

**BELL SYSTEM PRACTICES**  
Teletypewriter and Manual  
Telegraph Station and P.B.X.  
Installation and Maintenance

**SECTION P35.650**  
Issue 2, April, 1949  
AT&T Co Standard

## 14 TYPE REPERFORATORS

### REQUIREMENTS AND PROCEDURES

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## 1. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of reperforators of the 14 type.

1.02 This section is reissued to eliminate the material dealing with the selector mechanism (covered in Section P32.001), to eliminate the general instructions previously contained in the P sections giving requirements and procedures and now contained in Section P30.012, and to add or revise the requirements and procedures.

1.03 In addition to requirements listed herein the 14 type reperforator shall meet requirements of the following sections:

- P30.002—Orientation Tests and Distortion Tolerances
- P30.012—Teletypewriter—General Requirements
- P32.001—Selector Mechanisms

## 2. LUBRICATION

2.01 Reperforators shall be lubricated in accordance with Section P35.603 covering Lubrication of 14 and 20 Type Reperforators.

## 3. REQUIREMENTS AND PROCEDURES

3.01 **Selector-Clutch Torque:** After clutch has been freshly lubricated and motor has been run for at least 10 minutes a pull of Min. 14 ozs., Max. 18 ozs. applied tangentially to the selector stop-arm, when the motor is running, shall hold the selector cam-sleeve from rotating when the selector stop-arm is held just clear of its stop. **Fig. 1**

MIN. 14 OZS.  
 MAX. 18 OZS.  
 TO HOLD SLEEVE  
 STATIONARY

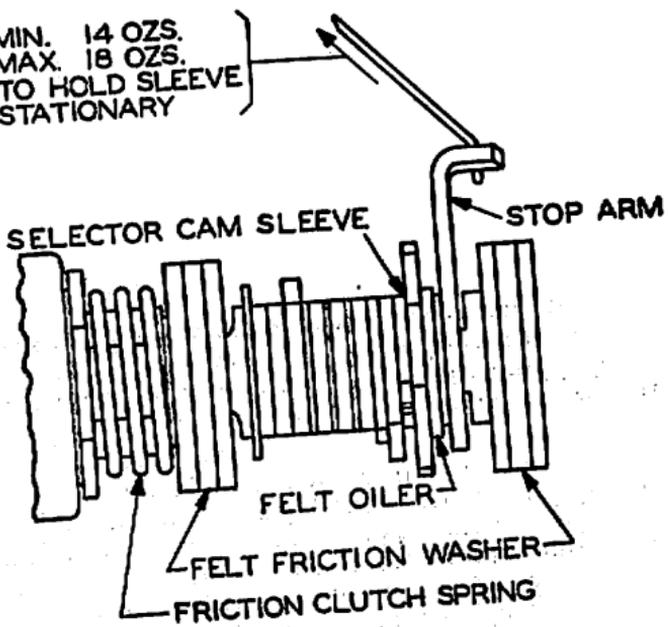


Fig. 1

(a) To adjust, replace felt friction-washers, add or remove spring adjusting-washers, replace spring or on units equipped with a 119541M adjustable capstan-nut, readjust nut.

NOTE: Replacing the felt washers will usually be satisfactory since the spring holds its adjustment over long periods. Before replacing spring, consideration should be given to the addition of washer-shims, 96763M (.012"), 96764M (.016") or 96765M (.020"), around the shoulder of the 72515M nut at the end of the spring nearest the bearing.

(1) To replace felt washers; remove the range-finder assembly, remove the mounting-post nut and loosen the shoulder-screw that mounts the space-out lever and swing the space-out lever to one side, detach locking-lever spring and remove retaining-disc noting that it has a left-hand thread and unscrews to the right (clockwise); remove outer felt-washer, cam-sleeve assembly, cam-sleeve disc, and inner felt-washer, holding selector-levers away from the shaft and rotating cam-sleeve disc until notch in its edge registers with points of the selector-levers. Replace the felt washers with new washers that have been saturated with oil as specified in Section P35.603.

