C F.T.M.

PRINTS
"D"

1. CAR. RET.
INTLK N/O F.T.M.

NOTE F.T.M. FAILS TO MAKE

B.S. 1/15/64 GH.

BACKSPACE

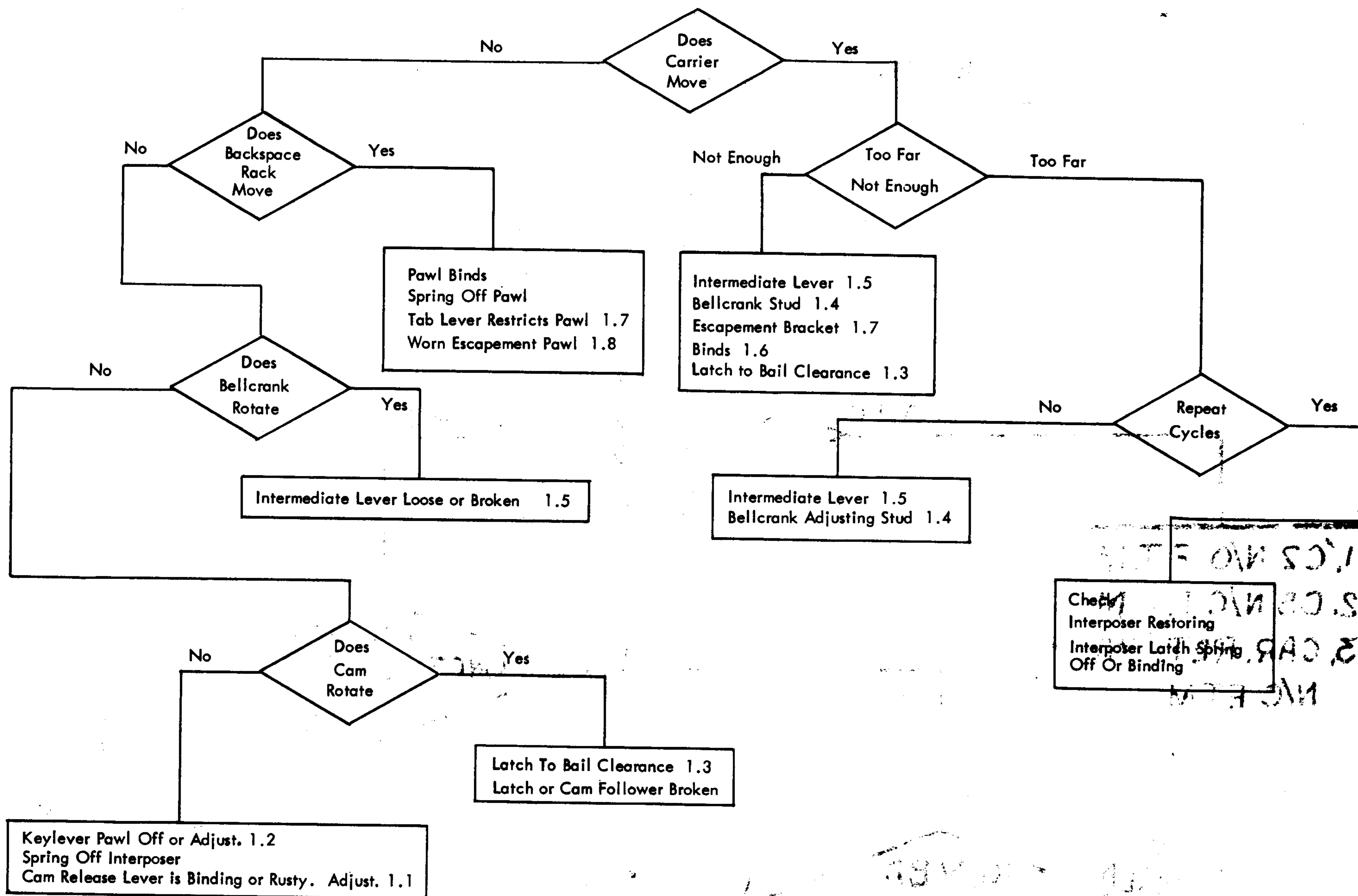


FIG 1.0

1.0 Backspace Adjustments

- 1.1 With the interposer and cam latched, form the Release Lug to obtain .025" to .035" clearance between the Interposer Lug and the Release Lever Lug.
- 1.2 The Keylever Pawl clears the interposer by .020" - .025".
- 1.3 The latch to bail clearance should be:
 - a. .005" - .015" Space/Backspace.
 - b. .020" - .030" Carrier Return/Index.
 - c. .007" - .015" Tab or Wordmark.
- 1.4 Adjust the Intermediate Lever adjusting screw to obtain .005" - .015" between the B/S Rack and B/S Pawl with all parts at rest. This adjustment is used to position the Backspace Rack at rest. It MUST NOT be used to determine the throw of the backspace rack.
- 1.5 Adjust the intermediate lever, front to rear, so that the escapement pawl does not fall into the next rack tooth when hand cycling. The escapement

pawl should ride to a point just before it drops into the rack tooth.

- 1.6 BINDS - CHECK THE FOLLOWING:
 - a. Feed roll mounting arm hits the tab overthrow stop.
 - b. Dust covers and card holders.
 - c. Anvil and front carrier shoes.
 - d. Rear carrier shoe.
 - e. Escapement cord is off its pulley.
 - f. Pinion gear.
- 1.7 Adjust the escapement pawl mounting bracket so that both pawls bottom fully in the rack and the extension lug on the tab lever clears the pawls by .005" - .010".
- 1.8 Backspace may go a full space but a worn escapement pawl will cause the carrier to skip ahead 1/2 space. See Fig. 3.1. Look for this condition under powered operation. To prevent a reoccurrence, replace the escapement pawl AND rack.

SPACEBAR

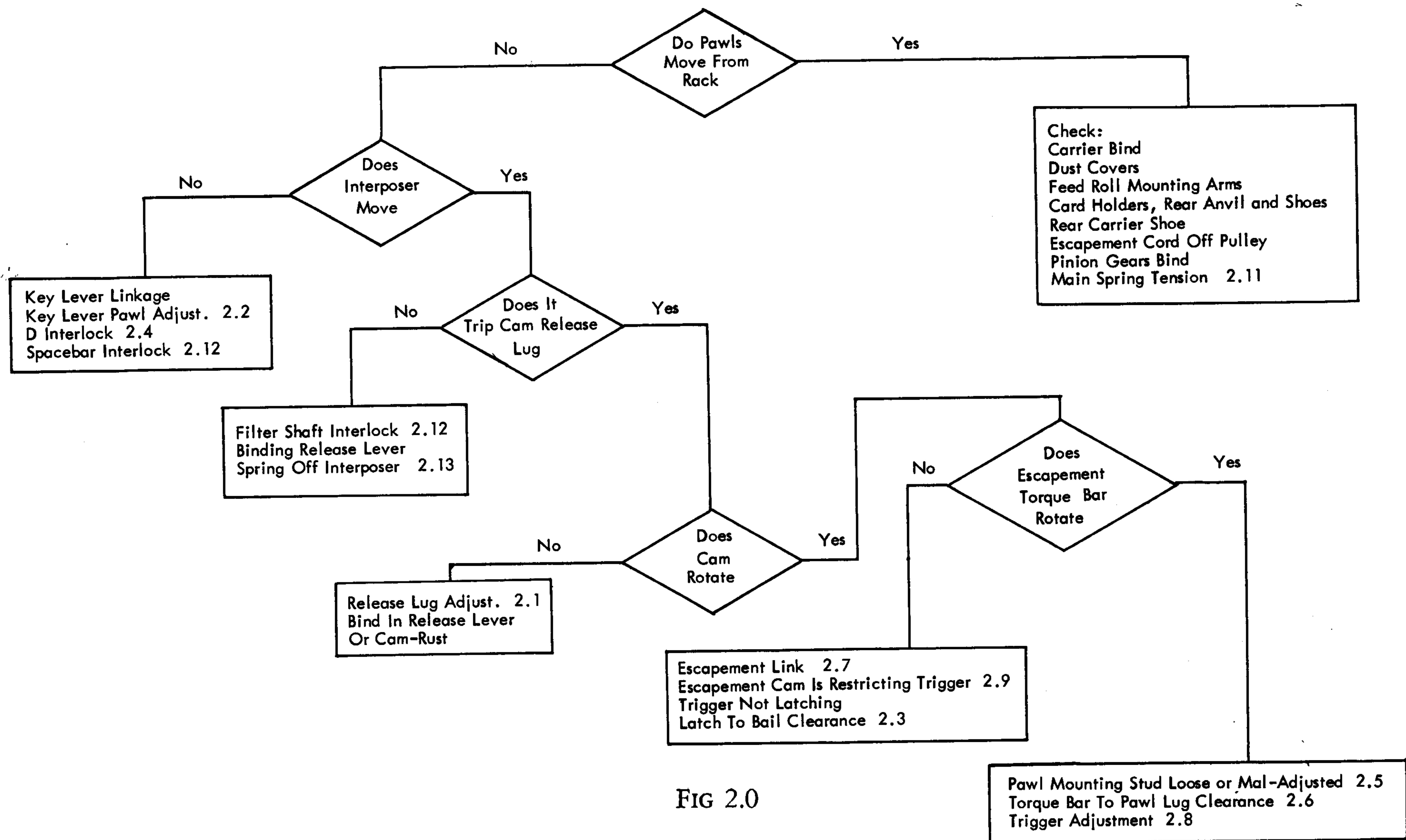


FIG 2.0

2.0 Spacebar Adjustments

- 2.1 With the interposer and cam latched, form the Release Lug to obtain .025" - .035" clearance between the Interposer Lug and the Release Lever Lug.
- 2.2 The Keylever Pawl should clear the interposer by .005" - .015".
The backstop should be adjusted so that the keylever pawl operates freely (.035" bite).
- 2.3 The latch to bail clearance should be:
a. .005" - .015" Space/Backspace.
b. .020" - .030" Carrier Return/Index.
c. .007" - .015" Tab or Wordmark.
- 2.4 The lockout shaft may flip over if the lockout shaft link is allowed to move to the left or right. A clip, P/N 1138464, may be installed on the lockout bail to limit any movement.
- 2.5 The pawl mounting stud should clear the Escapement Torque Bar by .002" - .006".
- 2.6 The Torque Bar should clear the Release Lug by .002" - .010".
- 2.7 The Escapement Link should span the gap between the Escapement Cam Follower Arm and the Spacebar Trigger Lever.

- 2.8 The trigger should disengage from the Torque Bar when the pawls are .005" - .015" from the rack.
- 2.9 Escapement should occur after printing and after the typehead has moved away from the platen by 1/4" to 1/2".
- 2.10 Escapement Shaft binds may be relieved by tapping the bearings on the Escapement Shaft to improve the bearing alignment.
- 2.11 The Mainspring tension should be 2 pounds.
- 2.12 Position the escapement cam left or right to leave .020" - .030" lateral motion in the Lockout Cam when it is on the high point of the Escapement Cam. Adjust the Lockout Cam to allow .020" - .030" front to rear motion in the Interposer when the Lockout Cam is engaged. Adjust the Interposer Guide Bracket for .015" - .025" clearance between the Interposer and Lockout when the Lockout is at rest. (Note: For the new style Interlock — see Reference Manual #225-1726).
- 2.13 The Spacebar Interposer spring should be in the top hole of the Interposer.
- 2.14 S. H. INTERMITTENT FAILURE TO SPACE
Intermittent space failures can be caused by excessive cycle clutch overthrow or incorrect print escapement cam timing.

PRINT ESCAPEMENT

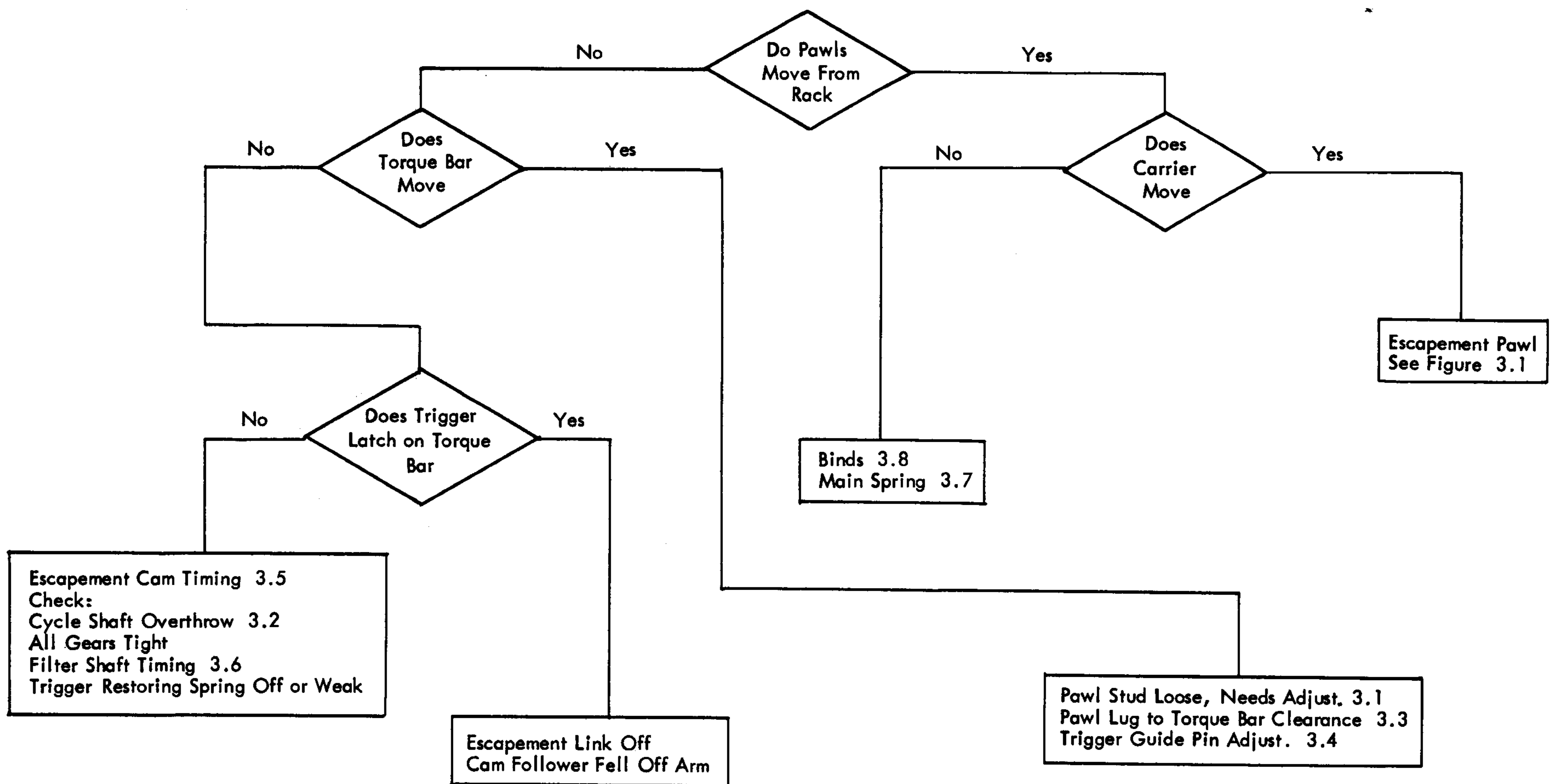


FIG. 3.0

3.0 Print Escapement Adjustments

- 3.1 The Pawl Stud should clear the Escapement Torque Bar by .002" - .006".
- 3.2 The cycle shaft overthrow should be .007" - .015" (1 to 3 degrees).
- 3.3 The Torque Bar should clear the Pawl Release Lug by .002" - .010".
- 3.4 The Trigger should disengage from the Torque Bar when the pawls are .005" - .015" from the rack.
- 3.5 Escapement should occur after printing and after the Typehead has moved away from the Platen by 1/4" - 1/2".
- 3.6 With an Interposer latched down and the Filter Shaft Gear held in a driven direction, there should be .010" - .015" clearance between the Interposer and the Filter Shaft Blade.
- 3.7 The mainspring tension should be 2 pounds.
- 3.8 BINDS — CHECK THE FOLLOWING:
 - a. Feed Roll Mounting Arm hits the Tab Overthrow Stop.

- b. Dust Covers — Card Holders.
- c. Anvil and front Carrier Shoes.
- d. Rear Carrier Shoe.
- e. Escapement Cord is off of its pulley.
- f. Pinion Gear.

