

MAY 27 1964

BULLETIN 127B

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ADJUSTMENTS AND LUBRICATION

MODEL 14

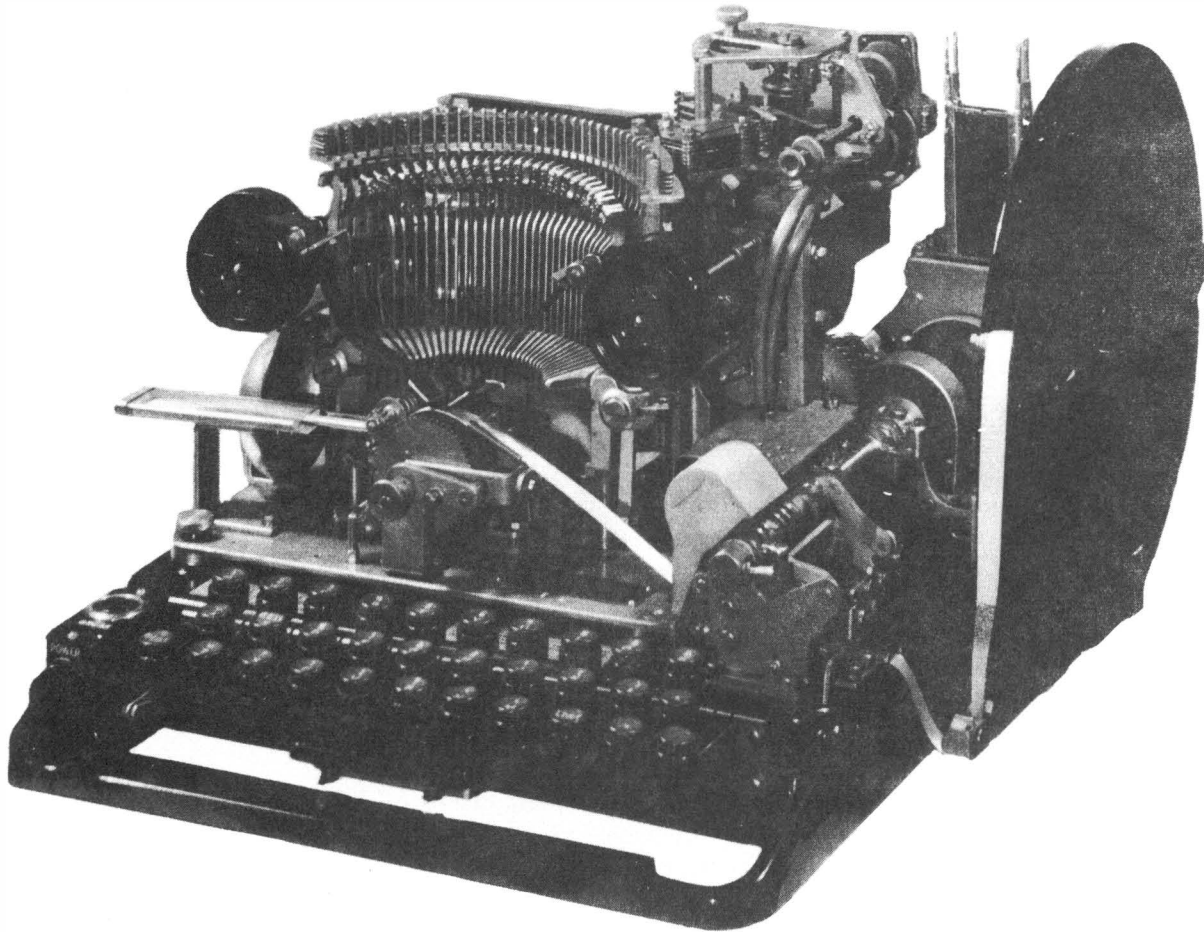
TYPE BAR TAPE PRINTER

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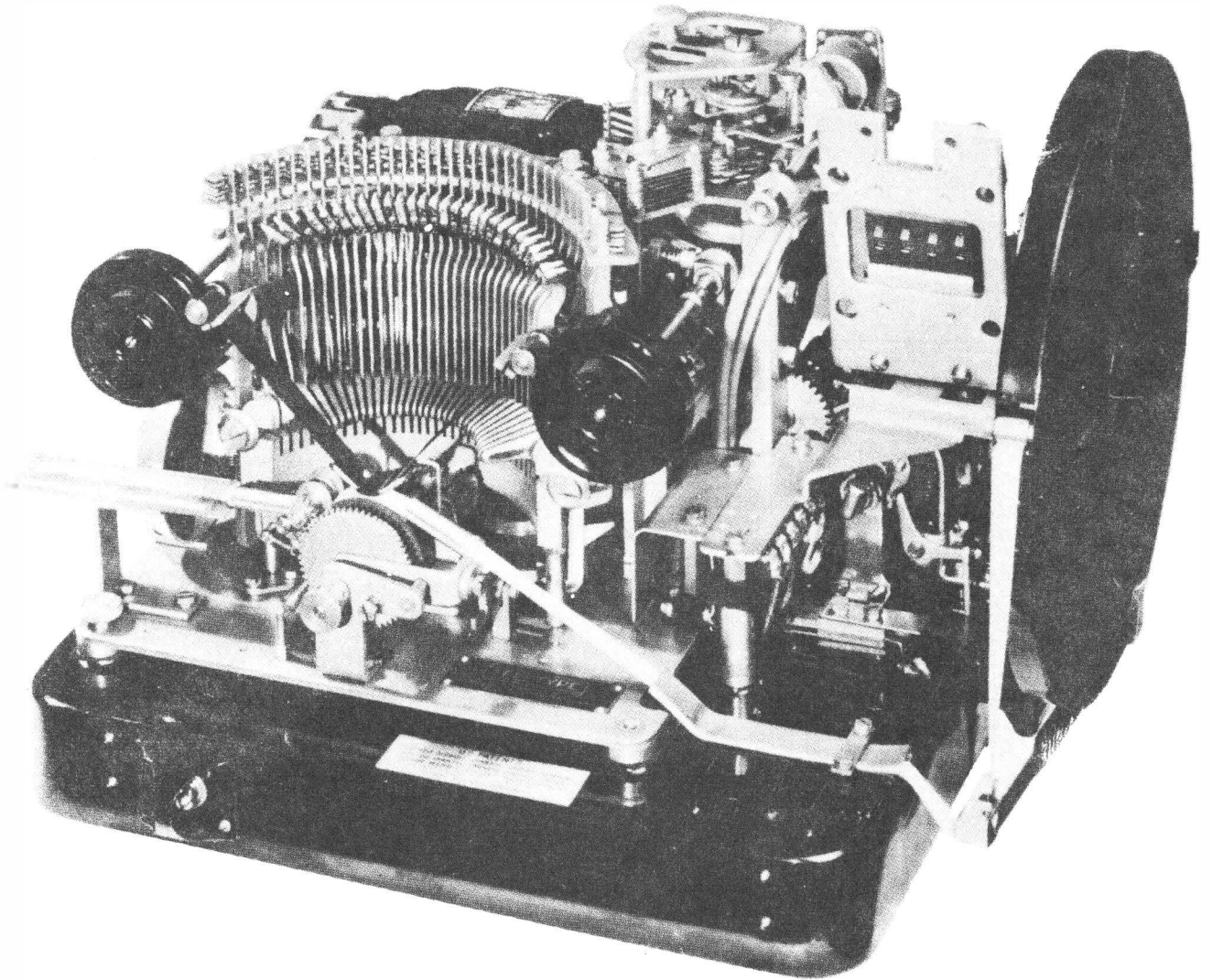
**TELETYPE<sup>®</sup>**  
**CORPORATION**  
SUBSIDIARY OF *Western Electric Company* INC.  
CHICAGO, ILLINOIS, U. S. A.