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- (2) To remove friction-clutch spring or add adjusting washers, proceed as in (1) and remove clutch driving-disc and spring.

**CAUTION:** The following adjustment should not be made without first attempting to meet clutch torque requirements by replacing clutch-washers as directed in (1).

- (3) On units equipped with adjustable clutch-spring parts (119541M) the tension may be adjusted to compensate for variations in spring tension. This can be done by turning the capstan-nut with the blade of a 3" screwdriver. Turning the nut in a counter-clockwise direction, as viewed from the selector end of the shaft, increases the tension.

3.02 **Motor** shall be located so that the axis of the pinion-shaft lies in the mid-plane of the main-shaft gear.

(a) Gauge by eye.

(b) To adjust, loosen motor mounting-screws and reposition motor on its mounting-plate, keeping the edges of the motor-base and the mounting-plate parallel.

3.03 **Motor-pinion** and main-shaft gear shall not bind and there shall be barely perceptible backlash between them at the closest point in their revolution.

(a) Gauge bind by feel and backlash by eye, holding pinion and moving main-shaft gear.

(b) To adjust, loosen right motor-plate mounting-screw and the lock-nut of the motor-plate adjusting-screw, slightly loosen other two motor-plate mounting-screws, start motor and carefully readjust vertical position of motor-plate adjusting-screw until gear noise is a minimum. Tighten motor-plate mounting-screws and adjusting-screw lock-nut and recheck backlash.

**CAUTION:** In making this adjustment with the motor running care should be taken to avoid damaging the main-shaft gear or overloading the motor as the result of too close mesh between the gear and pinion.

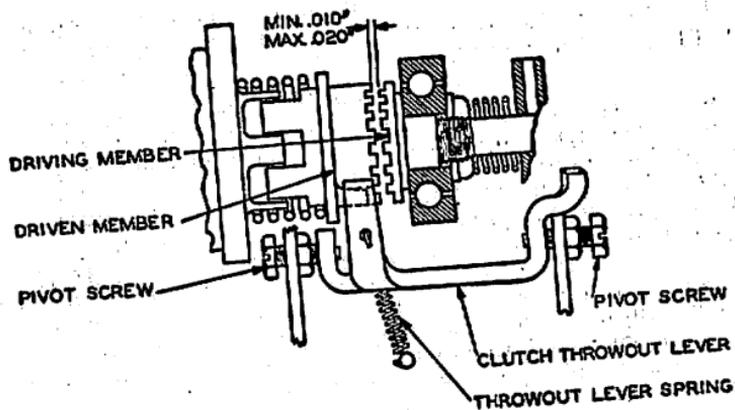


Fig. 2

3.04 **Main-shaft clutch teeth** shall clear each other by Min. .010", Max. .020" when clutch is fully cammed out of engagement. Fig. 2

(a) To adjust, reposition clutch-throwout lever pivot-screws making sure that the throwout lever is free in its bearings, without perceptible end play when pivot-screw lock-nuts are tightened.

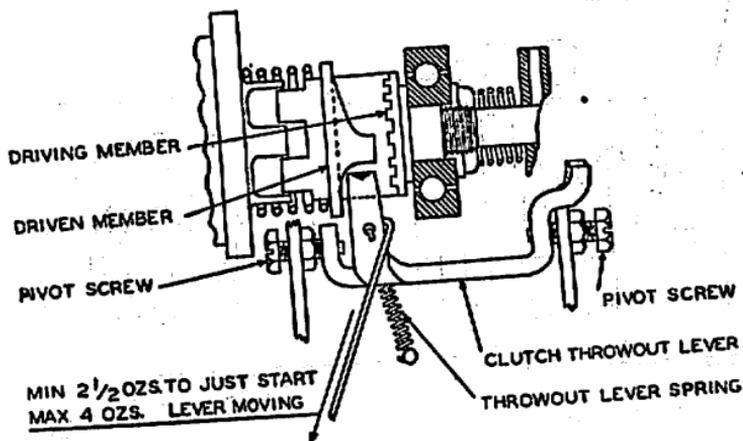


Fig. 3

3.05 **Clutch-throwout-lever spring** shall have a tension of Min. 2-1/2 oz., Max. 4 oz. measured at right angles to

the throwout lever, at the spring-hole, when the clutch-teeth are fully engaged and the clutch-throwout lever is resting against the low part of the driven clutch-member.