ESCAPEMENT PAWL

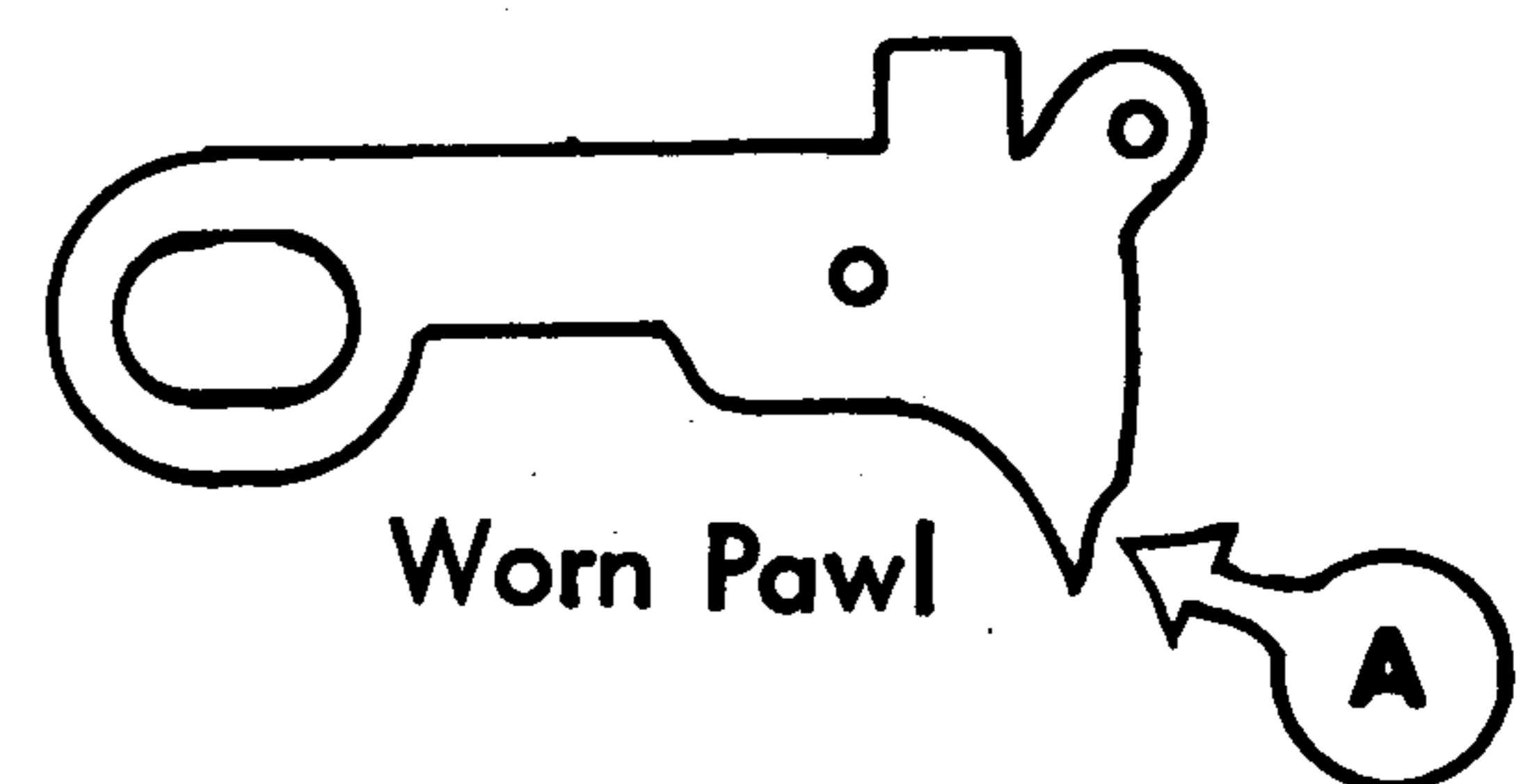


FIG. 3.1

A worn pawl will be notched and polished at point "A".

SHIFT OR ENTER

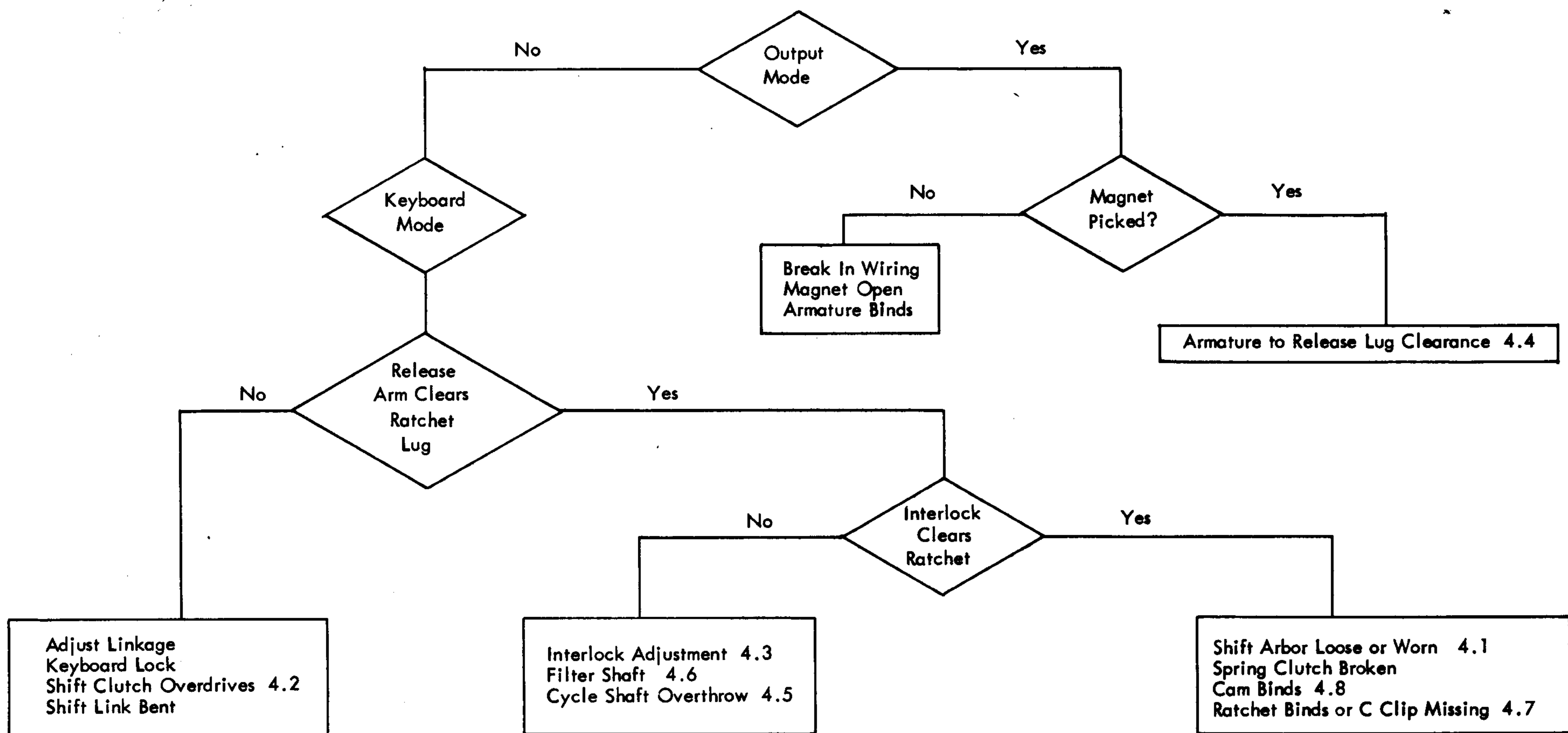


FIG. 4.0

4.0 Shift (or Enter) Adjustments

- 4.1 The shaft end play should be .002" - .004". If the Shift Arbor comes loose, a new set screw is available (P/N 257969) which will lock the arbor securely on the shaft.
- 4.2 The Shift Ratchet should rotate $\frac{1}{2}$ to 1 tooth when released. Under power, the Shift Cam should reach a detented position with the detent held away from the Shift Cam.
- 4.3 .030" - .050" clearance between the ratchet and the interlock. Adjust the Interlock Cam.
- 4.4 .002" - .008" clearance between the Upper Case (U. C.) Armature and the Release Arm Pin.
- 4.5 The cycle shaft overthrow should be .007" to .015" (1 to 3 degrees).
- 4.6 With an interposer latched down and the Filter Shaft Gear held in a driven direction, there should be .010" - .015" clearance between the Interposer and the Filter Shaft Blade. If the filter shaft timing

is wrong, the Shift Interlock Cam should be checked and readjusted. (*Adjustment 4.3*)

- 4.7 The "C" clip must be inserted so that the lug that extends from the ratchet is in the "C" clip window as shown in Fig. 4.1.

SHIFT RATCHET RETAINER

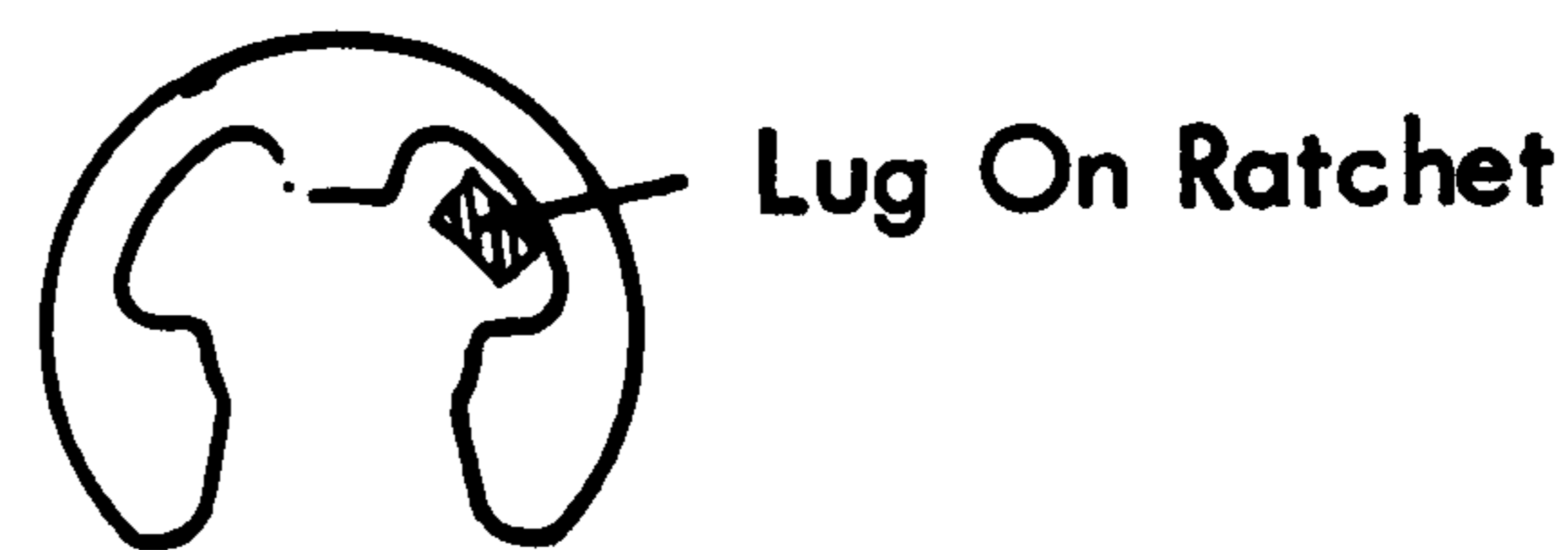


FIG. 4.1

- 4.8 Binds in the Shift Cam may be caused by mal-adjustment of the Shift Back-up Roller. Adjust for .002" - .004" clearance between the cam in lower case. A Spring Hook Pusher end may be used to adjust the Back-up Roller eccentric stud.

5.0 Beating the Shift

"Beating the Shift" is a simultaneous print and shift operation which results in mal-selection or broken tapes.

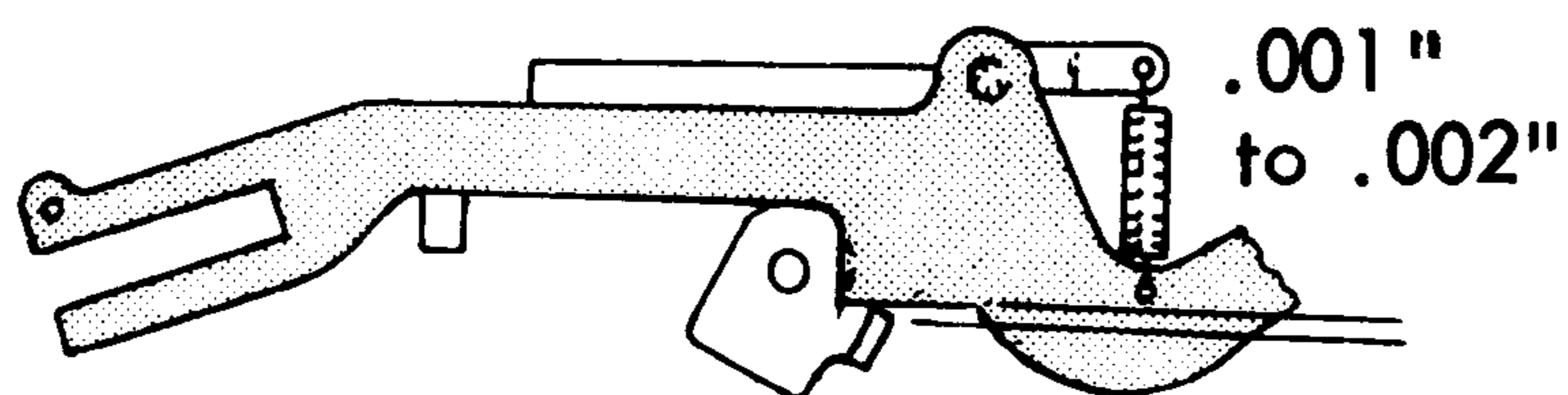
The following adjustments differ from standard and may be used to minimize "Beating the Shift".

5.1 CHARACTER INTERRUPTER

Adjust vertically for .001" - .002" between the Interrupter Pawl and the Clutch Link. Adjust horizontally for .040" (or more) pawl to link clearance.

Link Forward

Shift Cam Detented
(Not Shown)

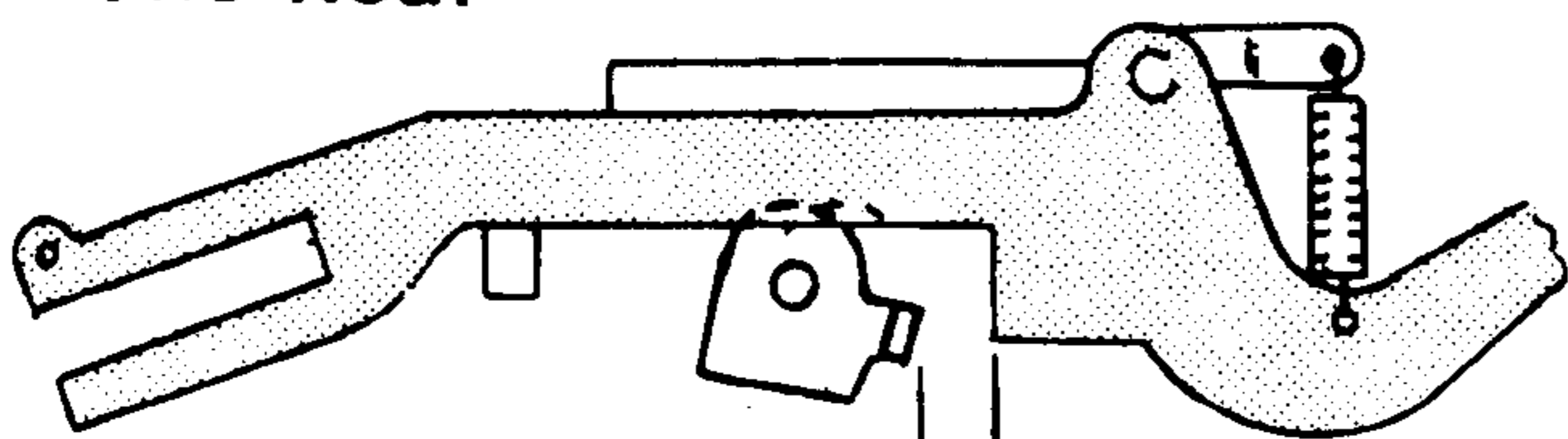


Position by Rotating The Interrupter Pawl Spring Anchor (Not Shown)

FIG. 5.1

5.2 The horizontal adjustment should be held to the maximum. This will allow the Interrupter Pawl to interlock the Clutch Latch Link at the last moment before the latch disengages from the Cycle Clutch Sleeve.