MODEL 14 SENDING—RECEIVING TAPE PRINTER  
( LESS COVER )



MODEL 14 RECEIVING-ONLY TAPE PRINTER  
( LESS COVER )

## LIST OF EFFECTIVE PAGES

AUGUST, 1959

Supersedes September, 1946 Issue

PAGE	CHANGE IN EFFECT
Title Page A to E	Original Original
1 to 41	Original

The above list indicates the effective pages as of the date of issue. Upon receipt of change pages, insert them numerically and discard any superseded pages.

## CONTENTS

Paragraph	Page
1. GENERAL -----	1
1.a. Adjustment -----	1
1.b. Spring Tensions -----	1
1.c. Motor Speed Adjustment -----	1
1.d. Receiving Range Adjustment -----	1
1.e. Pulling Magnet Selector -----	1
2. ADJUSTMENTS-----	2
2.a. Typing Unit -----	2
2.a.(60) Bell and Break Contact Mechanism Adjustment -----	14
2.a.(60)(a) Double Contact Mechanism -----	14
2.a.(60)(a)2. Bell Hammer Adjustment-----	14
2.a.(60)(a)3. Break Signal Contact Spring Adjustment -----	14
2.a.(60)(a)4. Contact Mounting Screws Adjustment-----	14
2.a.(60)(a)5. Contact Springs Adjustment -----	14
2.a.(60)(a)6. Detent Arm Spring Tension -----	14
2.a.(60)(b) Single Contact Mechanism -----	14
2.a.(60)(b)1. Contact Springs Adjustment for Single Contact Mechanism. ----	14
2.a.(56) Bell Hammer Eccentric Screw Adjustment-----	13
2.a.(22) Carriage Bracket Locating Plate -----	10
2.a.(32) Carriage Extension Adjustment-----	11
2.a.(23) Carriage Locking Pawl Post Adjustment -----	10
2.a.(30) Carriage Locking Pawl Spring Tension -----	11
2.a.(29) Carriage Return Spring Tension -----	10
2.a.(14) Function Bar Bracket Plates Adjustment -----	9
2.a.(8) Holding Magnet Selector Mechanism Adjustments-----	5
2.a.(8)(a) Armature Pivot Screw Adjustment -----	5
2.a.(8)(l) Armature Spring Tension Adjustment -----	7
2.a.(8)(f) Locking Lever Spring Tension-----	6
2.a.(8)(e) Locking Wedge Adjustment -----	6
2.a.(8)(d) Selector Arm Bracket Adjustment -----	5
2.a.(8)(m) Selector Arm Operating Screw Adjustment -----	7
2.a.(8)(c) Selector Arm Pivot Screw Adjustment -----	5
2.a.(8)(n) Selector Arm Spring Tension -----	7
2.a.(8)(g) Selector Arm Stop Detent Adjustment-----	6
2.a.(8)(h) Selector Arm Stop Detent Spring Tension-----	6
2.a.(8)(i) Selector Lever Spring Tension -----	6
2.a.(8)(b) Selector Magnet Adjustment -----	5
2.a.(8)(k) Selector Magnet Bracket Adjustment -----	6
2.a.(8)(j) Selector Magnet Bracket Position Adjustment -----	6
2.a.(8)(r) Selector Stop Arm and Stop Lever Engagement Adjustment -----	7
2.a.(8)(o) Stop Lever Eccentric Screw Adjustment -----	7
2.a.(8)(q) Stop Lever Spring Tension -----	7
2.a.(8)(p) Trip Latch Spring Compression -----	7
2.a.(8)(s) Trip-Off Screw Adjustment-----	8
2.a.(54) Left Function Pull Bar Spring Bracket Adjustment -----	13
2.a.(41) Left Ribbon Reverse Arm Shaft Adjustment -----	10
2.a.(24) Left Tape Guide Adjustment -----	10
2.a.(18) Main Bail Adjusting Screw Adjustment -----	10
2.a.(58) Main Bail Cam Clutch Torque -----	13
2.a.(16) Main Bail Guide Post Adjustment -----	9
2.a.(2) Main Shaft Adjustment -----	2
2.a.(5) Main Shaft Clutch Spring Tension -----	2
2.a.(3) Main Shaft Clutch Throwout Lever Adjustment -----	2
2.a.(4) Main Shaft Clutch Throwout Lever Spring Tension -----	2
2.a.(61) Mechanical End-Of-Line Indicator Adjustment -----	14
2.a.(61)(h) Cam Lever Spring Tension -----	15

## Paragraph

## Page

2.a.(61)(c) Contact Bracket Adjustment -----	14
2.a.(61)(g) Feed Pawl Spring Adjustment -----	14
2.a.(61)(b) Lamp Contact Adjustment -----	14
2.a.(61)(f) Release Bail Spring Tension -----	15
2.a.(61)(d) Worm Follower Adjustment -----	14
2.a.(61)(e) Worm Follower Spring Tension -----	15
2.a.(61)(a) Worm Shaft End Play -----	14
2.a.(63) Mechanical Motor Control Mechanism On Upper Case "H" Adjustments -----	15
2.a.(63)(h) Contact Lever Adjusting Screw Adjustment -----	16
2.a.(63)(a) Contact Lever Bracket Adjustment -----	15
2.a.(63)(d) Contact Lever Spring Tension -----	15
2.a.(63)(b) Latch Lever Bracket Extension Adjustment -----	15
2.a.(63)(c) Latch Lever Extension Adjustment -----	15
2.a.(63)(e) Latch Lever Spring Tension -----	15
2.a.(63)(i) Main Bail Spring Adjustment -----	16
2.a.(63)(g) Motor Control Contacts Adjustments -----	16
2.a.(63)(f) Operating Lever Spring Tension -----	16
2.a.(62) Mechanism to Prevent Printing and Spacing on Lower Blank Adjustments -----	15
2.a.(62)(b) Space Suppression Lever Adjustment -----	15
2.a.(62)(a) Space Suppression Lever Stop Arm Adjustment -----	15
2.a.(6) Motor Position Adjustment -----	2
2.a.(65) Positive Carriage Shift Mechanism Adjustment -----	16
2.a.(65)(d) Carriage Capstan Nuts Adjustment -----	17
2.a.(65)(c) Carriage Locking Toe Adjustment -----	16
2.a.(65)(i) Figures Locking Pawl Spring Tension -----	17
2.a.(65)(b) Figures Stop Screw Adjustment -----	16
2.a.(65)(a) Locking Pawl Post -----	16
2.a.(65)(e) Shift Plate -----	17
2.a.(65)(f) Shift Plate Eccentric -----	17
2.a.(65)(h) Shift Plate Eccentric (Units Equipped With #84584 Release Pull Bar) -----	17
2.a.(65)(g) Shift Plate (Units Equipped With #84584 Release Pull Bar) -----	17
2.a.(17) Pull Bar Guide Adjustment -----	9
2.a.(35) Pull Bar Lock-Out Lever Adjustment -----	11
2.a.(15) Pull Bar Springs Tension -----	9
2.a.(7) Pulling Magnet Selector Mechanism Adjustments -----	2
2.a.(7)(h) Armature Locking Lever Spring Tension -----	4
2.a.(7)(g) Armature Locking Wedge Adjustment -----	4
2.a.(7)(f) Armature Stops Adjustment -----	4
2.a.(7)(m) Armature Trip-Off Eccentric Screw Adjustment -----	5
2.a.(7)(o) Magnet Bracket Adjustment -----	5
2.a.(7)(n) Magnet Coils Adjustment -----	5
2.a.(7)(c) Selector Armature Adjustment -----	3
2.a.(7)(e) Selector Armature Bracket Adjustment -----	3
2.a.(7)(d) Selector Armature Bracket Link Adjustment -----	3
2.a.(7)(a) Selector Armature Bracket Link Friction Adjustment -----	2
2.a.(7)(b) Selector Lever Spring Tension -----	3
2.a.(7)(i) Stop Lever Eccentric Screw Adjustment -----	4
2.a.(7)(j) Stop Lever Spring Tension -----	4
2.a.(7)(l) Trip Latch Spring Compression -----	4
2.a.(64) Push Tape Feed Mechanism Adjustment -----	16
2.a.(64)(b) Figures Stop Screw Adjustment -----	16
2.a.(64)(a) Locking Pawl Post -----	16
2.a.(64)(c) Tape Feed Roll Spring Tension -----	16
2.a.(49) Ribbon Check Pawl Adjustment -----	13
2.a.(50) Ribbon Check Pawl Spring Pressure -----	13
2.a.(12) Ribbon Feed Lever Spring Tension -----	9
2.a.(51) Ribbon Feed Pawl Adjustment -----	13
2.a.(52) Ribbon Feed Pawl Spring Pressure Adjustment -----	13
2.a.(48) Ribbon Feed Shaft Detent Plunger Spring Compression -----	13
2.a.(47) Ribbon Feed Shaft Safety Spring Compression -----	12
2.a.(36) Ribbon Guide Adjustment -----	11