NOTE: Remove large chad-chute. Fig. 3

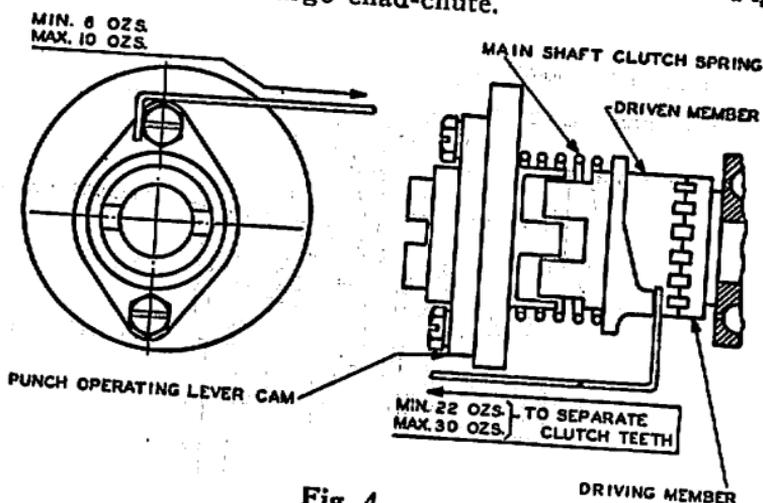


Fig. 4

3.06 **Main-shaft clutch spring** shall have a tension of Min. 22 oz. Max. 30 oz. to separate the clutch-teeth. With the teeth of the driven clutch-member resting against the teeth of the driving clutch-member, but not engaged, hook the scale over the throwout-cam on the driven clutch-member and pull as nearly in line with the shaft as possible.

Fig. 4

3.07 **Clutch driven-member**, after being pulled manually to position of extreme disengagement, as in 3.06, shall start and slide until it engages with or touches the driving-member teeth as the force opposing the clutch-spring is reduced to not less than 10 oz. For identification of parts see Fig. 4.

(a) To adjust, clean and lubricate clutch. If sliding surface of driven-member and bushing on which it slides are not smooth and polished, replace these parts.

NOTE: Failure to receive first character after a period of idleness may be caused by sticking of main-shaft-clutch parts. If trouble of this nature is reported it may be checked for by observing punching of the first character received after main-shaft has been at rest for at least 10 minutes, with power disconnected.

NOTE: Replace large chad-chute.

3.08 **Punch Operating-Lever-Cam Friction-Clutch.** A 10 oz. pull applied to the punch operating-lever-cam-screw perpendicular to the plane passing through the two cam mount-

ing-screws, with motor running, selector magnet operated and punch operating-lever held away from its cam, shall move cam in a direction opposite to that of normal rotation. A pull of 6 oz. applied under the same conditions shall not so move the cam.

Fig. 4

(a) This measurement requires considerable care, and observations should be made only when it is thought that cam is not keeping in speed with main-shaft. If necessary to check this feature, hold punch-operating-lever away from cam, block magnet-armature in operated position, so main-clutch will not engage, hook scale over the top screw of cam and pull in a direction reverse to normal rotation until cam just starts to move.

NOTE: Pulling too far will tend to make main clutch engage and give a greater reading, therefore only a slight backward motion of the cam should be given.

CAUTION: It is important to keep clutch stop-arm against driven jaw to prevent main-clutch engaging and winding scale around main-shaft; so either keep armature operated to avoid tripping clutch stop-arm, or block or clamp clutch stop-arm so that main-clutch cannot engage.

3.09 Punch-arm shaft shall turn freely with just perceptible end play and the end of the shaft shall be flush with the front of the front bearing-block when the punch-arm is held against the front bearing-block.