Link To The Rear



Adjustment Made With Bail Anchor Plate (Not Shown)

Set To Maximum Before Release Of Cycle Clutch

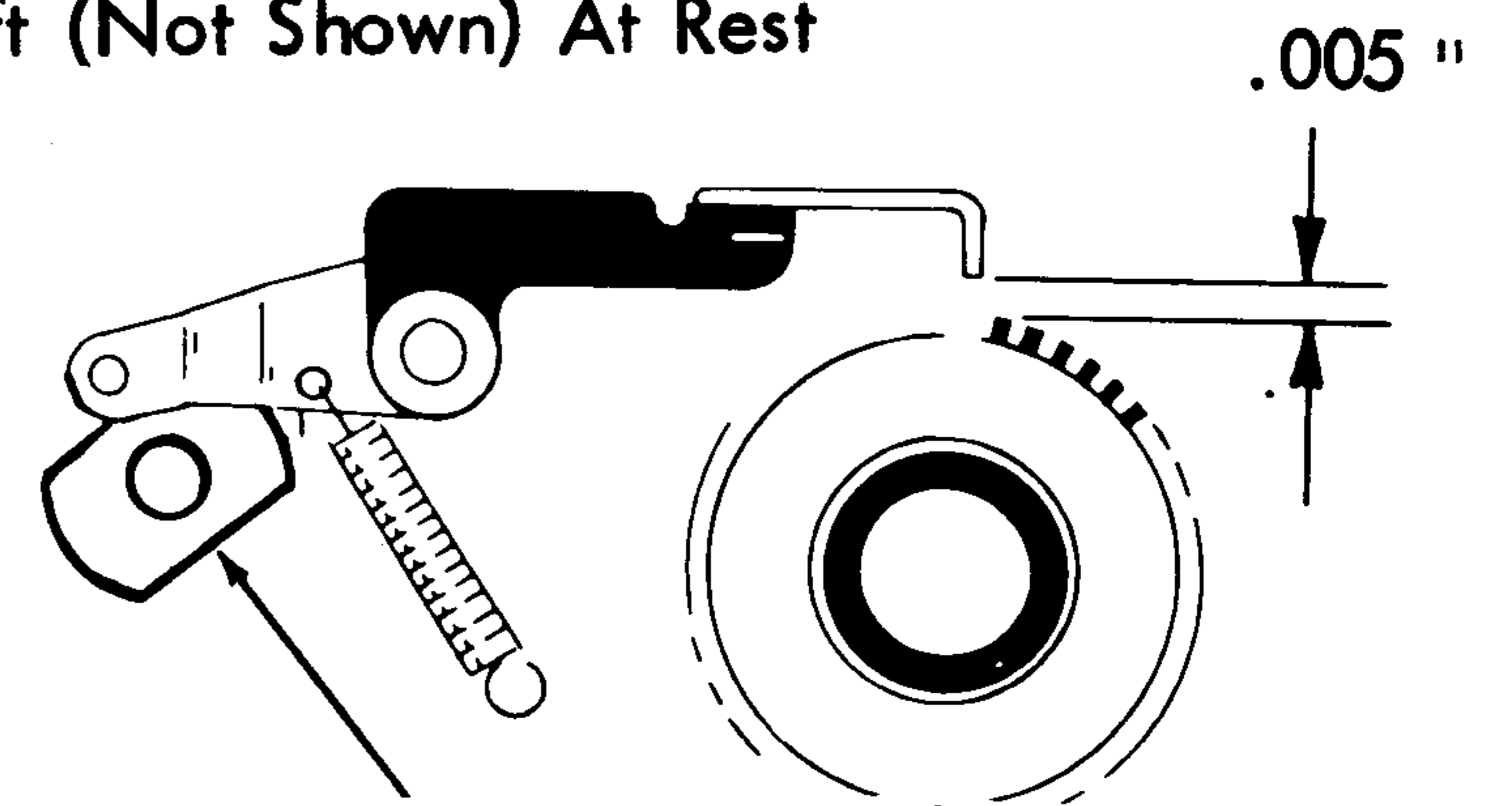
FIG. 5.2

5.3 SHIFT INTERLOCK

With the Cycle Shaft latched and the Filter Shaft at rest, advance the Interlock Cam until a clearance of .005" exists between the tip of the interlock and the Shift Clutch Ratchet.

5.4 Adjust the Shift Spring Clutch so that the Shift Clutch will rotate $\frac{3}{8}$ " or half the distance between two ratchet teeth. Caution: DO NOT reduce this clearance to a point where the Shift Clutch Spring drags on the arbor.

Filter Shaft (Not Shown) At Rest



Rotate Cam To Obtain Clearance

FIG. 5.3

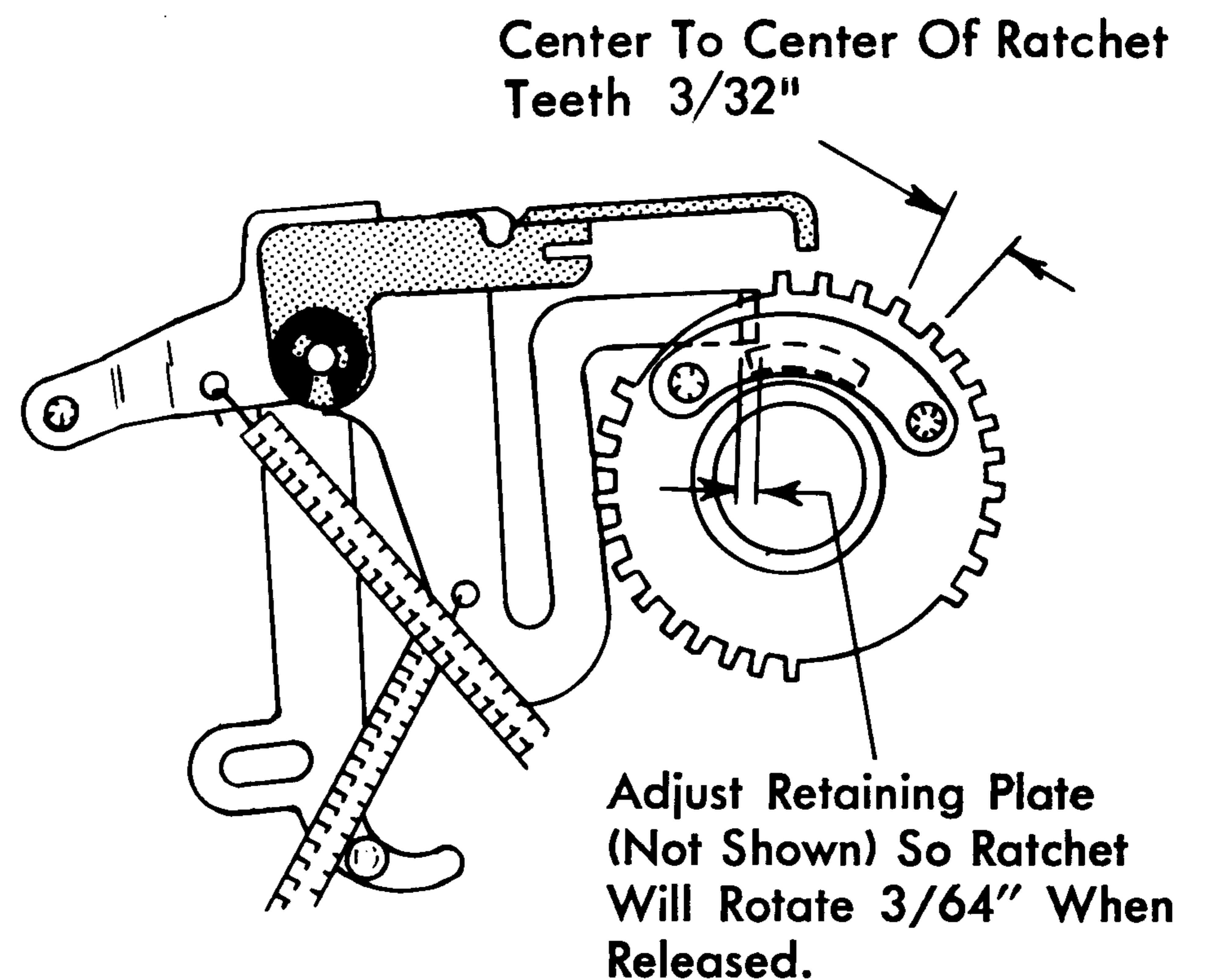


FIG. 5.4

5.5 S. H.

The Lower Case Armature may stay attracted to the core due to oil or residual magnetism. This will prevent latching in upper case and therefore cause a simultaneous shift to lower case and print operation. Clean the Armature and core. Readjust the armature stop for .003" - .008" clearance between the armature and core. It is desirable to maintain the adjustment close to the high limit.