Paragraph	Page
2.a.(42) Ribbon Reverse Arm Shaft Adjustment -----	12
2.a.(43) Ribbon Reverse Arm Shaft Collar Adjustments-----	12
2.a.(45) Ribbon Reverse Arm Yield Spring Tension Adjustment -----	12
2.a.(44) Ribbon Reverse Pawl Link Adjustments-----	12
2.a.(39) Ribbon Spool Bracket Adjustment -----	12
2.a.(37) Ribbon Spool Cups Adjustment -----	11
2.a.(46) Ribbon Spool Shaft Slot Adjustment -----	12
2.a.(40) Ribbon Spool Shaft Spring Compression Adjustment -----	12
2.a.(53) Right and Left Ribbon Reverse Pawls Spring Tension -----	13
2.a.(38) Right and Left Ribbon Spool Shaft Gears Adjustments-----	11
2.a.(55) Right Function Pull Bar Spring Bracket Adjustment -----	13
2.a.(25) Right Tape Guide Adjustment -----	10
2.a.(59) Selector Clutch Torque -----	14
2.a.(1) Selector Separator Plate Adjustment -----	2
2.a.(33) Shift Rocker Adjustment-----	11
2.a.(31) Shift Rocker Lever Post Adjustment -----	11
2.a.(28) Shift Rocker Post Adjustment-----	10
2.a.(57) Signal Bell Adjustment -----	13
2.a.(9) Spacer Detent and Spacer Detent Lever Spring Tension -----	8
2.a.(10) Spacer Feed Pawl Spring Tension -----	8
2.a.(20) Spacer Locking Bail Finger Adjustment -----	10
2.a.(13) Spacer Locking Bail Spring Tension -----	9
2.a.(19) Spacer Locking Pawl Bracket Adjustment -----	10
2.a.(21) Spacer Locking Pawl Springs Tension-----	10
2.a.(11) Spacer Operating Lever Spring Tension-----	9
2.a.(27) Tape Chute Adjustment -----	10
2.a.(26) Tape Feed Roll Spring Tension -----	10
2.a.(34) Type Bar Removal -----	11
2.a.(66) Unshift On Space Pull Bar Blocking Mechanism -----	18
 2.b. Keyboard Base Adjustments -----	 18
2.b.(6) Bell Hammer Extension Stop Adjustment -----	18
2.b.(7) Bell Hammer Spring Tension -----	18
2.b.(17) Clutch Spring Compression -----	19
2.b.(16) Clutch Throwout Lever Adjustment-----	19
2.b.(20) Clutch Throwout Lever Eccentric Adjustment -----	19
2.b.(22) Clutch Throwout Lever Spring Tension-----	19
2.b.(26) Control Relay Adjustments -----	20
2.b.(4) Gear Guard Adjustment-----	18
2.b.(19) Intermediate Pawl Eccentric Adjustment -----	19
2.b.(18) Lock Loop Roller Adjustment-----	19
2.b.(10) Lock Loop Spring Tension -----	18
2.b.(12) Locking Lever Shaft Adjustment -----	18
2.b.(13) Locking Lever Travel -----	18
2.b.(9) Locking Pawl Spring Tension-----	18
2.b.(27) Mechanical Motor Control Mechanism Adjustment -----	21
2.b.(27)(e) Armature Stop Adjustment-----	21
2.b.(27)(j) Inner Contact Assembly Adjustment -----	21
2.b.(27)(f) Latch Backstop Screw Adjustment -----	21
2.b.(27)(i) Latch Spring Tension -----	21
2.b.(27)(k) Outer Contact Assembly Adjustment -----	21
2.b.(27)(h) Start Magnet Armature Spring Tension -----	21
2.b.(27)(c) Start Magnet Bracket Adjustment-----	21
2.b.(27)(a) Start Magnet Core Adjustment -----	21
2.b.(27)(g) Stop Magnet Armature Spring Tension-----	21
2.b.(27)(d) Stop Magnet Bracket Adjustment -----	21
2.b.(27)(b) Stop Magnet Core Adjustment -----	21
2.b.(25) Repeat On "S" Mechanism Adjustment -----	20
2.b.(25)(a) Repeat Space Rod Spring Tension -----	20
2.b.(25)(b) Repeat Yoke Lug Adjustment -----	20

Paragraph	Page
2.b.(24) Repeat On Space Mechanism Adjustments -----	20
2.b.(24)(d) Jack Spring Tension -----	20
2.b.(24)(f) Key Lever Spring Adjustment -----	20
2.b.(24)(a) Repeat Space Rod Adjustment -----	20
2.b.(24)(b) Repeat Space Rod Bracket Adjustment -----	20
2.b.(24)(c) Tape Guide Tube Adjustment -----	20
2.b.(24)(e) Typing Unit Slip Connections Spring Tension Adjustment -----	20
2.b.(2) Tape Lever Adjusting Clamp Adjustment -----	18
2.b.(8) Tape Lever Spring Tension -----	18
2.b.(5) Tape-Out Bell Adjustment -----	18
2.b.(11) Transmitting Cam Cylinder Adjustment -----	18
2.b.(14) Transmitting Contacts Gap Adjustment -----	18
2.b.(15) Transmitting Contacts Spring Pressure -----	19
2.b.(21) Trip-Off Pawl Eccentric Adjustment -----	19
2.b.(23) Trip-Off Pawl Spring Tension -----	19
2.b.(3) Trip-Off Pawl Stop Plate Adjustment -----	18
2.b.(1) Universal Bar Pilot Screws Adjustment -----	18
 2.c. Governor Adjustments -----	 22
2.c.(10) Governor Adjusting Bracket Adjustment -----	23
2.c.(6) Governor Brush Position -----	22
2.c.(8) Governor Brush Spring Plate Bracket Adjustment -----	23
2.c.(9) Governor Brush Spring Pressure -----	23
2.c.(9)(a) Inner Disc Brush Spring -----	23
2.c.(9)(b) Outer Disc Brush Spring -----	23
2.c.(3) Governor Brush Spring Requirement -----	22
2.c.(4) Governor Shims Adjustment -----	22
2.c.(7) Inner and Outer Disc Contact Spring Adjustment -----	22
2.c.(5) Speed Adjustment Lever Stop Plate Adjustment -----	22
2.c.(2) Speed Adjusting Wheel Friction Washer Spring Tension Adjustment -----	22
 2.d. Synchronous Motors -----	 23
2.d.(1) Starting Switch Adjustments -----	23
 3. LUBRICATION -----	 24
3.a. Typing Unit -----	24
3.a.(46) Bell and Break Contact Mechanism -----	25
3.a.(47) Mechanical End-Of-Line Indicator Mechanism -----	25
3.a.(49) Motor Control On Upper Case "H" Mechanism -----	25
3.a.(50) Push Tape Feed -----	25
3.a.(48) Suppression Of Printing and Spacing On Lower Case Of BLANK Mechanism -----	25
3.b. Keyboard -----	25
3.b.(21) Motor Control On Upper Case "H" -----	26