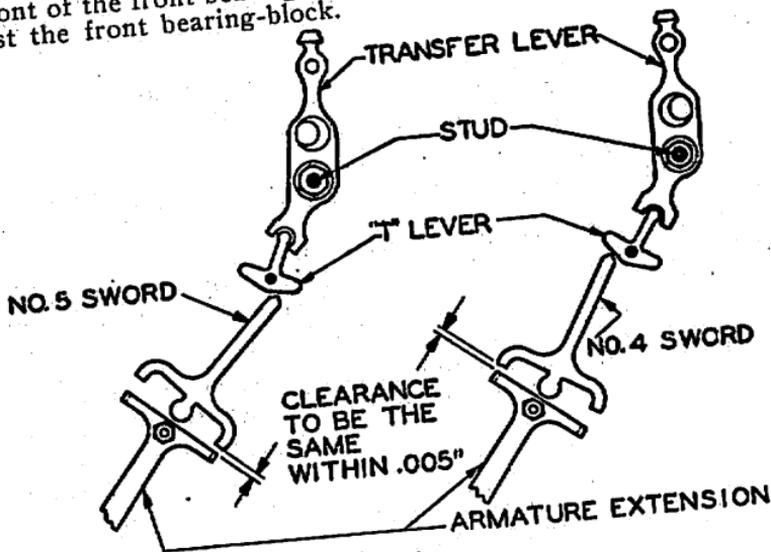


Fig. 5

- (a) Gauge by eye and feel.
- (b) To adjust position of shaft, remove punch-hammer spring and reposition punch-arm by means of its set screws. To adjust end play of shaft reposition rear bearing-bracket-collar by means of its set screws. Reassemble punch-hammer spring.

3.10 **Punch-Unit Bracket.** Clearance between engaging surfaces of the No. 5 sword and the armature extension with the armature unoperated shall be the same within .005" as that between the No. 4 sword and the armature-extension with the armature operated when the No. 4 transfer-lever is in its left (spacing) position, the No. 5 transfer-lever is in its right (marking) position and the selector cam-sleeve in the stop position.

Fig. 5

- (a) To adjust, loosen two punch-unit-bracket mounting-screws and reposition unit, using rear screw as a pivot.

3.11 **Transfer-levers** shall be positioned so that their forked arms line up in the same vertical planes with the corresponding selector "T" levers. For identification of parts see Fig. 5.

Fig. 5

- (a) Gauge by eye.
- (b) To adjust, loosen transfer-lever-stud lock-nuts and reposition stud.

3.12 **Punch-hammer travel** shall be such that punches are driven through tape sufficiently to punch all holes clearly each time hammer is operated.

- (a) Gauge by punching tape several times with **LTRS** combination set up.
- (b) To adjust, back off punch-hammer adjusting-nut until punches fail to perforate tape when **LTRS** combination is set up and main-shaft is rotated, advance adjusting nut slowly until all holes are just punched clean, and then advance nut an additional 1/4 turn. For identification of parts see Fig. 9.

Fig. 9

**CAUTION: Do not take apart defective punch-blocks. If satisfactory punching cannot be obtained replace entire punch-block assembly. The rust preventive should be removed from the replacing block before it is assembled to the perforator.**

3.13 **Lock-bail wedge** shall be seated firmly between at least two transfer-levers, with the "Y" combination set up and the main-shaft rotated until the punch-hammer is in its extreme upward position. For identification of parts see Fig. 6.

- (a) Gauge by eye and feel.  
 (b) To adjust, reposition lock-bail eccentric-shaft.