OPERATIONAL AREA IN OUTPUT MODE

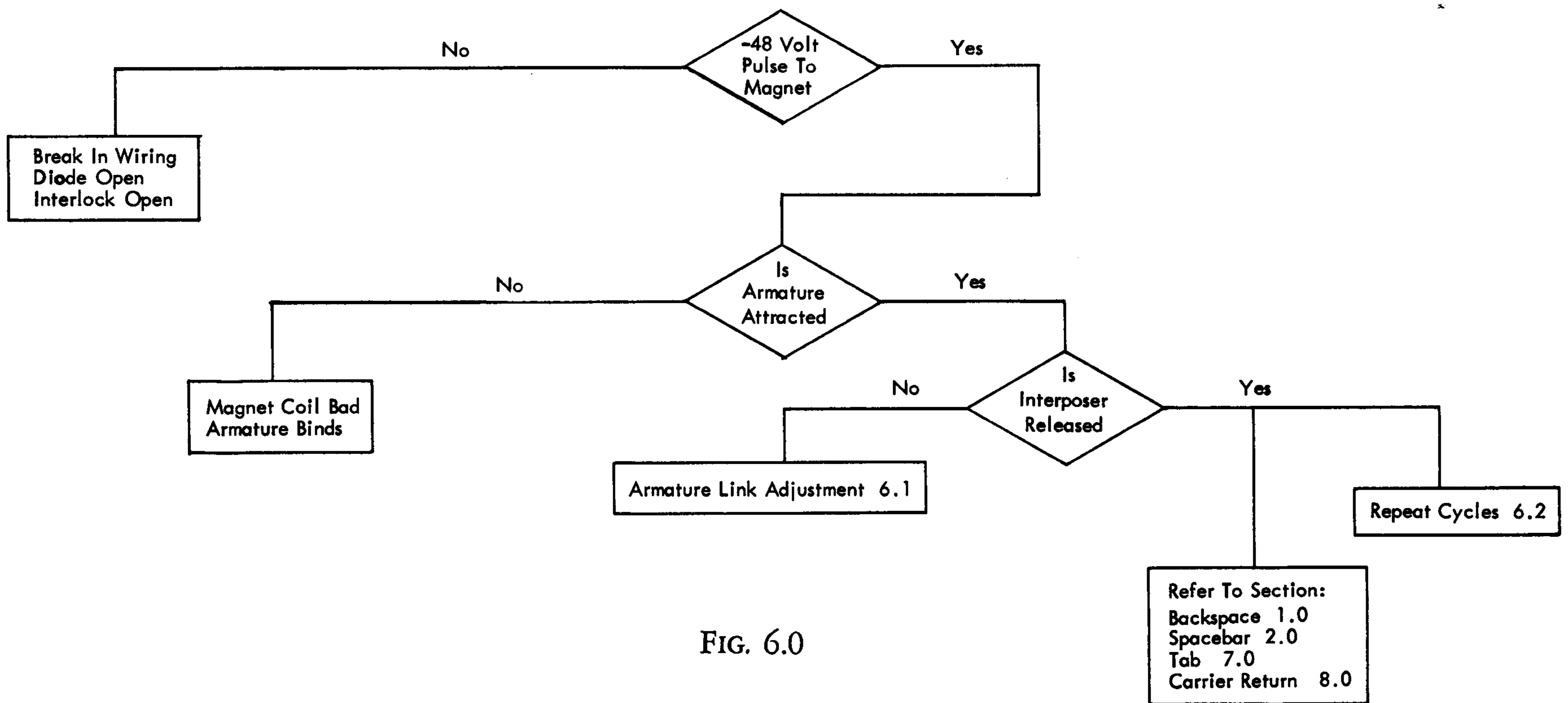


FIG. 6.0

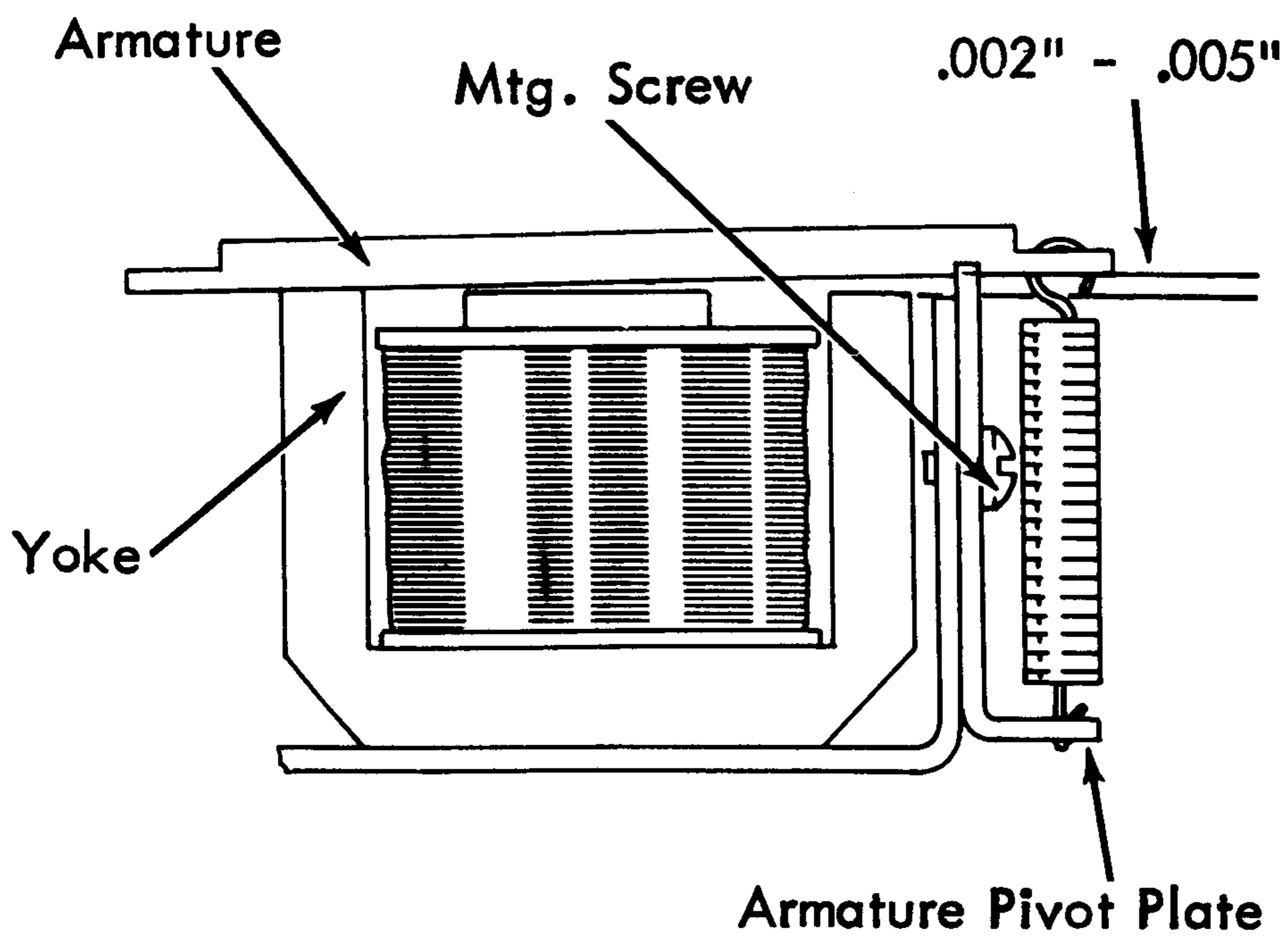


FIG. 6.1

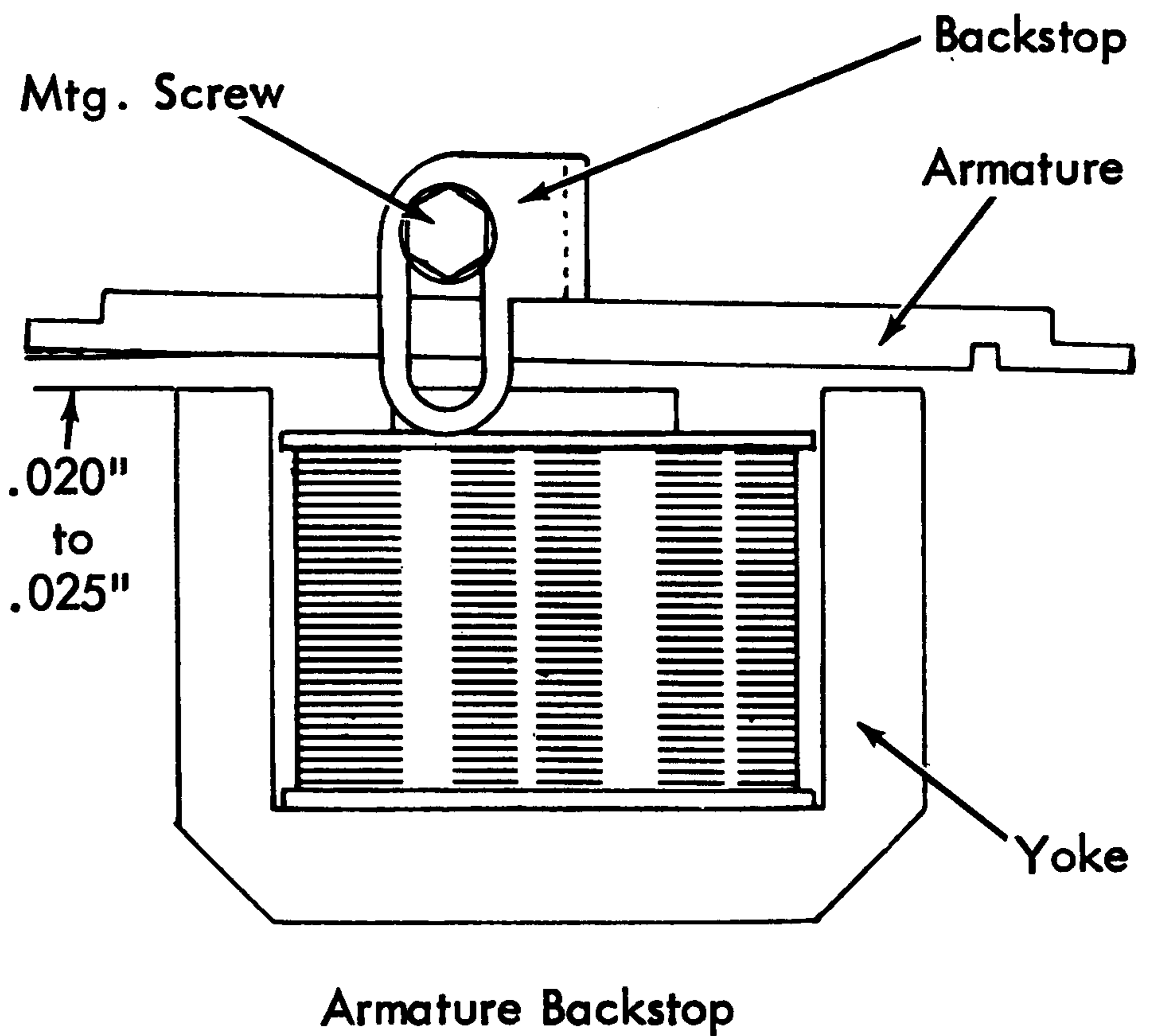


FIG. 6.2

6.0 Operational Adjustments

6.1 Adjust the Armature Link so that the interposer clears the latch bracket by $.005'' - .010''$ with the magnet energized.

6.2 REPEAT CYCLES MAY BE CAUSED BY:

- a. The armature sealing to the core. Adjust the armature pivot plate for $.002'' - .005''$ armature to yoke clearance. It is desirable to maintain the adjustment close to the high limit to insure

- that the armature does not contact the core.
- b. Insufficient interposer restoring action.
- c. Interposer latch binding or spring off.

6.3 S. H. SHIFT TO UPPER CASE

If the Shift Release Link is adjusted too long it will restrict the Shift Release Arm motion. This results in shift failures when shifting to upper case in output mode.

TAB MECHANISM

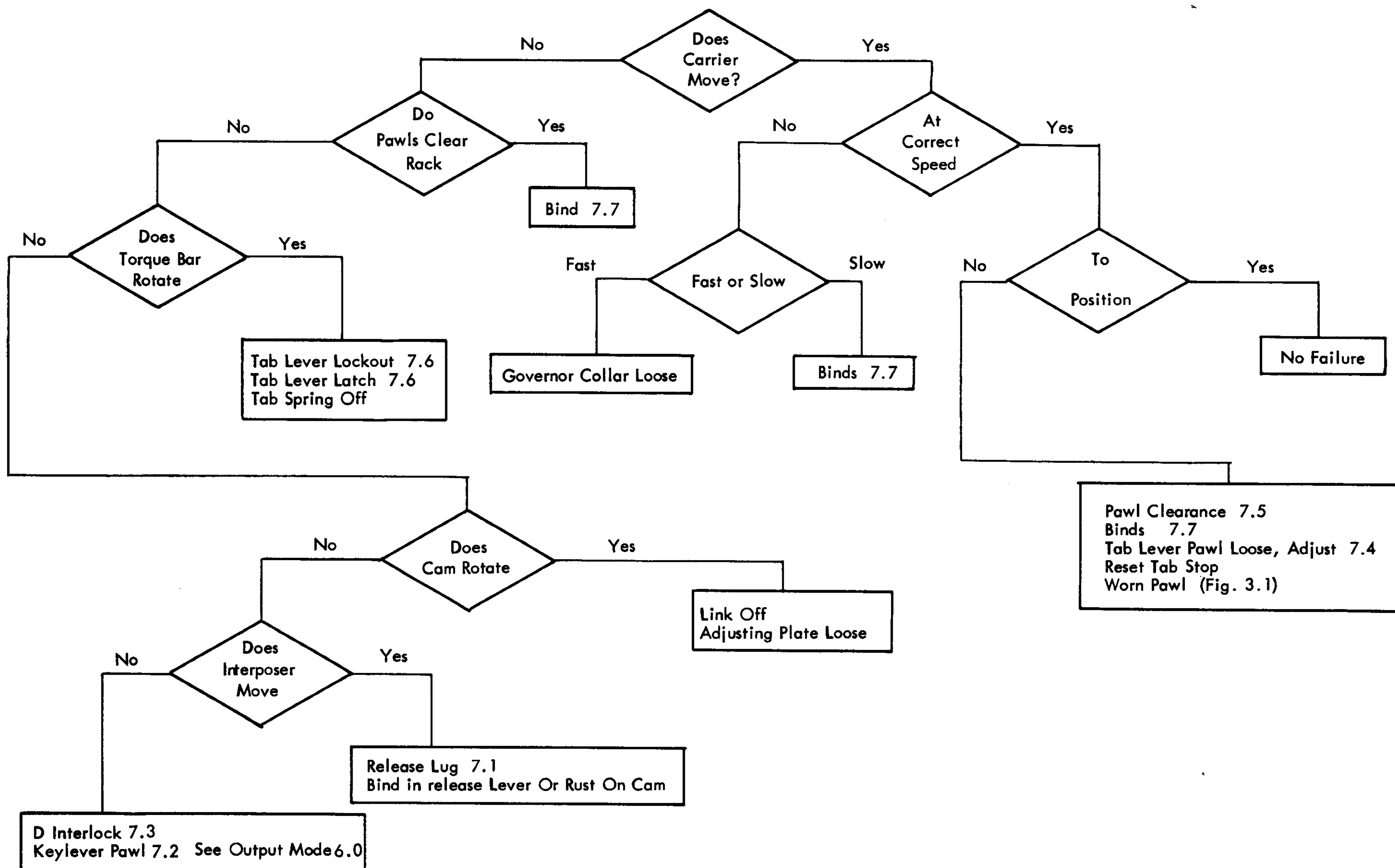


FIG. 7.0

7.0 Tab Adjustments

7.1 With the interposer and cam latched, form the Release Lug to obtain .025" - .035" clearance between the Interposer Lug and the Release Lug.

7.2 The Keylever Pawl should clear the interposer by .020" - .025".

The backstop should be adjusted so that the Keylever Pawls operate freely with .035" overlap.

7.3 The lockout shaft may flip over if the lockout shaft link is allowed to move left or right. A clip, P/N 1138464, may be installed on the lockout bail to prevent lateral movement.

7.4 The Tab Lever should clear a "set" Tab Stop by .035" - .045" with the Tab Lever at rest.

7.5 Form the upright lug of the Tab Latch for .010" - .015" clearance between the Escapement Pawl and the Escapement Rack.

7.6 The Tab Lever should overthrow the Tab Latch by .005" - .010".

7.7 BINDS — CHECK THE FOLLOWING:

- Feed Roll Mounting Arm hits the Tab Overthrow Stop.
- Dust Covers — Card Holders.
- Anvil and Front Carrier Shoes.
- Rear Carrier Shoe.
- Escapement Cord is off of its pulley.
- Pinion Gear.
- The mainspring tension should be 2 pounds.

CARRIER RETURN

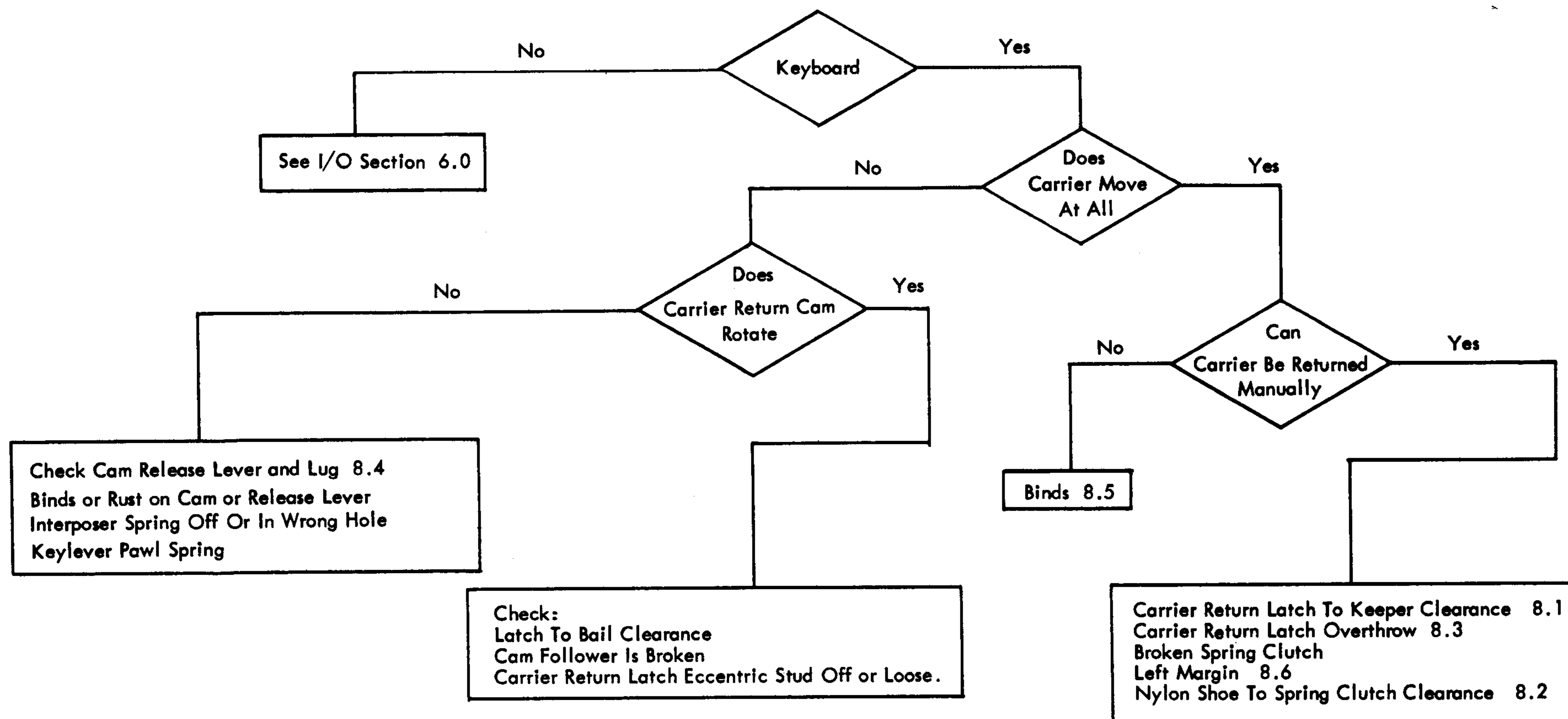


FIG. 8.0

8.0 Carrier Return Adjustments

8.1 With the Margin Rack held to the left, adjust the unlatching link so that the keeper clears the actuating arm by .005" - .015".

8.2 Adjust for a minimum of .010" clearance between the C/R Shoe and the Spring Clutch. *Note: The Carrier Return Spring Clutch Clamp may be off or broken.*

8.3 Adjust the Carrier Return Arm Screw for .020" - .030" overthrow between the latch and the keeper with the C/R Cam on the high point. The latch overthrow is affected by platen load; therefore, insure that the Platen is installed when making this adjustment.

8.4 With the interposer and cam latched, the release lug should clear the interposer by .025" - .035".

8.5 BINDS — CHECK THE FOLLOWING:

- a. Feed Roll Mounting Arm hits the Tab Overthrow Stop.
- b. Dust Covers — Card Holders.
- c. Anvil and Front Carrier Shoes.
- d. Rear Carrier Shoe.
- e. Escapement Cord is off its pulley.
- f. Pinion Gear.

8.6 An uneven left margin may be caused by:

- a. The Clutch Unlatching Link being too short.
- b. The overbank adjustment.
- c. A worn Escapement Pawl. (Fig. 3.1)

8.7 S. H.

The Tab Governor Spring Clutch must be free of rust, dirt, and excess oil. Too much oil will cause the clutch to bind or drag.

The Carrier Return Pinion and Spring Clutch must also be free of rust, dirt and oil. Excess oil will cause sluggish Tab and Escapement operation.

8.8 S. H. TORQUE LIMITER

Adjust the Extension Spring for ½ - ¾ lb. of tension on the Carrier, while holding the Carrier against a carrier return operation. If the Torque Limiter Spring appears to ride off the right side of the arbor, replace the Extension Spring with a spring P/N 1115382 and readjust.

9.0 Operational Notes

9.1 REPEAT FUNCTIONS

There are no repeat functions on the I/O Printer, consequently the Operational Keylever Pawls require only the bottom lug. The top lug (*Repeat Lug*) should be broken off if it is installed.

9.2 NYLON CORD DRUM

If the slot in the Nylon Cord Drum opens or breaks, a new slot may be made with a spring hook which has been heated.

9.3 INTERPOSER HEIGHT

The operational interposer height may be adjusted by using the following procedure:

- a. Hold the Clutch Release Arm so that the cam repeats.
- b. Turn the Interposer adjusting screw clockwise, until the mechanism begins to operate. (*Carrier begins to move*).
- c. Back the adjusting screw out until the mechanism stops operating, then back it out an additional ½ turn.

9.4 OPERATIONAL SHAFT REMOVAL

The Operational Shaft can easily be removed by moving it to the right side of the machine just far enough to clear the center bearing of the main frame. Lift the shaft out through the top of the machine.

9.5 S. H. OPERATIONAL LATCH BRACKET REMOVAL

The Operational Latch Bracket Assembly can be removed through the rear of the machine if the C5 cam follower is disconnected and moved out of the way.