## ADJUSTMENTS AND LUBRICATION

1. GENERAL

1.a. ADJUSTMENTS - This bulletin covers requirements and adjusting procedures for the maintenance of Model 14 Printers. Adjustments are arranged in a sequence that would be followed if a complete readjustment of a unit were undertaken. In following such a procedure, parts or assemblies which are removed to facilitate adjustment should not be replaced until all other adjustments are made which would be facilitated by the removal of these parts. If one adjustment is changed, related adjustments should be checked.

1.b. SPRING TENSIONS - The spring tension values indicated in this bulletin are scale readings which should be obtained when Teletype scales are used as specified. Springs which do not meet the requirements specified and for which no adjusting procedure is given should be replaced by new springs. Ordering information may be obtained from the Teletype parts bulletin.

Before proceeding with any adjustment or tension, read the applicable portion of the text carefully. After the adjustment is completed, be sure to tighten any screws or nuts which may have been loosened. If a part that is mounted on shims is to be dismantled, the number of shims used at each of its mounting screws should be noted so that the same shim pile-ups can be replaced when the part is remounted.

Care should be exercised in removing or installing the cover to avoid damaging parts in close proximity. As a precaution, raise or lower the cover slowly with a vertical movement.

1.c. MOTOR SPEED ADJUSTMENT - 110 volt 50 or 60 cycle synchronous motors may be used on 110 volt 50 or 60 cycle alternating current power supply unless the frequency varies more than plus or minus .75%; in which case series wound governed motors should be used. When governed motors are used, a speed indicating fork is required for the purpose of checking the motor speed. The fork is equipped with shutters attached to the end of the tines. The governor is equipped with a target having alternate black and white spots (Figure 85).

To check the speed, the target should be well illuminated. Tap the fork gently to make it vibrate. Hold the fork so that the shutters are close to the eye and view the target through the openings in the shutters. If the motor is running at the correct speed, the target will appear stationary. If the motor speed is too fast, the target will appear to be moving in the direction of rotation; if too slow, in the opposite direction.

NOTE: There is a possibility of setting the speed incorrectly, due to getting a speed multiple; i.e., the speed could be half the desired speed, or some multiple thereof, even though the spots appear stationary when viewed through the shutters on the tuning fork. This should be kept in mind if trouble is experienced in the operation of the unit.

When increasing or decreasing the motor speed, the speed adjusting lever or the governor adjusting bracket, respectively, should be momentarily depressed. (See Figure 85 for location of parts).

1.d. RECEIVING RANGE ADJUSTMENT - Mounted on the selector above the end of the main shaft is a range finder assembly which is used for the purpose of orientating the selector to incoming signals.

Before proceeding to measure the receiving range on a unit equipped with a pulling magnet selector, turn the selector armature spring adjusting screw to a position where it will require 6 to 6-3/8 ozs.\* to stretch the armature spring to its position length. Then transmit RY (the letters R and Y sent alternately) to the printer continually while the receiving range is being determined. This procedure is described in the following paragraphs.

While RY is being received, loosen the index arm thumb screw and shift the index arm of the range finder toward 0 until errors appear in the copy. Then move the arm back slowly until errors no longer appear; at least 72 characters should be received without error. This position indicates one limit of the orientation range. Note the position of the index arm on the scale. Determine the opposite end of the receiving range by repeating the foregoing procedure with the index arm near the opposite end of the scale. After the two limits of the receiving range have been found, set the index arm of the range scale midway between these two points.

NOTE: If facilities for transmitting biased test signals to the receiving unit are available, the index arm should be set at the optimum setting for the reception of biased signals.

1.e. PULLING MAGNET SELECTOR

\* If unit is equipped with a holding magnet selector See Page 7

1.e.(1) When a distortion test set is available for measuring the receiving margins of a unit, the armature spring tension may be varied from 6 to 7 ounces in order to obtain the specified receiving margins. This tension should be checked with the armature in the marking position and the spring stretched to position length.

1.e.(2) When no distortion test set is available, but the unit is equipped with a line relay, the selector armature spring adjusting screw should be positioned so that it will require from 6 to 6-3/8 ounces to stretch the spring to position length when the armature is in its marking position.

To check, unhook the spring from the adjusting screw, hook an 8 oz. scale in the spring eye, and pull in line with the screw.

1.e.(3) When no distortion test set is available and the unit is not equipped with a line relay, turn the armature spring adjusting screw in a clockwise direction until errors appear in the copy. Then, from this point, count the number of turns the adjusting screw can be turned in a counterclockwise direction before errors again appear in the copy. Turn the adjusting screw back (clockwise) half this number of turns to a point midway between the two failing points (the middle of the armature spring margins) and lock the adjusting screw with its lock nut.

NOTE: To secure reliable clutch trip, the tension should be checked to ascertain that it is not below 4-1/2 ozs.

If no errors appear in the copy throughout the entire physical range of the spring so that the above procedure cannot be followed, set the spring tension at 6 to 6-3/8 ozs. and lock the adjusting screw. The orientation range should be rechecked after the armature spring range has been determined.

## 2. ADJUSTMENTS

### 2.a. TYPING UNIT

#### 2.a.(1) SELECTOR SEPARATOR PLATE ADJUSTMENT (Figure 1)

NOTE: The separator plate leaf springs are adjusted during the initial assembly of the unit and should require attention only if the selector has been damaged or dismantled. If it is found necessary to check the adjustment, extreme care should be exercised in the removal and replacement of the selector lever springs to guard against distorting them. The subsequent selector adjustments will be facilitated if the swords and selector levers are replaced in the identical location they formerly occupied.

The leaf springs should exert a light pressure against the swords. To adjust, bend the leaf springs at the narrow portions so that the ends of the springs are .050" to .060" below the under surface of the straight portions.

2.a.(2) MAIN SHAFT ADJUSTMENT - When the main shaft is rotated, the selector cams on the selector cam sleeve should line up with their respective selector levers. To adjust, loosen the four screws that hold the main shaft bearing brackets (Figure 2), and set the position of the main shaft.

2.a.(3) MAIN SHAFT CLUTCH THROWOUT LEVER ADJUSTMENT (Figure 2A) - With the motor operating, open and close the signal line and then stop the motor. There should be from .010" to .020" clearance between the teeth of the two clutch members. Adjust the clutch throwout lever by means of its pilot screws to obtain this clearance. After adjusting, the lever should be free with not more than .002" end play.