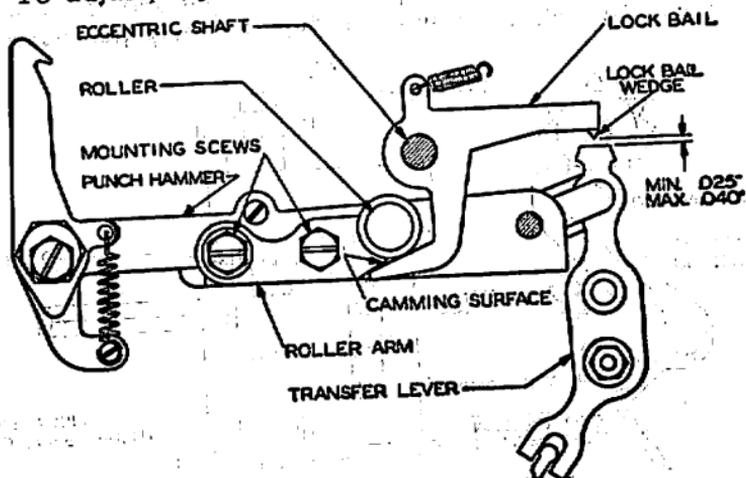


Fig. 6

3.14 Lock-bail wedge shall clear the transfer levers by Min. .025", Max. .040" when the main-shaft is in its stopped position and the transfer-levers are held in center of their travel.

- (a) To adjust, loosen roller-arm mounting-screws and reposition roller-arm. Tighten mounting-screws. Fig. 6

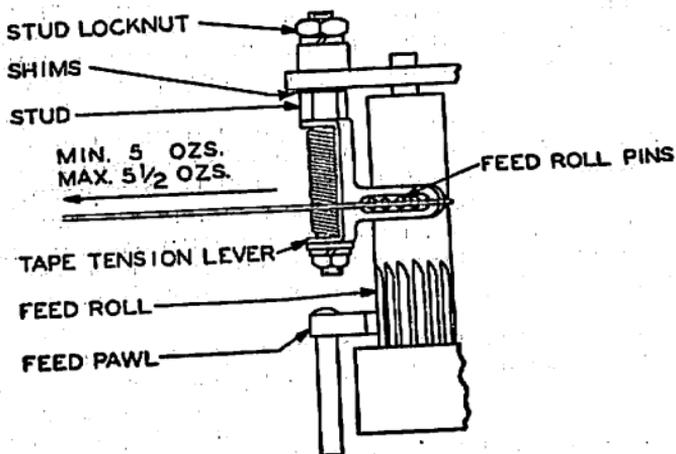


Fig. 7

3.15 **Tape-tension lever** shall not touch tape feed-roll-pins when play in both feed-roll and tension-lever is taken up in opposite directions.

(a) Gauge by eye.

(b) To adjust, reposition tape-tension-lever stud by adding or removing shims between the stud and the mounting-bracket.

Fig. 7

3.16 **Lock-bail spring** tension shall be Min. 6 oz., Max. 10 oz. measured at center of the lock-bail locking edge as the bail starts to move when the main-shaft is in the "stop" position.

(a) Gauge by pulling vertically upward.

3.17 **Punch lever** shall be free of bind and in alignment with their respective punch-block tape-pins when the punch-hammer is in its unoperated (lower) position.

(a) Gauge by eye.

(b) To adjust, loosen punch-hammer-pivot-screw lock-nuts and relocate hammer by repositioning pivot-screws. In locating pivot-screws make sure that punch-hammer is free in its bearings with just perceptible end play and then tighten pivot-screw lock-nuts.

3.18 **Feed-roll** shall rotate freely and have not more than .004" end play when tape-tension-lever, feed-pawl and feed-roll-detent-lever are held clear of the roll.

(a) Gauge by feel.

(b) To adjust, reposition feed-roll bearing-plate to eliminate bind and add or remove shims between punch-block and feed-roll bearing-plate to adjust end play.