MAL-SELECTION

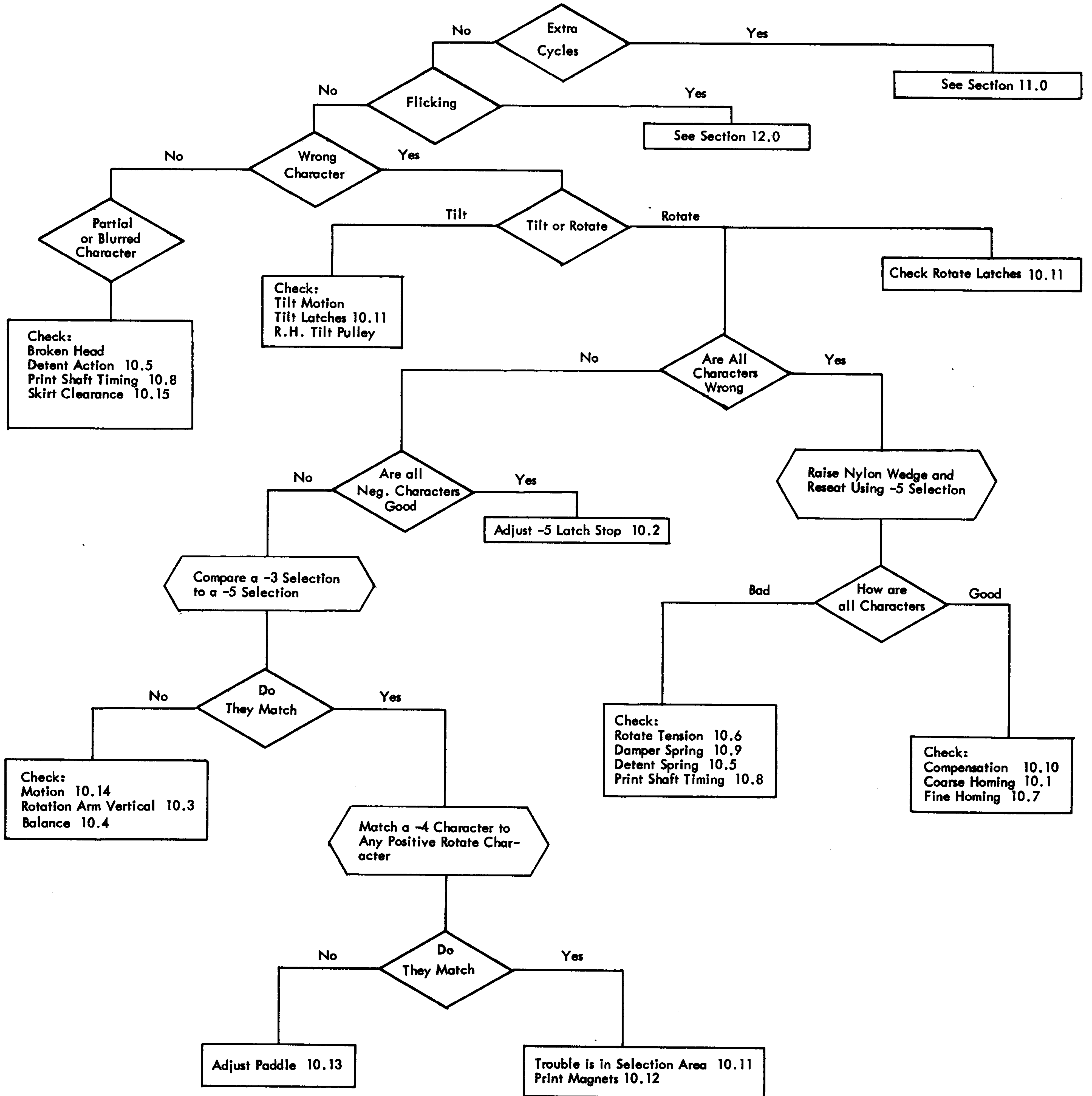


FIG. 10.0

10.0 Mal-Selection Adjustments

- 10.1 Loosen the set screw in the Rotate Pulley and set the home position so that the detent enters the head .015" down the slope, with the head play removed in a clockwise direction.
- 10.2 .002" - .005" clearance between the -5 latch and its stop.
- 10.3 Half cycle a home character and adjust the rotate link so that the pointer on the rotate arm matches the #1 scribe on the Hooverometer, when the Hooverometer is depressed against the damper spring.
- 10.4 Match the home detenting with:
 - a. The negative 5 latch selected.
 - b. All positive latches selected.
- 10.5 The detents should seat fully with no side play.
- 10.6 2 lbs. with a -5 character half cycled.
- 10.7 Adjust the Rotate Arm Eccentric so that a half cycled -5 selection matches a half cycled home selection.
- 10.8 Adjust the print shaft timing so that the detent enters and leaves all rotate positions without rubbing on the skirt.
- 10.9 The Damper Spring must not bind on the Paper Bail Stud. Adjust the Damper Spring Stop $\frac{1}{8}$ " - $\frac{1}{16}$ " from bottom of the spring. A -5 selection should fully compress the Damper Spring.
- 10.10 COMPENSATOR WEDGE
Overcompensation may occur whenever (a) the system receives a sudden shock which unloads the rotate arm, (b) the detent enters the wrong typehead notch prior to rotate completion, (c) the detent enters the wrong notch after rotate completion. If the wedge drops too far (*overcompensates*) check:
 - a. Excessive head play.
 - b. Shift timing adjustments.
 - c. Fine timing and skirt clearance #10.8.
 - d. Binding or sticking rotate spring.
 - e. Binding rotate eccentric arm shoulder.
 - f. Binding or sticking damper spring #10.9.
 - g. Popping selector latches due to maladjusted latchlinks.
 - h. Filter shaft timing.
 - i. Binding typehead due to the tilt ring spacer being off center.
 - j. Rotate spring tension #10.6.If the wedge does not drop far enough (*undercompensates*) check:
 - a. Wedge is dirty, oily, or serrated. The wedge

should be cleaned with IBM cleaning fluid. If the wedge becomes scored or serrated it may be reversed.

- b. Rotate arm eccentric adjustment #10.7.

COMPENSATOR ASSIST SPRING (See Fig. 10.1) All machines must be equipped with the Compensator Assist Spring, Ref. No. 3. The Clamp Release Arm should be removed from the Rotate Arm. The Clamp Release Arm, Ref. No. 1, may be broken off at the point indicated, Ref. No. 2. This DOES NOT apply to machines below Serial No. 4002800 since a heavier Rotate Arm Spring was used. Note: Those early machines equipped with the heavier Rotate Arm Spring, do not have a Clamp Release Arm installed.

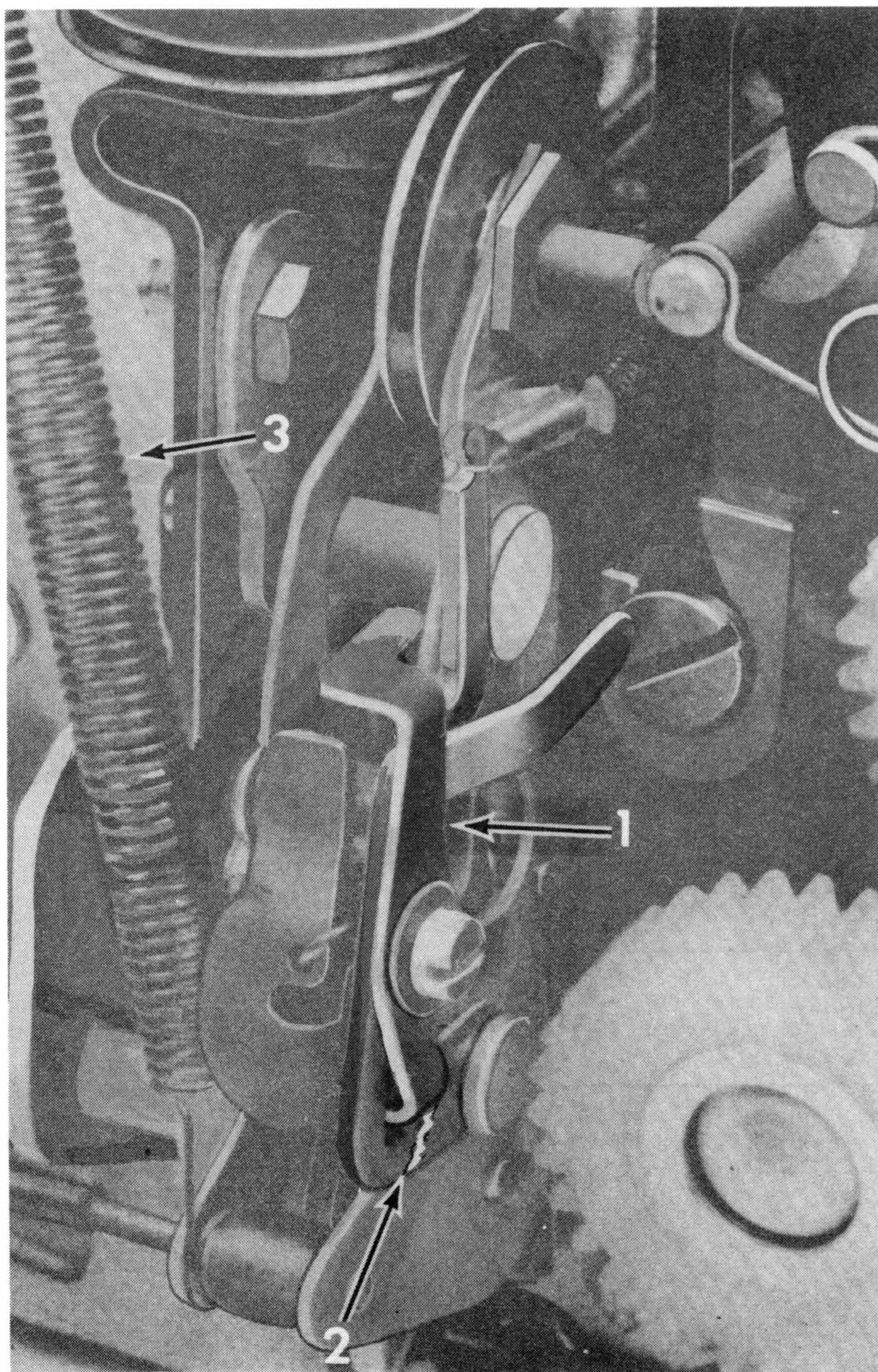


FIG. 10.1

- 10.11 Selection System Check (See Section 13.0.)
- 10.12 Print Magnets (See Section 14.0.)
- 10.13 Form the paddle so that home detenting matches the -4 detenting.
- 10.14 Adjust the Rotate Arm length so that a -3 character detents the same as a +5 character.

10.15 SKIRT CLEARANCE

While manually half cycling a 2 tilt, +5 rotate character, there should be .020" - .030" clearance between the Rotate Detent and any tooth on the type element. To obtain this clearance, half cycle any character and rotate the Detent Actuating Lever Mounting Stud so that the Detent Actuating Lever is all the way to the rear, then adjust the detent cam on the print sleeve for .001" clearance between the low dwell of the cam and the cam follower.

11.0 Extra Cycles

Extra Cycles may be defined as an unwanted +5 rotate, 3 tilt character selection. (Usually a period.) The most common causes of Extra Cycles are listed below in order of probability.

11.1 CYCLE CLUTCH LATCH LINK PAWL BITE

The pawl must overlap its keeper by $\frac{1}{2}$ the thickness of the keeper. (Adjust the bail upstop)

11.2 CYCLE CLUTCH LATCH RESTORING

Adjust so that the pawl overthrows the keeper by .025" - .030". Caution — Excessive overthrow will also cause extra cycles because the pawl will bounce off the keeper.

NOTE: The nylon cam may not provide equal restoring motion on both lobes. Adjust the overthrow to meet the specifications on the lobe which provides the least motion. If the two lobes cause more than .020" difference in restoring overthrow, the nylon cam should be replaced. The nylon cams are now being ground to closer tolerances.

11.3 Insufficient or excessive latch bite or a worn latch will cause extra cycles. Adjust the entire keeper bracket assembly (front to rear) to obtain .030" - .035" latch bite on the sleeve. This is equal to the thickness of the latch. Caution — If this adjustment is changed readjust per Section 11.2.

11.4 BINDS IN THE CYCLE BAIL

The bail must be free to rotate about its axis on both the right and the left side. If a bind is suspected, remove the bail and polish the ends with crocus cloth.

12.0 Flicking

Flicking is an erroneous character induced by the operator. It is usually a +5 rotate, 3 tilt selection (period for most systems) and is caused by the operator tapping a key button which drives the cycle bail down, but does not latch an interposer. The Cycle Clutch Pawl will release and cause a +5 rotate, 3 tilt selection.

12.1 ADJUSTMENTS TO MINIMIZE FLICKING

The cycle clutch latch link pawl should clear its keeper by .001" - .002" as it is unlatched by an interposer. This adjustment may be observed through the hole in the right side frame. An interposer must be latched down while holding the cycle clutch link. Allow the link to move forward slowly and look for .001" - .002" clearance between the pawl and the keeper. This must be checked on both sides of the keyboard and must be the same across the keyboard.

NOTE: If this adjustment is changed, the pawl bite must be checked.

Pawl bite should not exceed $\frac{1}{2}$ the thickness of the keeper. Adjust the cycle bail upstop. This will maintain a clearance of .010" - .020" between the cycle bail and the interposers. With this clearance the cycle bail will not be able to bounce on the interposers.

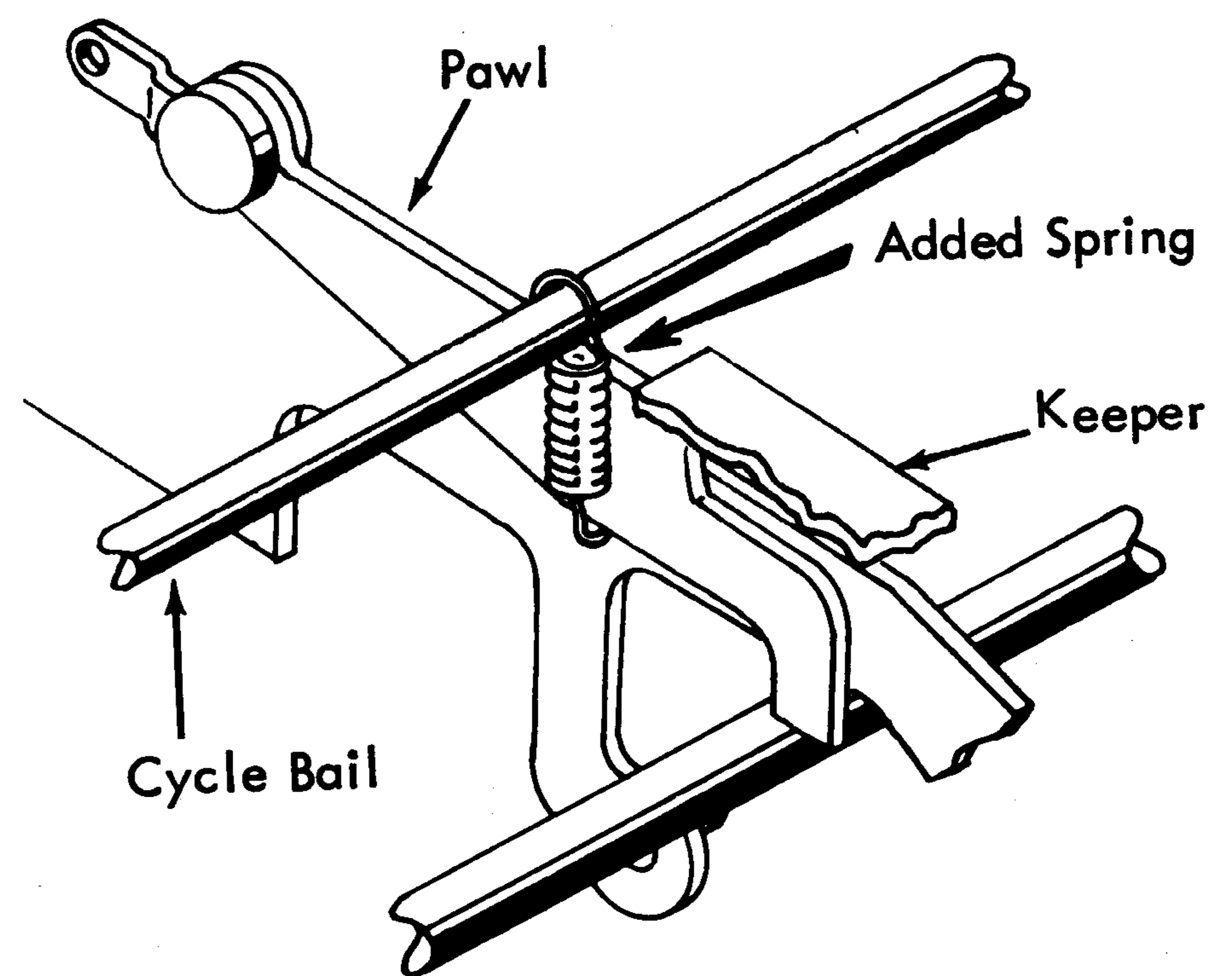


FIG. 12.1

A spring P/N 1090343, may be added between the cycle clutch trip bail and the cycle clutch pawl to reduce bail bounce. (Figure 12.1.)

Interposer latch springs:

- Must not be bent or malformed.
- Must overlap the interposer by a minimum of .050" when the interposer is latched down.

13.0 Selection System Check for Mal-Selection

13.1 INTERPOSER TO FILTER SHAFT CLEARANCE

The vertical clearance should be .025" - .030" when the interposer is unlatched.

13.2 SELECTOR LATCH INTERPOSER TO SELECTOR BAIL CLEARANCE

Form the interposer stops to obtain .001" clearance. If this adjustment is made, the latch links MUST be readjusted.

ADJUST AS FOLLOWS:

The selection latches should hang vertically with maximum overlap on the bail plate. The links should have only .001" - .002" lost motion in them and must not restrict the overhang of the latches.