2.a.(4) MAIN SHAFT CLUTCH THROWOUT LEVER SPRING TENSION (Figure 2A) - With the clutch throwout lever on the low surface of the driven clutch member, hook an 8 oz. scale over the clutch throwout lever at the spring hole, and pull horizontally at right angles to the clutch throwout lever. It should require 2-1/2 to 4 ozs. to start the lever moving.

2.a.(5) MAIN SHAFT CLUTCH SPRING TENSION (Figure 2B) - With the teeth of the driven clutch member resting against the teeth of the driving member, but not engaged, hook a 32 oz. scale over the throw out cam on the driven clutch member and pull as nearly in line with the shaft as possible. It should require 24 to 30 ounces for 60 WPM and 32 to 42 ounces for 75 WPM speed to separate the clutch teeth.

2.a.(6) MOTOR POSITION ADJUSTMENT - There should be a minimum backlash without binding between the motor pinion and the main shaft gear. Check this backlash for one complete revolution of the main shaft. The position of the motor may be adjusted by means of the motor mounting screws.

2.a.(7) PULLING MAGNET SELECTOR MECHANISM ADJUSTMENTS - The pulling magnet selector illustrated in Figure 6 should meet the following requirements: REMOVE THE RANGE FINDER (See Page 5 for HOLDING MAGNET SELECTOR MECHANISM ADJUSTMENTS)

2.a.(7)(a) SELECTOR ARMATURE BRACKET LINK FRICTION ADJUSTMENT (Figure 3) - Remove the selector bracket link screw. With an 8 oz. scale hooked in the link screw hole and pulled at right angle to the link, it should require some tension, not over 8 ozs., to start the link moving. If necessary, remove the link and adjust the slotted end to obtain this friction. Replace the link and screw.

2.a.(7)(b) SELECTOR LEVER SPRING TENSION (Figure 3) - With the code bars in the MARKING position and with the main bail in its highest position, move the swords manually to the SPACING position. Hook a 32 oz. scale over the end of each selector lever at the selector cam sleeve and pull radially to the main shaft. It shall require from 6 to 10 ozs. to start each selector lever moving.

NOTE: When making this check, be sure that the selector levers are free and without bind.

2.a.(7)(c) SELECTOR ARMATURE ADJUSTMENT (Figure 4) - The armature should be free on its pivot screws, with barely perceptible endplay. There should be some clearance, not more than .008", between the lower surface of the armature locking wedge and the No. 1 sword under the following conditions:

2.a.(7)(c)1. No. 1 selector lever resting on the peak of its cam.

2.a.(7)(c)2. No. 1 sword held against the upper separator plate without bending the latter.

2.a.(7)(c)3. Armature end play taken up in a direction to reduce the specified clearance to a minimum.

To adjust, proceed as follows:

If there is no clearance between the armature locking wedge and the No. 1 sword, loosen the lock nut on the upper pivot screw and adjust to obtain clearance, noting that a quarter-turn of the screw is equivalent to approximately .006". Remove the armature bracket and adjust lower pivot screw to obtain the proper armature end play. Replace the armature bracket.

If there is more than .008" clearance, remove the armature bracket and adjust the lower pivot screw. Replace the bracket and adjust the armature end play by means of the upper pivot screw.

2.a.(7)(d) SELECTOR ARMATURE BRACKET LINK ADJUSTMENT (Figures 5 and 6) - See Note (A) The position of the armature bracket should be such that a line through the center of the No. 1 sword extends approximately through the centers of the armature pivot screws when the swords are held midway between the stop posts by means of the No. 72581 gauge pins. To adjust, proceed as follows:

2.a.(7)(d)1. Unhook the locking lever spring, loosen the magnet bracket mounting screws, and move the bracket to its rearmost position. Loosen the armature bracket mounting screws, the link screw, and back off the armature stops. Move the bracket eccentric out of the way, so that it will not interfere with the adjustment. Rotate the main shaft until the No. 1 se-

lector lever rests on the peak of its cam.

2.a.(7)(d)2. Hold the swords in a position midway between the two stop posts by means of the No. 72581 gauge pins inserted between the stop posts and the swords. Be sure that both the armature extension arms are between the arms of the swords. With the swords held in this position, place the No. 73370 locating gauge over the ends of the No. 1 sword, so that the two legs of the gauge are against the ends of the sword arms. Move the bracket to a position where both the armature extension arms are against the flat surface between the legs of the gauge.

2.a.(7)(d)3. Hold the bracket in this position and tighten the link screw only. Remove the locating gauge and the two gauge pins.

2.a.(7)(e) SELECTOR ARMATURE BRACKET ADJUSTMENT (Figure 6) - See Note (A) - The position of the armature bracket should be such as to provide some clearance, not more than .040", between each sword and either stop post under the following conditions:

Rotate the main shaft until the No. 1 selector lever is resting on the peak of its cam. With the armature in its unoperated SPACING position, move the spacing arm of the No. 1 sword against the armature extension. Place a .040" wire gauge against the spacing stop post and move the armature slowly toward the MARKING position. The blade of the sword should strike the .040" gauge before the armature leaves the spacing arm of the sword. Under these conditions, the armature will move the sword to within not more than .040" of the stop post. Remove the .040" gauge and repeat the foregoing procedure. The armature should leave the spacing arm of the sword before the blade of the sword strikes the spacing stop post. Under these conditions, there should be some clearance between the sword and the stop post.

Unhook the armature spring at its adjusting screw and, with the selector armature in its operated MARKING position, move the marking arm of the No. 1 sword against the selector armature extension. Then rotate the armature slowly toward the SPACING position until the armature just leaves the marking arm of the No. 1 sword. Check the clearance between the No. 1 sword and the marking stop post in the same manner as described in the foregoing paragraph. With each selector lever on the peak of its cam, each associated sword should be tried for the foregoing requirement of some clearance, not more than .040", between each sword and the stop posts.

To adjust, tighten the armature bracket mounting screws just enough so that the bracket may be moved by tapping it lightly. By rotating the bracket on its pivot, the clearance be-

NOTE (A) These requirements should be checked with the range finder assembly removed.

tween the swords and the stop posts may be regulated. If this clearance is more than .040" move the bracket in a direction to bring the armature toward the sword. If there is no clearance, move the bracket in the opposite direction to bring the armature away from the sword.

If the clearance between the sword and one stop post is close to zero and the clearance between the sword and the other stop post is more than .040", it will be necessary to refine the SELECTOR ARMATURE BRACKET LINK as follows:

Loosen the armature bracket mounting screws and the armature bracket link screw and move the armature bracket to the right or left so that the rear end of the link will move in a direction corresponding to the post at which a greater clearance is desired; i.e., if the clearance between the sword and the right stop post is less than that between the sword and the left stop post, move the bracket to the right. Tighten the bracket link screw and proceed to adjust the armature bracket according to the preceding paragraphs.

After the bracket is set and both screws are tightened, move the bracket eccentric against the bracket and tighten its screw. The eccentric and link will, therefore, determine the position of the bracket. The bracket may be removed by simply removing the two bracket screws. In replacing, the bracket should be held against the eccentric stop, while the two bracket screws are tightened.

2.a.(7)(f) ARMATURE STOPS ADJUSTMENT (Figures 6 and 7) - See Note (A) - The No. 1 sword arms (right and left) should clear the associated arm of the selector armature extension by .035" to .037"\* when the front edge of the opposite sword arm is against its armature extension arm and the No. 1 selector lever is on the high part of its cam. To adjust the clearance of the right arm, remove the locking lever spring and reposition the unoperated stop screw with the armature in its unoperated position. To adjust the clearance of the left arm, reposition the operated stop nut with the armature in the operated position, and with the coils energized. If either clearance is changed, recheck the clearance of the other arm. If necessary, pinch the nut to make it tight on its screw. Replace the locking lever spring.