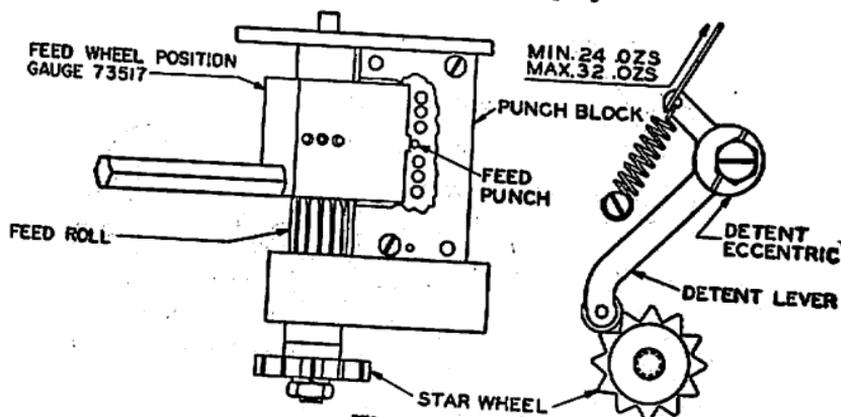


Fig. 8

3.19 **Feed-roll-detent spring** tension shall be Min. 24 ozs., Max. 32 ozs. measured behind spring-hole in the detent-lever as the detent-roller starts moving from the star-wheel.

(a) Gauge by pulling in line with the spring.

3.20 **Tape-stripper-plate** upper edge shall clear the feed-roll by not more than .010" throughout a complete revolution of the feed-roll.

(a) Gauge by eye.

(b) To adjust, loosen tape-stripper-plate mounting-screws and reposition plate.

3.21 **Tape-tension-lever spring:** The tape-tension-lever shall bear against feed-roll with a pressure of Min. 5 oz., Max. 5-1/2 oz. measured at end of lever and perpendicular to a plane passing through center of tension-lever-stud and end of lever.

(a) To adjust, loosen tape-tension-lever-stud lock-nut and rotate stud clockwise or counterclockwise to increase or decrease spring tension respectively.

3.22 **Feed-Roll Detent—Preliminary Setting—**(Final Setting Par. 3.25)—Distance from center of feed-punch to the punch-arm roller is on a high part of its cam.

(a) To check, hold tape-tension lever away from feed-roll and insert feed-wheel position gauge 73517M in punch-block so that projection of gauge stops against feed-punch. With gauge in this position a feed-roll pin should line up with the middle hole in the gauge.

(b) To adjust, loosen feed-roll detent-lever-screw and turn eccentric bushing until middle hole of gauge fits freely over feed-roll pin. Tighten feed-roll-detent-screw, remove gauge, and restore tape-tension lever to its normal position.

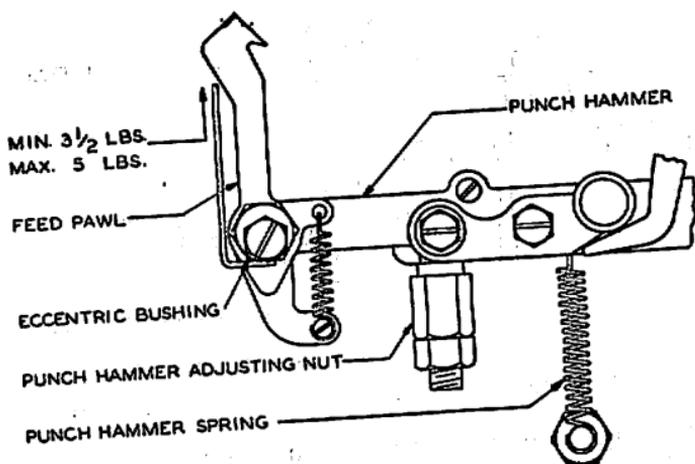


Fig. 9

3.23 Feed-pawl shall engage the next feed-roll ratchet tooth when the main-shaft has been rotated until the selected punch-levers clear the punch-pins by not more than .020".

(a) To adjust, reposition feed-pawl eccentric.