13.3 SELECTION LATCHES

All latch springs must be secure. Check the latch extension to pusher clearance. This should be .035" for all latch pushers except the check latch which is .020" - .025".

There have been instances where the Check Latch will jump on top of the positive bail causing sustained mal-selection. No latches can be operated since the check latch is holding the bail down. This condition can also occur if the Selection Bail Downstop is mal-adjusted. With the machine latched at half-cycle there should be .001" - .010" clearance between the bail and the downstop. The vertical clearance between the check latch and the bail should be increased to .020" - .025" if this occurs.

14.0 Print Magnets

14.1 The pusher to latch clearance must be .035" for all pushers except the Check Latch which is .020" - .025".

14.2 The armatures must not bind when depressed manually. Check for oil, dirt, residual magnetism, and bent armatures.

When operating the armatures manually, be careful not to bend or deform them.

14.3 The Cycle Trip Bail Knockoff Extensions must clear the knockoff eccentrics by .003" - .008" when an armature is manually attracted.

14.4 A clearance of .001" - .010" must be maintained on the horizontal and vertical latching surfaces of the armatures.

14.5 All armatures must not contact their cores when energized. Adjust the stops and pivot plate for .004" - .008" clearance between the armatures and yokes.

14.6 CYCLE CLUTCH TRIP

If problems are encountered with cycle clutch tripping when only one armature is used, check the Cycle Clutch Trip Mechanism to determine if it

is the old style. The old style trip mechanism (*trip lever*) is connected directly to the Cycle Clutch Trip Bail. The new style trip lever is spring loaded and the Cycle Clutch Trip Bail Link is connected to a latch lever which releases the trip lever.

14.7 PRINT MAGNET COILS

Two types of Print Magnet Coils have been used in the I/O Printer. The latter one is P/N 1135134 and is stronger than the coils used in some early machines. The original coil used was P/N 1128681.

15.0 Cycle Clutch — Adjustments & Special Notes

15.1 CYCLE SHAFT END PLAY

The cycle shaft end play should be .001" - .003" (*tap the shaft very LIGHTLY to insure proper seating*).

15.2 LATCH HEIGHT

The cycle clutch latch height must always be checked before attempting cycle clutch collar adjustment (*Fig. 15.1*). If the latch is too high, extra cycles may occur. If the latch is too low, the cycle clutch may not unlatch.

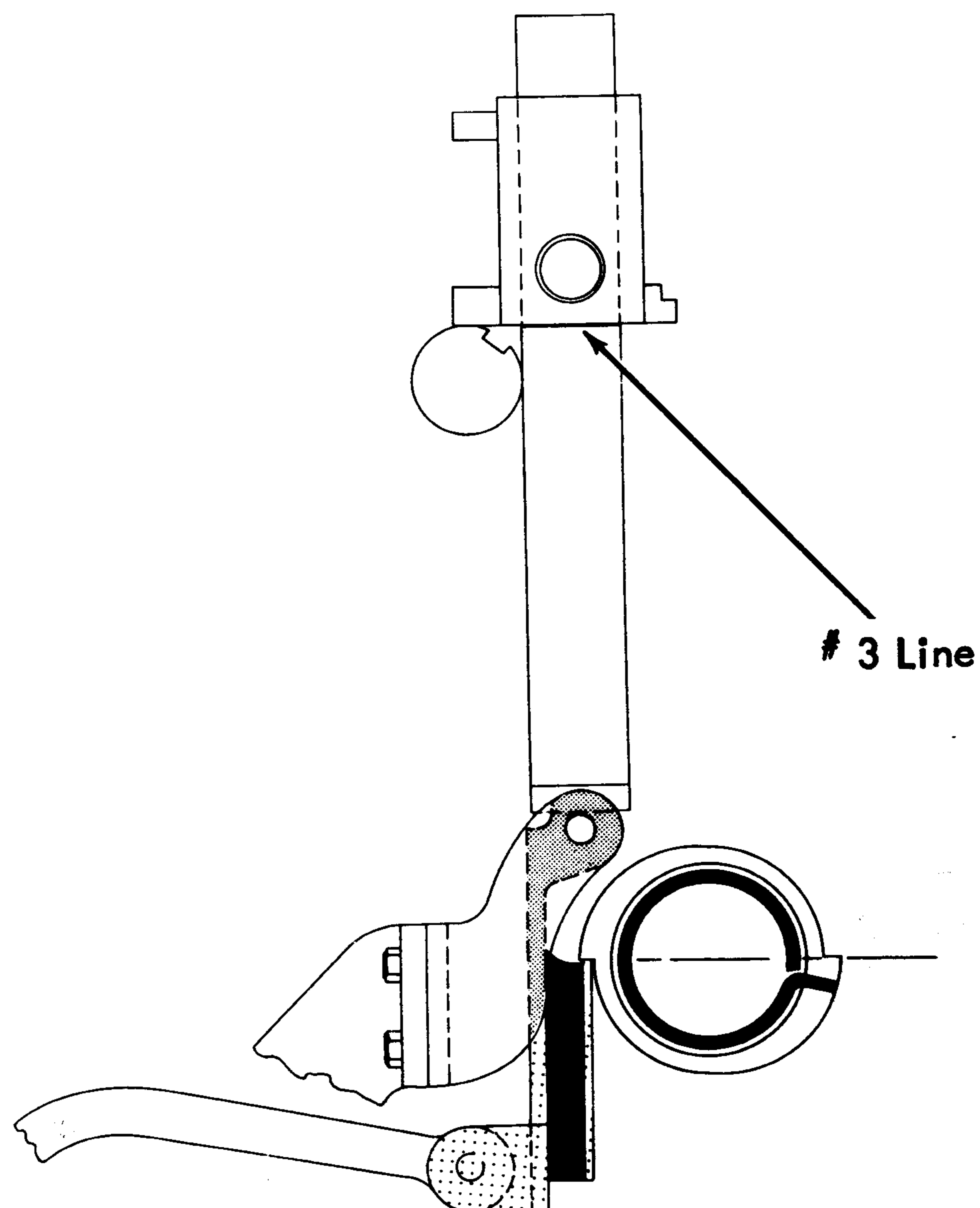


FIG. 15.1

15.3 CYCLE CLUTCH COLLAR

The Cycle Clutch Collar should be rotated back or front to allow the spring clutch to disengage from the cycle shaft $\frac{3}{2}$ " to $\frac{1}{8}$ " before the Cycle Shaft Ratchet latches on its check pawl. This adjustment is accomplished as follows:

- a. Loosen the Cycle Clutch Overthrow Stop (*white nylon cam*).
- b. Slowly hand cycle a —5 rotate, 0 tilt character. When the cycle shaft stops turning, mark a reference point on a print shaft gear tooth and its bearing. Unlatch the Cycle Clutch and very slowly rotate the Cycle Shaft until the check pawl falls into the ratchet on the Cycle Shaft. Once again, observe the print shaft gear — it should have moved $\frac{1}{2}$ to $\frac{3}{4}$ of a tooth.
- c. Tighten the collar, being sure to allow .010" - .015" end play in the Cycle Clutch Sleeve.
- d. Adjust the Cycle Clutch Overthrow Stop (*white nylon cam*), front to rear, to allow .007" to .015" rotary motion of the Cycle Shaft when it is latched up. This clearance may also be observed on the degree wheel as 1 to 3 degrees rotation.

15.4 If the above sequence of adjustments does not produce correct cycle clutch operation, check for the following conditions:

- a. Worn or rusted spring clutch (replace).
- b. Lack of spring clutch lubrication (use Sil-X).
- c. Binds in the operational shaft or shift clutch assembly.
- d. Bind or lack of lubrication in the drive gears (remove, clean, lubricate).
- e. Bind in the print shaft or carrier and rocker.
- f. Excessive cycle clutch latch restoring overthrow causing the latch to rub on the low dwell of the sleeve.

15.5 CYCLE CLUTCH PULLEY AND HUB ASSEMBLY

The Cycle Clutch Pulley can be oversize. Check for this condition by holding the Carrier against a return. If the belt thumps and the motor vibrates back and forth the pulley may be oversize.

Remove the belt from the Motor Pulley and wrap it around the Cycle Clutch Pulley to determine if the cogs on the belt match the cogs on the pulley. An oversize pulley should be replaced, following the procedure outlined in the Reference Manual.

16.0 Broken Tapes

When a tape breaks, the cause should be isolated to prevent a recurrence. The following list outlines the causes of tape breakage.

16.1 ROTATE TAPE

- a. Rotate detent clearance, (Is the Detent Actuating Lever Roller in place)
 - *b. Print shaft timing.
 - *c. Shift interlock adjustments.
 - d. Shift Arm moving out in straight line.
 - e. Defective Rotate Arm or Shift Arm Pulley.
 - f. Any bind that affects free rotation of the head.
 - g. Loose or missing Tape Guide.
 - h. Burrs on any area where the tape travels.
 - i. Negative latch clearance is insufficient.
 - j. Latch links adjusted too long.
 - k. Latches slip from under the bail during operation (*links too short*).
 - l. Foreign material obstructing the travel of the tape.
 - m. Interference between the Tilt and Rotate Pulleys.
- * Most common causes.

16.2 TILT TAPE

- a. Detent to Tilt Ring clearance.
 - b. Burrs on the Tilt Pulley (*especially where the tape comes out of the pulley.*)
 - c. Any bind that affects free motion of the Tilt Ring.
 - d. Foreign material in the sector gears.
 - *e. Print shaft timing (affects the rotate mechanism).
 - *f. Tilt Pulley Spring missing or broken. (*Spring eye must face the rear of the machine*).
 - g. Interference between Tilt and Rotate Pulleys.
 - h. Excessive wear in the R. H. Tilt Pulley Stud.
- * Most common causes.

16.3 S. H.

The Rotate Tape should twist "top to the front" as it leaves the left side of the Carrier.

16.4 S. H.

When installing the new style (crimped) tapes, it may be difficult to insert the "T" end through the rear of the Rocker. To facilitate installation, the tape should be inserted eyelet first through the front of the Carrier, and pulled through until the "T" can easily be inserted.

16.5 S. H.

The Tape Wiper on the left side of the Carrier must be removed. It causes flexing of the tapes which can result in mal-selection and eventually tape breakage.

16.6 S. H.

When installing a Rotate Tape it is necessary to remove the Tilt Pulley Spring. The Tilt Tape slackens and usually falls off the pulley. This can be prevented by placing a rubber band around the Tilt Tape near its anchor pin on the right side of the Carrier, and then hooking the rubber band to the

right hand Margin Stop. This will hold tension on the Tilt Tape to keep it on the pulley, and will also hold the tape on the anchor pin clear of the path for the new Rotate Tape.

17.0 Keyboard Lockup

17. The most common causes for Keyboard Lockup are:
- The Cycle Clutch Latch Link Pawl doesn't clear the keeper with an interposer latched down. (Section 10.0).
 - Filter shaft timing adjustment.
 - Cycle shaft overthrow adjustment (Adjustment 4.5)
 - Latch motion restricted by restoring roller. (Section 15.0).
 - Cycle clutch adjustments — latch binding (Section 15.0).
 - Character interrupter adjustment. (Section 5.0.) Also check the Shift Brake.
 - The Linelock Interposer binds in the Selector Compensator (clean and lubricate.)

18.0 Transmit Errors

- 18.1 S. H.
The transmit contacts may be dirty. Clean with IBM contact cleaning fluid then wipe dry with clean bond paper.
- 18.2 The transmit contact air gaps should be .020".
- 18.3 The C1 and C2 contacts must not bridge (N/O and N/C make at the same time.) For C1 and C2 timing see the applicable systems Reference Manual.
- 18.4 PRINT SELECTION CONTACT ACTUATORS
If the contact actuators bind, they should be replaced with the new style. The material used in manufacturing the contact actuators has been changed from a clear translucent nylon to a cloudy, yellowish, fiber nylon. The finish of the actuator plates has been changed from nickel to chrome to provide more reliable operation of the actuators. When replacing an old style actuator with a new style acutator, the actuator plate must ALSO be changed. Only new style actuator plates are available for field replacement. All part numbers remain the same.

19.0 Machine Lockup

- 19.1 The most common causes of Machine Lockup are:
- The Cycle Clutch Spring may be broken, out of adjustment (Section 15.0), or is in need of lubrication.

- Idler gear binding. Remove and lubricate with #6 oil.
- Remove the type element then recheck for lock-up. If no lock-up is encountered, all typehead motion adjustments and print shaft timing must be checked.
- The Print Sleeve and bearings may be dry or worn.
- Binds in the Carrier and Rocker Assembly.
- Check the Print Cam Follower for binds.
- Oversize Cycle Clutch Pulley and Hub Assembly. (Section 15.5.)
- Shift Cam Back-Up Roller adjustment. (Section 4.8.)
- Operation Shaft binds or Shift Cam adjustment. (Section 4.0.)
- Shift Spring Clutch is dry or requires adjustment. (Section 4.0.)

20.0 Ribbon

20.1 CENTERING SPRINGS

Center the Reverse Interposer and observe for .003" - .005" clearance in the spring loops. (Fig. 20.1)

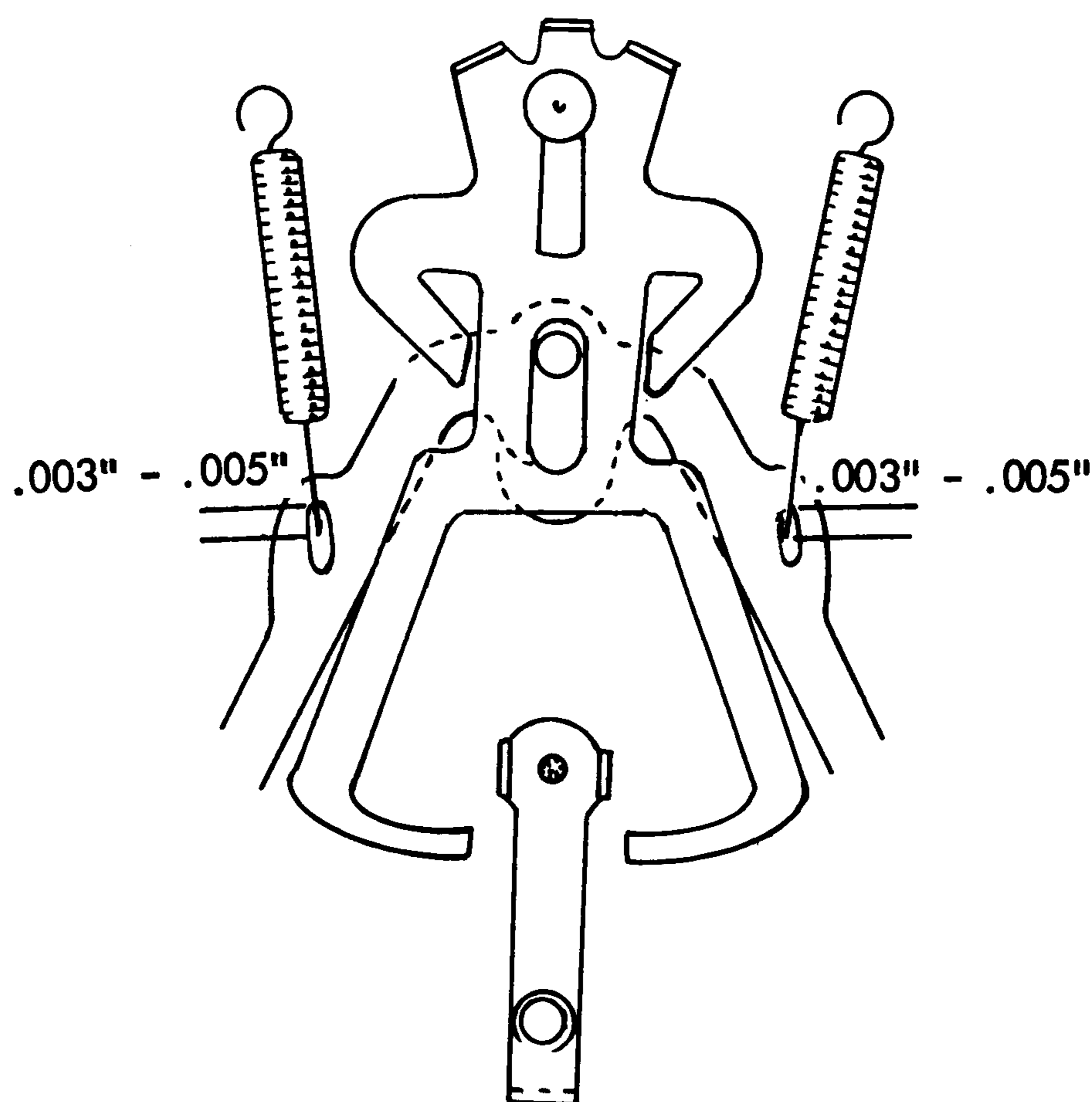


FIG. 20.1

20.2 RATCHET BRAKE

Form the brakes to provide sufficient drag on the Ribbon Ratchets to hold them from any motion

after the ratchet has been manually rotated far enough to actuate the reverse mechanism.