\* The upper limit may be increased up to .042" only if necessary in order to permit meeting the requirements for clearance given under the heading ARMATURE TRIP-OFF ECCENTRIC SCREW ADJUSTMENT.

2.a.(7)(g) ARMATURE LOCKING WEDGE ADJUSTMENT (Figure 8) - There should be .006" to .012" clearance between the point of the armature locking wedge and the point of the locking lever when the locking lever is on the long high part of the lock-

ing cam and the two points are in line. To adjust, move the locking wedge forward or backward in its slot in the armature extension by means of the locking wedge lock nut.

2.a.(7)(h) ARMATURE LOCKING LEVER SPRING TENSION (Figure 8) - With the locking lever on the high part of the locking cam, hook a 32 oz. scale in the spring hole of the locking lever and pull in line with the spring. It should require 10 to 14 ozs. to start the lever moving.

2.a.(7)(i) STOP LEVER ECCENTRIC SCREW ADJUSTMENT (Figure 9) - See Note (A) - The stop lever on the range finder assembly should overtravel the latching surface of the trip latch by some, not more than .006" clearance. To adjust, position the stop lever eccentric screw by means of its lock nut, making certain that the tightening of the eccentric screw lock nut does not disturb the adjustment.

2.a.(7)(j) STOP LEVER SPRING TENSION (Figure 10) - See Note (A)

NOTE: Be sure that the stop lever eccentric has been adjusted before taking this reading.

With the trip latch plunger held operated, hook an 8 oz. scale at the end of the stop lever on the range finder assembly. It should require 3/4 to 1-1/4 ozs. to start the lever moving.

2.a.(7)(k) SELECTOR STOP ARM AND STOP LEVER ENGAGEMENT ADJUSTMENT (Figure 11) (For units equipped with adjustable range scale assembly) - With the selector magnet armature in the spacing position, rotate the selector cam sleeve until the stop arm moves the stop lever to its maximum travel beyond the step of the trip latch. Loosen the range scale assembly mounting screws and the positioning link mounting screw just enough to make them friction tight. Position the range scale assembly so that the over travel of the stop lever beyond the trip latch is at least half but not more than the width of the stop lever. This should be checked with the range indicator set at 0, 60 and 120 on the range scale. Tighten the mounting screws and the positioning link screw.

2.a.(7)(l) TRIP LATCH SPRING COMPRESSION (Figure 9) - See Note (A) - When measuring this requirement, the range finder assembly should be held in a horizontal position. When an 8 oz. scale, held in a vertical position, is applied to the trip latch as near to the stop lever as possible and pushed upward, it should require 1 to 1-1/2 ozs. to start the trip latch moving.

REPLACE THE RANGE FINDER ASSEMBLY

NOTE (A) These requirements should be checked with range finder assembly removed.

TAKING CARE TO AVOID JAMMING THE TRIP LATCH PLUNGER AGAINST THE ARMATURE TRIP-OFF ECCENTRIC SCREW WHEN REMOUNTING.

2.a.(7)(m) ARMATURE TRIP-OFF ECCENTRIC SCREW ADJUSTMENT (Figure 11) - There should be some clearance, not more than .004" between the stop lever and the trip latch when the armature is in the unoperated position and the selector cam sleeve is rotated until the stopping edge of the stop lever is directly below the latching surface of the trip latch. While checking the above clearance, take up the play in the stop lever with a screwdriver applied axially adjacent to the spring hole as close to the bearing as possible with thrust in the direction of the trip latch. This clearance should be held to a minimum to favor the "at least .002" end play" of the trip plunger.

The trip latch plunger should have at least .002" end play when the armature is held in the attracted position and when the stop lever is resting against its eccentric stop post. (See Figure 9)

To adjust, loosen the trip-off eccentric screw lock nut and position the eccentric to meet the first requirement. The latter requirement serves as a check on the trip-off eccentric adjustment and also on the adjustment of the armature stops.

2.a.(7)(n) MAGNET COILS ADJUSTMENT - The top edge of the core of the upper magnet coil should align (within 1/64") with the top edge of the armature. Adjust by means of the magnet coil mounting screws.

2.a.(7)(o) MAGNET BRACKET ADJUSTMENT - There should be .002" to .007"\* clearance between each magnet core and the armature antifreeze strip when the magnet coils are energized and the armature is against the operated stop nut (marking stop). The faces of the cores should be parallel to the face of the armature. To adjust, position the bracket by means of its enlarged mounting holes. See Figure 6 for location of parts.

\* This clearance should be .003" to .010" when a chromium plated armature is used.

2.a.(8) HOLDING MAGNET SELECTOR MECHANISM ADJUSTMENTS - The holding magnet selector illustrated in Figure 12 should meet the following requirements: REMOVE THE RANGE FINDER ASSEMBLY (See Page 2 for Pulling Magnet Selector Mechanism Adjustments).

2.a.(8)(a) ARMATURE PIVOT SCREW ADJUSTMENT (Figure 12) - With the armature spring and the selector arm spring unhooked, the armature should be free on its pivots with barely perceptible end play.

NOTE (A) These requirements should be checked with the range finder assembly removed.

To adjust, loosen the armature upper pivot screw lock nut and position the armature by means of its upper pivot screw. Tighten the lock nut and replace the selector magnet bracket.

Rehook the armature spring and the selector arm spring.

2.a.(8)(b) SELECTOR MAGNET ADJUSTMENT (Figure 13) - When the armature is in its operated position, it should touch both magnet cores at approximately the centers of their pole-faces, and the cores should be centrally located with respect to the armature as gauged by eye when holding a light background behind the magnet and armature assembly. To adjust, remove the selector magnet bracket and reposition the magnet core assembly by means of its mounting screws while holding the assembly so that the cores are vertical and the armature, by its own weight, rests against the pole-faces. Replace the selector magnet bracket.

NOTE: When the cores are in proper adjustment, it should require at least 3-1/2 lbs. pull, with a 64 oz. scale hooked to the armature edge in line with the armature extension, to separate the armature from the cores when a current of .020 amperes is flowing through the magnet coils (coils in series shunted by 5000 ohm resistance).

2.a.(8)(c) SELECTOR ARM PIVOT SCREW ADJUSTMENT (Figures 14 and 15) - See Note (A) - With the armature spring, the selector arm spring, and selector arm stop detent spring unhooked, the selector arm should be free on its pivots with barely perceptible end play, and the locking lever should over-travel the top and bottom edges of the locking wedge. There should also be .008" minimum clearance between the selector arm and the armature extension, and a minimum clearance of .010" between the selector arm and the selector arm stop detent when the play in the detent is taken up in a direction to make this clearance a minimum. The end play should be adjusted by means of the upper pivot screw. If the minimum clearance requirements are not met, it will be necessary to remove the selector magnet bracket, the selector arm bracket, and adjust both pivot screws of the selector arm.

2.a.(8)(d) SELECTOR ARM BRACKET ADJUSTMENT (Figure 12) - See Note (A) - The position of the selector arm bracket should be such as to provide some clearance, not more than .040", between each sword and either stop post, under the following conditions:

Remove the locking lever spring, the armature spring, selector arm stop detent spring, and the selector arm spring. Rotate the main shaft until the No. 1 selector lever is resting on the peak of its cam. With the selector arm in its unoperated (SPACING) position, move the spacing arm of the No. 1 sword against the selector extension. Then rotate the

selector arm slowly toward the MARKING position until the selector arm just leaves the spacing arm of the No. 1 sword. There should be some clearance, not more than .040", between the No. 1 sword and the spacing stop post.