Fig. 10

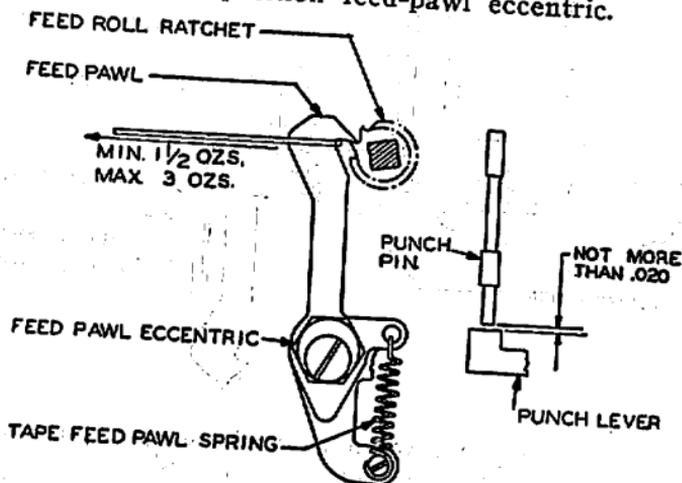


Fig. 10

3.24 Feed-pawl spring tension shall be Min. 1-1/2 oz., Max. 3 oz. measured at feed-pawl notch as pawl starts to

move.

3.25 Feed-Roll Detent—Final Setting (Preliminary Setting Par. 3.22)—Perforations in tape shall be evenly spaced, 10. to the inch, with an allowable variation of  $\pm .007$ " in a 4" length.

Fig. 10

(a) To check, perforate a series of nine "blank" and one LTRS combinations seven or eight times, place the tape on top of a 95960M gauge, then hold tape and gauge up to a light background and align a No. 3 code hole in the tape with the hole 1-1/2 inches from the left end of the gauge. Gauge holes shall be visible through all No. 3 code holes to the right of the point of alignment and the code hole above the large hole at the right end of the gauge shall fall entirely within the circumference of the gauge hole.

(b) To adjust, loosen feed-roll-detent screw and reposition eccentric bushing.

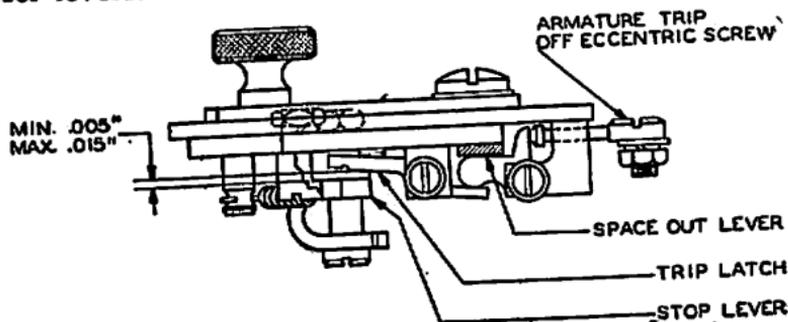
NOTE: If feed-roll-detent eccentric is changed, re-check 3.23.

3.26 Tape-guide shall be positioned so that tape may be readily inserted into punch-block.

(a) Gauge by inserting tape.

(b) To adjust, loosen guide mounting-screws and reposition guide.

3.27 **Punch-hammer spring** tension shall be Min. 3-1/2 lbs., Max. 5 lbs., measured at feed-pawl eccentric-bushing as the punch-hammer starts to move when the main-shaft clutch is disengaged and the lock-bail is held away from the transfer-levers. **Fig. 9**



**Fig. 11**

3.28 **Space-out lever** shall not bind and shall hold trip-latch so that it clears the stop-lever by Min. .005", Max. .015" when the space-out lever is in its "down" position. **Fig. 11**

- (a) Gauge minimum by eye and maximum with wire gauge.  
(b) To eliminate bind, reposition space-out lever guide-post. To adjust clearance, bend lower end of space-out lever.

3.29 **Space-out-lever spring** tension shall be Min. 5 oz., Max. 8 oz., measured on top of the manual space-out lever as lever starts to move.

- (a) Gauge by pushing down on lever.

3.30 **Outer motor-unit slip-connector springs** shall have a tension of Min. 2 lbs., Max. 4 lbs., measured at the end of the springs just below the head of the motor-block terminal-screw as the springs break contact with the terminal-screw when the motor-unit is mounted in its proper position.

- (a) To gauge, remove chad-drawer and guide.  
(b) To adjust, remove motor and bend springs.

3.31 **Inner motor-unit slip-connector spring** ends shall be within .015" of a straightedge laid across the two outer slip-connector springs (adjusted in accordance with 3.30) when the motor is removed from the base.

- (a) To adjust, bend springs.