20.3 FEED PLATE

Adjust to feed $2\frac{1}{2}$ teeth.

20.4 LIFT GUIDE PLATE

Adjust the Lift Guide Plate as low as possible so that there is no motion of the Ribbon when Ribbon Position Lever is moved from the high to the low position.

20.5 LIFT CONTROL LINK

Adjust so the highest and the lowest character print in all lift positions.

20.6 RIBBON REVERSE FAILURES

- a. Form the Reverse Trigger Springs down to increase their tension.
- b. Check for a burr on the top of the Reverse Interposer Rivet. File the burr off.

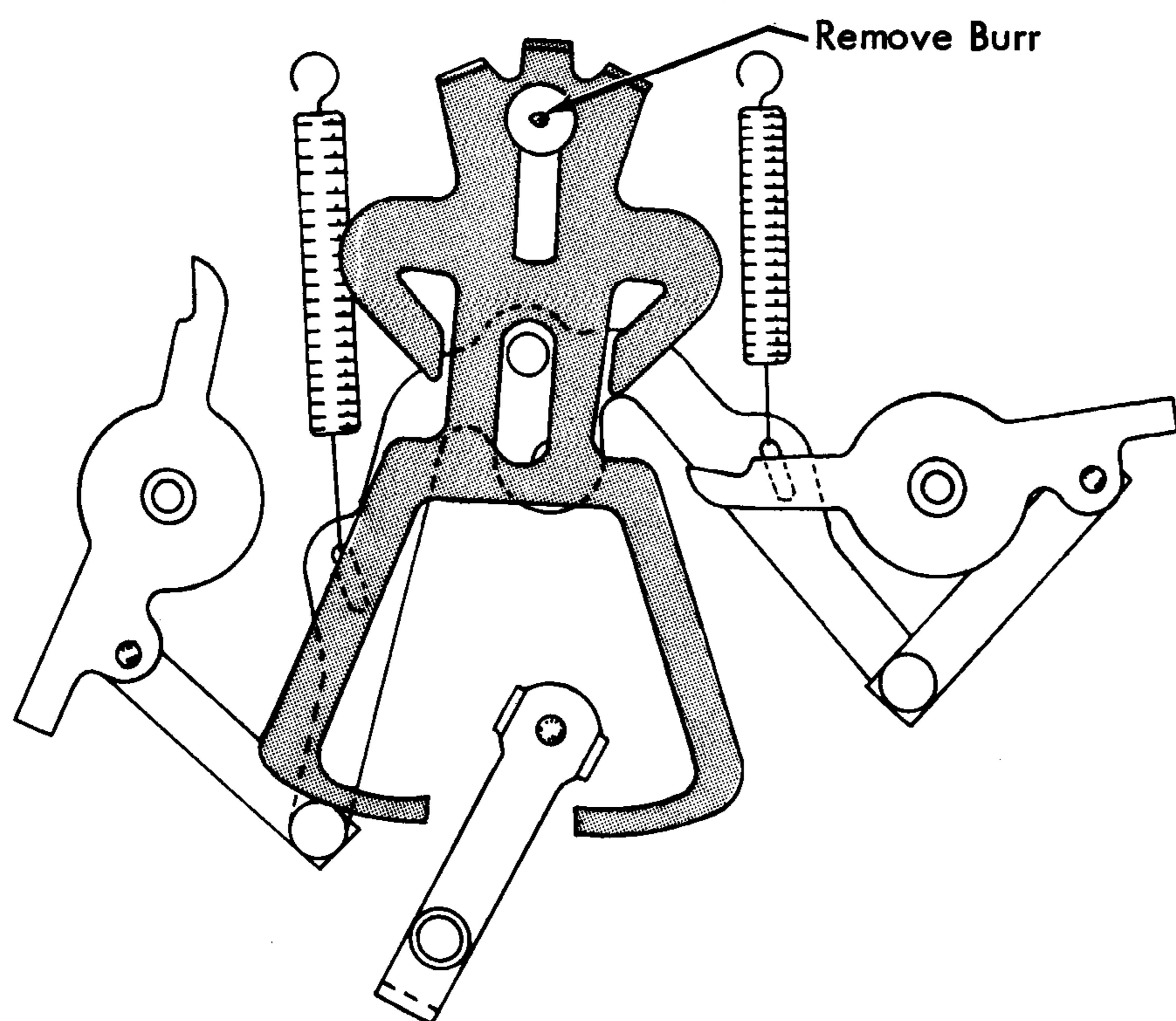


FIG. 20.2

21.0 Failure to Start

21.1 If the motor attempts to drive, check:

- a. Motor binding.
- b. Motor pulley binds.
 1. A bronze pulley should be used. This pulley is available in B/M #1271859. In the event the pulley binds on the motor shaft, the bronze pulley and the clutch assembly must be removed for cleaning. The motor shaft should be thoroughly cleaned with IBM cleaning fluid, polished with crocus cloth, and re-lubricated with #9 oil.

The bronze pulley should also be soaked in #9 oil. If #9 oil is not available, #6 may be used. Under no circumstances should any other lubricant or grease be used.

2. Excessive belt tension.
- c. Cycle Clutch Pulley oversize.
- d. Cycle Clutch Pulley Bearing — dry or binding.
- e. Bind in the Operation Shaft.
- f. Shift Clutch Pulley Bearing — dry or binding.

21.2 If the motor does not drive, check:

- a. The power cord.
- b. The motor for binds.
- c. The thermal cutout in the motor.

22.0 Contact Assemblies

See the applicable Systems Manual for all specifications.

22.1 S. H. CLEANING

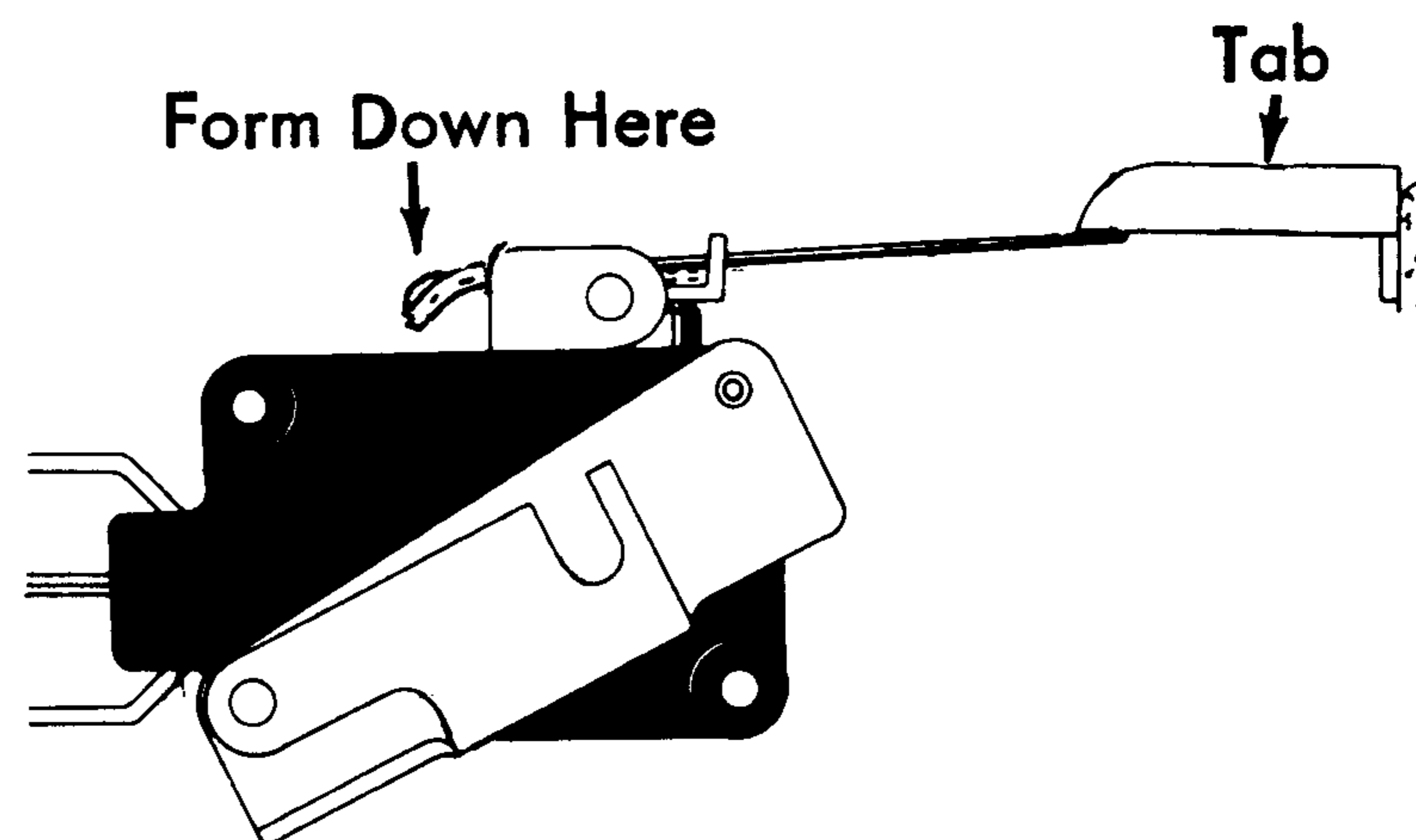
- a. The contacts must not bridge or bounce.
- b. The contacts must be clean, especially the N/C contacts as they tend to build up a residue.
- c. The contacts should be cleaned with IBM cleaning fluid and wiped dry with clean bond paper. Caution — do not use files, abrasives, or burnishing tools to clean the contacts.

22.2 S. H. OILY CONTACTS

If the contacts become oily due to oil bleeding from the blue steel straps, the contact assemblies may be replaced. I/O Printer contact assemblies now use nickel plated straps to prevent this problem and they may be obtained under the original part numbers.

22.3 S. H. TAB INTERLOCK MICRO-SWITCH

If the actuating wire pops out from under the torque bar actuating arm, form the rear section of the actuating wire to provide an overthrow stop for the wire (Figure 22.1.) See the I/O Printer Reference Manual for the specific adjustments.



Tab Micro Switch

FIG. 22.1

23.0 I/O Printer Tools

PART NO.	DESCRIPTION
460052	ET#6 oil (<i>green can.</i>)
470870	Scale 0-6# (<i>for rotate tension.</i>)
9900005	Wrench $\frac{1}{4}$ " X $\frac{5}{16}$ " (<i>special thin.</i>)
9900028	Bristol wrench 4" 6 flute #4 (<i>for Rotate Pulley.</i>)
9900034	Oiler for #6 oil.
9900061	$\frac{5}{16}$ " Spintite.
9900110	Hand Cycle Wheel.
9900111	Wrench $\frac{1}{8}$ " X $\frac{5}{32}$ " (<i>Cycle Clutch Restoring Roller.</i>)
9900173	#2 Bristol wrench — 4 flute (<i>for C1 and C2.</i>)
9900188	Sil-X grease .5oz. tube (<i>for cycle clutch.</i>)
9900190	T bender (<i>to form pushers.</i>)
9900208	Wrench $\frac{3}{16}$ " X $\frac{7}{32}$ " (<i>special thin.</i>)
9900216	#2 Bristol wrench — 6 flute (<i>gearless tilt detent.</i>)
158645	Grease gun for Cycle Clutch.
450813	Nozzle for above grease gun.

NOTE: This gun should be filled with Sil-X grease and used to lubricate the Cycle Spring Clutch.

OR

- 450640 Syringe oiler for Cycle Clutch.
- 450813 Nozzle for above oiler.

NOTE: Used for the same application but may be carried in C.E. Tool Bag.

23.1 S. H. HAND CYCLING WHEEL

The hand cycle wheel may easily be removed from the typewriter by holding it and turning on the motor.

CAUTION: Be sure there are no burrs or sharp areas on the wheel.

24.0 Preventive Maintenance

For complete PM procedures see the Reference Manual #225-1726. The following method of "cycle" inspection is recommended. The I/O Printer should be PM'd four times a year for single shift operation. The frequency should be increased in direct proportion to shift usage. Each inspection should include a complete lubrication as outlined in the Reference Manual. Each inspection should cover a different area of mechanical check and adjustment.

1st Inspection — Cycle clutch, Tilt Mechanism, Ribbon Mechanism.

2nd Inspection — Keyboard Area, Rotate Mechanism, Detenting.

3rd Inspection — I/O Hardware.

4th Inspection — Operational Area.

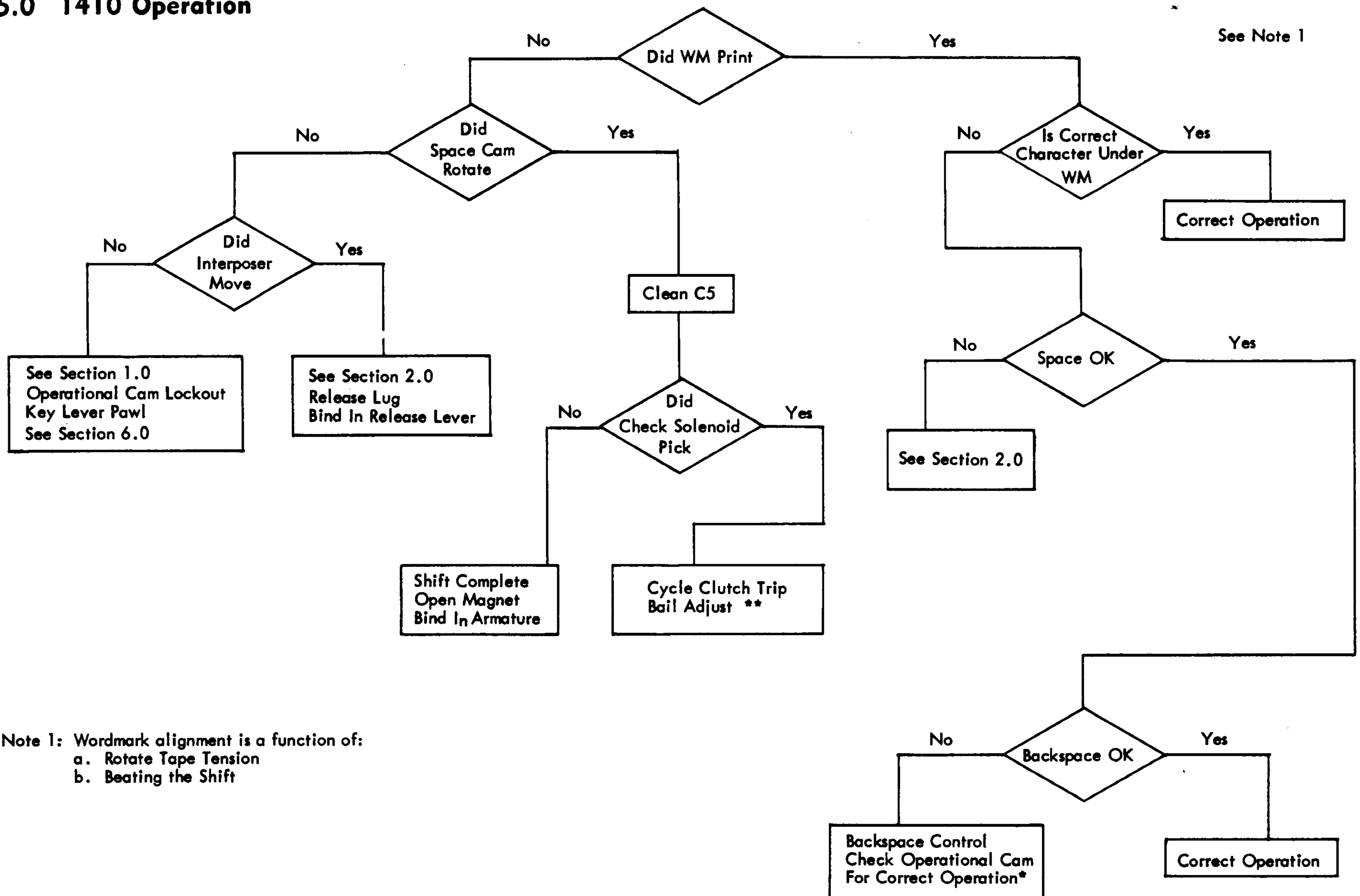
The following items require special attention:

- Motor and Motor Pulley.
- Cycle Clutch Spring and Arbor.
- Driven pulley hub and bearing.
- Operational Cam Bearings.
- Operational Shaft and Shift Cam Bearings.
- Shift Clutch Spring and Arbor.