With the selector arm in its operated (MARKING) position, move the marking arm of the No. 1 sword against the selector arm extension. Then rotate the selector arm slowly toward the SPACING position until the selector arm just leaves the marking arm of the No. 1 sword. There should be some clearance, not more than .040", between the No. 1 sword and the marking stop post.

With each selector lever on the peak of its cam, each associated sword should be tried for the foregoing requirement of some clearance, not more than .040". To adjust, loosen the selector arm bracket mounting screws just enough to make the bracket friction tight. Then, to equalize the clearance between the swords and the stop posts, loosen the centralizing eccentric screw lock nut and turn the eccentric screw clockwise to provide more clearance on the SPACING side or counterclockwise to provide more clearance on the MARKING side.

NOTE: Be sure that the selector arm stop detent does not interfere with the adjustment.

The centralizing eccentric screw should always be located so that its indicating line is adjacent to the marked scale that has been provided on the bracket to aid in gauging the amount the screw must be turned. Tighten the lock nut when the selector arm has been centralized. To obtain the "some clearance, not more than .040", requirement between the swords and the stop posts, insert the No. 90783 adjusting wrench in one of the two holes provided and turn the wrench to move the bracket closer to or farther from the swords as required. Then tighten the selector arm bracket mounting screws. Replace the locking lever spring, selector arm spring, and armature spring.

2.a.(8)(e) LOCKING WEDGE ADJUSTMENT (Figure 16) - With the locking lever on a high part of its cam, the end of the locking wedge should clear the locking lever by .005" to .012" when the end of the wedge is held in line with the locking lever. To adjust, loosen the locking wedge mounting screw and position the locking wedge in its guide; then tighten the mounting screw.

2.a.(8)(f) LOCKING LEVER SPRING TENSION (Figure 16) - With the locking lever on the high part of its cam, hook an 8 oz. scale on the end of the locking lever, at the spring hole, and pull in line with the spring. It should require 4 to 5-1/2 ozs. to start the lever moving away from the cam.

2.a.(8)(g) SELECTOR ARM STOP DETENT ADJUSTMENT (Figure 14) - With the locking lever on the

low part of its cam, there should be an equal amount of clearance, within .003", between the sides of the locking wedge and the locking lever when the selector arm is in the MARKING or SPACING position.

NOTE: When checking the MARKING position, be sure that the selector arm operating screw does not interfere with the movement of the selector arm.

To adjust, loosen the screw that mounts the selector arm stop detent eccentric post just enough to make the post friction tight. Position the stop detent by turning the post; then tighten the post mounting screw.

2.a.(8)(h) SELECTOR ARM STOP DETENT SPRING TENSION (Figure 14) - Unhook the stop spring from the locking lever guide and hook an 8 oz. scale in the spring eye. It should require 4 to 5 ozs. to pull the spring to its position length.

2.a.(8)(i) SELECTOR LEVER SPRING TENSION (Figure 16) - With the code bars in the MARKING position and with the main bail in its highest position, move the swords manually to the SPACING position. Hook a 32 oz. scale over the end of each selector lever at the selector cam sleeve and pull radially to the main shaft. It shall require from 6 to 10 ozs. to start each selector lever moving.

NOTE: When making this check, be sure that the selector levers are free and without bind.

2.a.(8)(j) SELECTOR MAGNET BRACKET POSITION ADJUSTMENT (Figure 17) - With the main shaft in the stop position, rotate the selector cam sleeve until the locking lever just drops off the high part of its cam; then rotate the cam sleeve backward until the rotation is stopped by the locking lever. Under this condition there should be a clearance of .060" to .065" between the armature extension and the face of a tooth on the armature cam. To adjust, loosen the selector magnet bracket mounting screws and the selector magnet bracket adjusting arm mounting screws just enough to make the bracket and adjusting arm friction tight. Then position the selector magnet bracket by means of the adjusting arm, using the No. 90783 adjusting wrench. To do this, insert the adjusting wrench in the hole above the end of the adjusting arm and rotate the wrench. Tighten the bracket and adjusting arm mounting screws.

NOTE: When checking the above requirement, the armature extension should be held approximately .045" from the bottom of the notch of its cam.

2.a.(8)(k) SELECTOR MAGNET BRACKET ADJUSTMENT (Figure 13)



NOTE: When making this adjustment the selector arm should be kept in the MARKING position.

With the selector magnet energized, the clearance between the selector arm operating screw and the selector arm should be .004" to .006" greater when the armature lever is on a peak of its cam than when the armature is opposite an indent on the cam.

2.a.(8)(k)1. To adjust, de-energize the selector magnet and rotate the selector cam sleeve until the armature extension is resting on the peak of the armature cam. Holding the cam sleeve in this position, turn the main shaft to a point where it moves the armature the greatest distance.

2.a.(8)(k)2. With the selector magnet still de-energized, loosen the selector magnet bracket mounting screws and, by means of its adjusting screw, rotate the selector magnet bracket so that the armature just touches the pole-faces; then turn the adjusting screw an additional one-tenth of a turn counterclockwise. This will press the armature firmly against the magnet cores. (While making the one-tenth of a turn adjustment, be careful to avoid lost motion by taking up the slack in the adjusting screw.)

2.a.(8)(k)3. With the selector magnet energized, measure the clearance between the selector arm operating screw and the selector arm and if there is no clearance, back off the selector arm operating screw to provide at least .006" clearance. Then rotate the selector cam sleeve so that the armature extension is opposite an indent of its cam and again measure the clearance between the selector arm operating screw and the selector arm. If the difference in the two clearances exceeds .006", the selector magnet bracket adjusting screw should be turned clockwise. If the difference in the clearance is less than .004", turn the screw counterclockwise. Tighten the selector magnet bracket mounting screws.

2.a.(8)(l) ARMATURE SPRING TENSION ADJUSTMENT (Figure 13-A) - Unhook the armature spring from its spring arm and rotate the main shaft until the armature extension is on a high part of its cam. With a 32 oz. scale hooked in its spring eye, pull the spring to its position length. The following tension should apply:

2.a.(8)(l)1. If a distortion test set is available, the spring tension should be set at the optimum value within the limits of 13 to 24 ozs.

2.a.(8)(l)2. If no distortion test set is available, the spring tension should be 17 to 19 ozs., except when coils are connected in parallel without a 1000 ohm shunt. Under this latter condition the tension should be 13 to 15 ozs. To adjust, loosen the spring arm mounting nut and position the spring arm. Then tighten the mounting nut. Rehook the armature spring.

2.a.(8)(m) SELECTOR ARM OPERATING SCREW ADJUSTMENT (Figure 18) - With the selector magnet energized and the selector cam sleeve rotated so that the armature extension is opposite an indent of its cam, there should be a clearance of .003" to .006" between the selector arm operating screw and the selector arm. To adjust, loosen the selector arm operating screw lock nut and position the screw; then tighten the lock nut.

2.a.(8)(n) SELECTOR ARM SPRING TENSION (Figure 19) - Unhook the selector arm stop detent spring. With the armature extension on a high part of its cam, and the locking lever held away from the locking wedge, hook an 8 oz. scale over the end of the locking wedge and pull parallel to the selector arm spring. It should require 1-1/4 to 1-3/4 ozs. to start the selector arm moving. Reform the outer loop of the selector arm spring, if necessary, to meet this requirement. Replace the detent spring.