These items should be lubricated every 6 weeks regardless of shift usage.

WORDMARK

25.0 1410 Operation



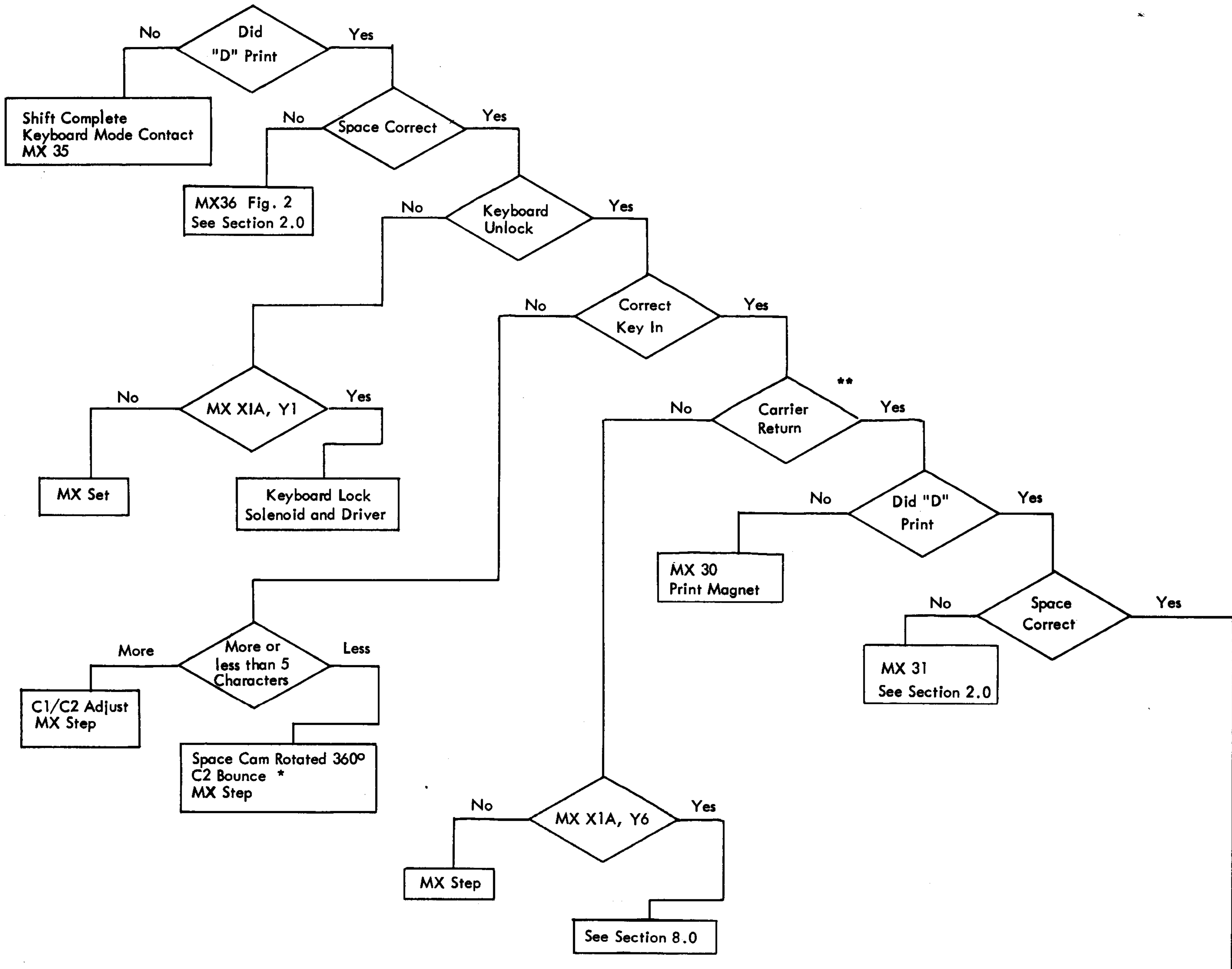
Note 1: Wordmark alignment is a function of:
 a. Rotate Tape Tension
 b. Beating the Shift

* The Space-Backspace-Tab Cam is double lobe cam. For a single operation the Cam rotates only 180 degrees.

**Failure to trip the cycle clutch when picking a single Magnet is inherent in the old style cycle clutch trip assembly. The old style assembly may be identified by the trip link which is directly attached to the trip lever. The new style assembly operates an intermediate lever, which releases a spring loaded trip lever. The new style may be ordered by 1410 CEM # 64.

FIG. 25.1

DISPLAY, ADDRESS SET & CE MODE



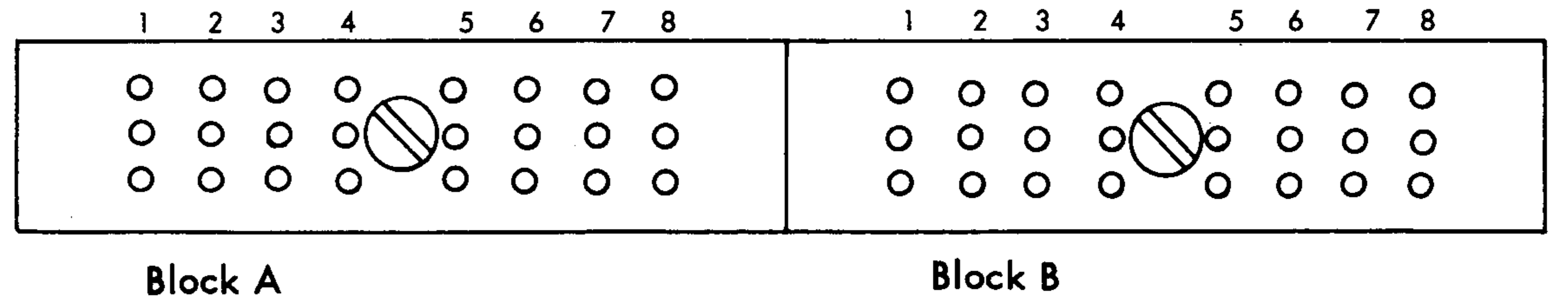
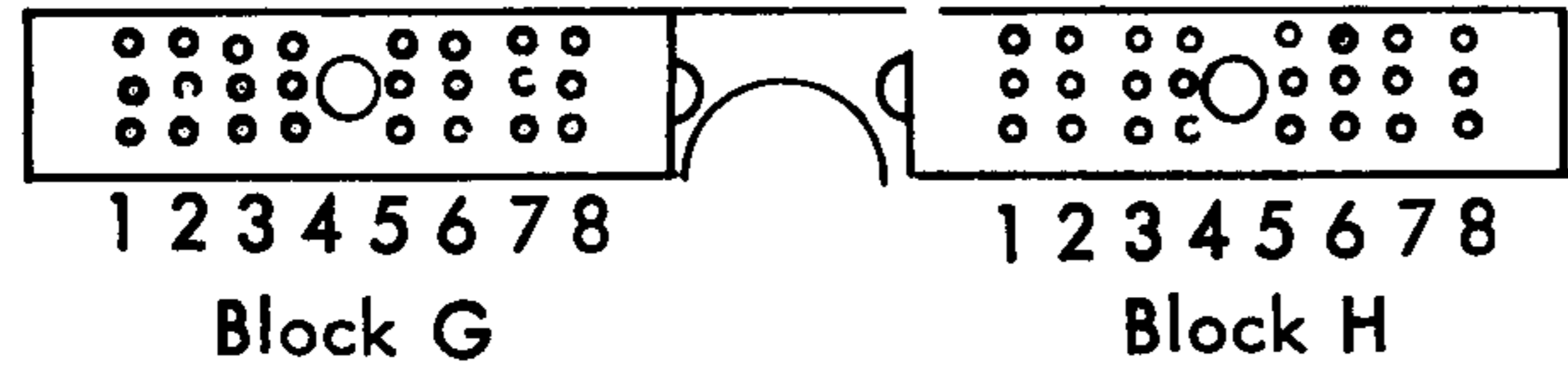
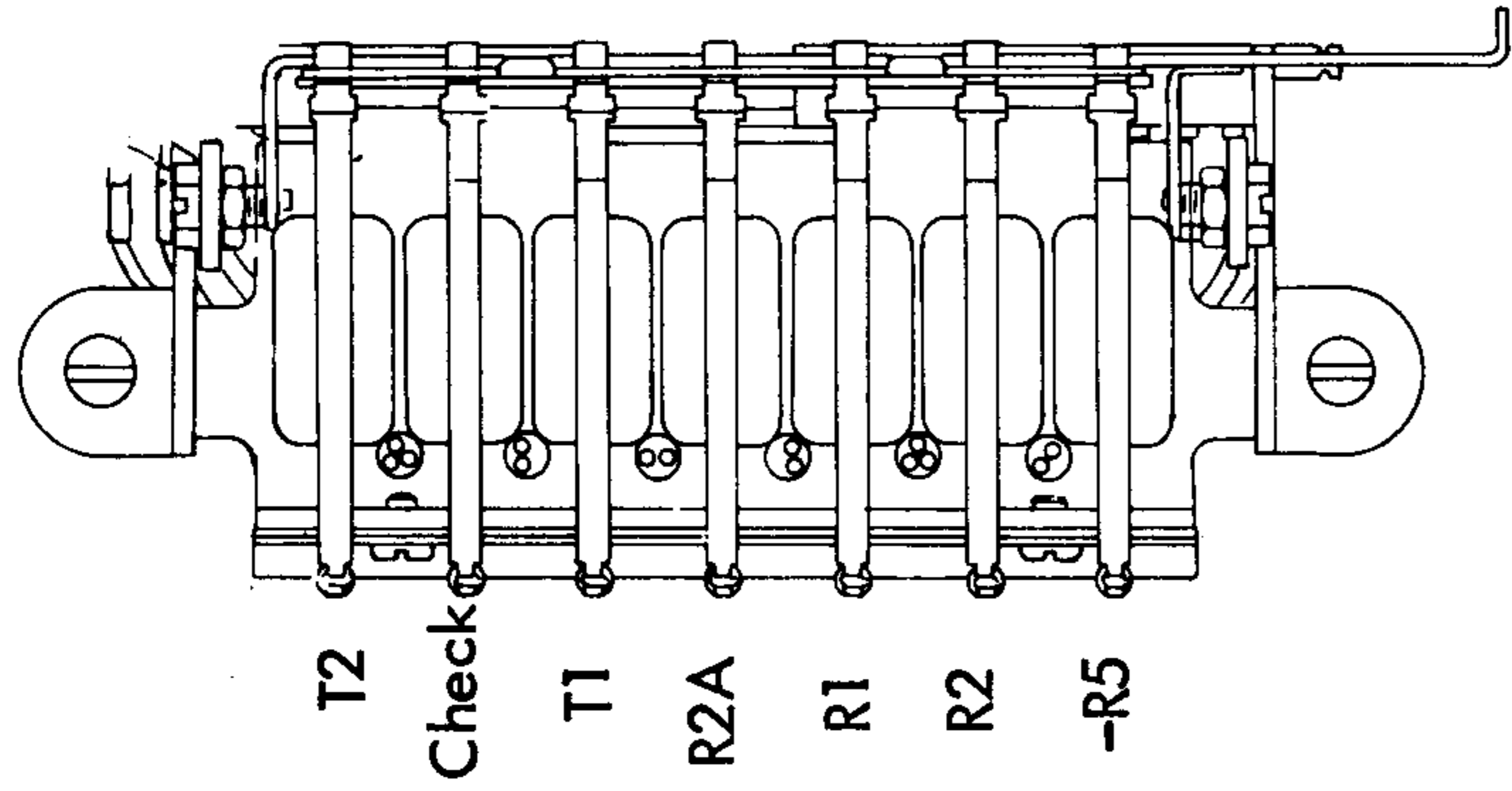
I/O Writer Should Continue To Display Until Wordmark Is Encountered.
 It Should Never Stop With MX 32 And A Wordmark. MX 32 is the First Position Actually Displayed.
 MX 33 is Wordmark Control.

*The Space - Backspace - Tab Cam Is A Double Lobe Cam. For A Single Operation, The Cam Rotates Only 180 Degrees.

** Display, Address set, and CE Mode are the same to this point except for character selected.

FIG. 25.2

26.0 I/O Component Location



Selection Contact Terminal Blocks

Print Selection Magnet Assembly

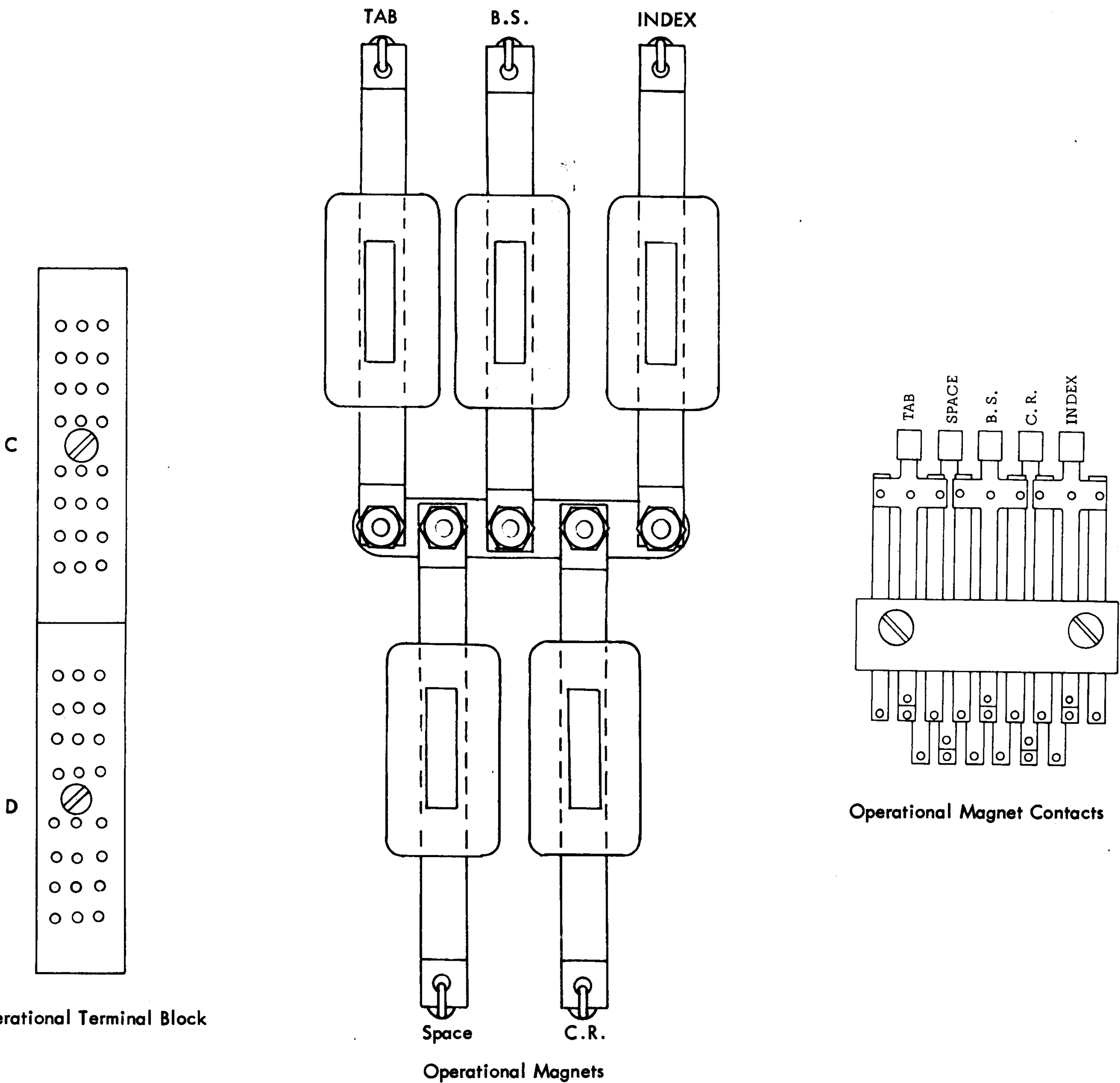


FIG. 26.0

27.0 CEM and Service Aid Index

SUBJECT	NUMBER
Safety	
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Covers and Dust Shield	15
Handling Procedure (Service Hint I)	3
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Lubrication	42
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Selection	
<i>(Includes rotate, Tilt, Print, Keyboard and Associated Cams, Latches and Contacts)</i>	
C1 and C2 Cams IBM 1415	29
Cycle Clutch Link, Sleeve, and Pawl Keeper Bracket	26
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Cycle Clutch Pulley	20
Power Cord	2*
* Indicates CEM	



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