CAUTION: Care should be taken not to nick, crimp or otherwise deform the spring or spring wire when reforming loops.

2.a.(8)(o) STOP LEVER ECCENTRIC SCREW ADJUSTMENT (Figure 20) - See Note (A) - The stop lever on the range finder assembly should overtravel the latching face of the trip latch by not more than .006". To adjust, loosen the stop lever eccentric screw lock nut and position the screw; then tighten the lock nut, making certain that the tightening of the lock nut does not disturb the adjustment.

2.a.(8)(p) TRIP LATCH SPRING COMPRESSION (Figure 20) - See Note (A) - When measuring this requirement, the range finder assembly should be held in a horizontal position. Apply the push end of an 8 oz. scale, held in a vertical position to the trip latch, as near to the stop lever as possible and push upward. It should require 1 to 1-1/2 ozs. to start the trip latch moving.

2.a.(8)(q) STOP LEVER SPRING TENSION (Figure 10) - See Note (A)

NOTE: Be sure that the stop lever eccentric has been adjusted before checking this requirement.

With the trip latch plunger held operated, hook an 8 oz. scale on the end of the stop lever of the range finder assembly and pull horizontally at a right angle to the stop lever. It should require 3/4 to 1-1/4 ozs. to start the lever moving.

2.a.(8)(r) SELECTOR STOP ARM AND STOP LEVER ENGAGEMENT ADJUSTMENT (Figure 11) (For units equipped with adjustable range scale as-

NOTE (A) These requirements should be checked with the range finder assembly removed.

sembly) - With the selector magnet armature in the spacing position, rotate the selector cam sleeve until the stop arm moves the stop lever to its maximum travel beyond the step of the trip latch. Loosen the range scale assembly mounting screws and the positioning link mounting screw just enough to make them friction tight. Position the range scale assembly so that the overtravel of the stop lever beyond the trip latch is at least half but not more than the width of the stop lever. This should be checked with the range indicator set at 0, 60 and 120 on the range scale. Tighten the mounting screws and the positioning link screw.

REPLACE THE RANGE FINDER ASSEMBLY, TAKING CARE TO AVOID JAMMING THE TRIP LATCH PLUNGER AGAINST THE ARMATURE TRIP-OFF SCREW WHEN REMOUNTING.

2.a.(8)(s) TRIP-OFF SCREW ADJUSTMENT (Figure 21) - There should be some clearance, not more than .004" between the stop lever and the trip latch when the armature is in the unoperated position and the selector cam sleeve is rotated until the stopping edge of the stop lever is directly below the latching surface of the trip latch. While checking the above clearance, take up the play in the stop lever with a screwdriver applied axially adjacent to the spring hole as close to the bearing as possible with thrust in the direction of the trip latch. This clearance should be held to a minimum to favor the "at least .002" end play" of the trip plunger.

The trip latch plunger should have at least .002" end play when the armature is held in the attracted position and when the stop lever is resting against its eccentric stop post. (See Figure 20)

To adjust, loosen the trip-off screw lock nut and position the screw to meet the first requirement. The latter requirement serves as a check on the trip-off screw adjustment and also on the adjustment of the selector magnet bracket.

#### END OF HOLDING MAGNET SELECTOR MECHANISM ADJUSTMENTS

NOTE: Before making the following adjustments, it is necessary to remove the type basket from the typing unit. In order to avoid stretching springs and the possible bending of levers, the following method is suggested: Unhook the code bar locking lever spring, the signal bell hammer spring, letters pull bar spring, the space release pull bar spring, and locking bail spring, if the unit is equipped with a mechanism to prevent printing and spacing on lower case blank. Remove the three type basket assembly mounting screws. Remove the right ribbon spool bracket front mounting screw, loosen the rear mounting

screw, and swing the bracket so that the ribbonspool cup will not interfere with the basket. Remove the bell-and-break signal mechanism. Hold the pull bars out of engagement with the pull bar guide (as an aid in holding the pull bars out of engagement with the pull bar guide, use a piece of wire or string around the upper ends of the pull bars). Disengage lower end of function pull bars from mechanism on base, and slide the assembly upward. Care should be taken that the pull bar toes are not jammed against the spacer locking bail or the signal bell hammer.

2.a.(9) SPACER DETENT AND SPACER DETENT LEVER SPRING TENSION (Figures 22 and 23) - See Note (B)

2.a.(9)(a) There should be .002" to .018" clearance between the face of the spacer feed pawl and the face of a tooth on the spacer ratchet wheel, when the spacer operating lever roller is resting in the bottom of the main bail plunger indent and the detent roller is resting in the hollow between two teeth. Gauge throughout one complete revolution of the ratchet wheel. To adjust, loosen the left front motor plate mounting screw and remove the two rear screws that hold the motor plate to the base. Remove the keyboard drive gear assembly and swing the motor out so as to gain access to the detent lever plate adjusting screw with a screwdriver. Adjust the detent lever plate, by means of these screws, to meet the foregoing requirements.

NOTE: It is possible to set the spacer detent in a position one full tooth off. This error, however, will affect the detent spring tension. Recheck the spring tension.

2.a.(9)(b) With the detent roller resting in the hollow between two teeth, hook a 4 lb. scale in the spring hole and pull in line with the spring. It should require 3-1/4 to 3-3/4 lbs. to start the detent lever moving.

NOTE: Since adjustments (a) and (b) are interrelated, both should be rechecked if one of them is altered. Make sure that the feed pawl advances the ratchet only one tooth during one complete operating cycle.

2.a.(10) SPACER FEED PAWL SPRING TENSION (Figure 22) - See Note (B) - Hook an 8 oz. scale over the spacer feed pawl just below the sloped edge of the pawl and pull as nearly at right angles to the pawl as

NOTE (B) These requirements should be checked with the type basket removed.

possible. It should require 1 to 2 ozs. to start the pawl moving.

2.a.(11) SPACER OPERATING LEVER SPRING TENSION (Figure 23) - See Note (B) - Hook a 12 lb. scale over the spacer operating lever just below the roller and pull as nearly parallel to the spring as possible. It should require 5 to 6 lbs. to start the lever moving.

2.a.(12) RIBBON FEED LEVER SPRING TENSION (Figure 24) - See Note (B) - Loosen the ribbon feed pawl and move it out of engagement with the ribbon feed ratchet. With the ribbon feed lever roller in the plunger indent, hook a 32 oz. scale over the top of the ribbon feed lever and pull horizontally toward the front of the unit. It should require 12 to 18 ozs. to start the lever moving. Tighten the ribbon feed pawl.

2.a.(13) SPACER LOCKING BAIL SPRING TENSION (Figure 25) - See Note (B) - Hook an 8 oz. scale under the spring hole in the right extension of the spacer locking bail and pull up vertically. It should require 1-1/2 to 2 ozs. to start the bail moving.

NOTE: When taking this tension, hold the spacer locking pawl away from the bail.

2.a.(14) FUNCTION BAR BRACKET PLATES ADJUSTMENT (Figure 26) - The two end pull bars supported by the function bar bracket plates should have an equal amount of play in the segment. Adjust both the right and left function bar bracket plates by rotating them on their mounting screws.

2.a.(15) PULL BAR SPRING TENSION (Figure 27) See Note (B) - Unhook the spring from each pull bar. With an 8 oz. scale held in a vertical position, hook the scale in the spring eye. It should require 3 to 4 ozs. to pull each character pull bar spring to its position length and 5-1/2 to 6-3/4 ozs. to pull corresponding function pull bar springs to their position length. Rehook springs.

Remount the type basket. Care should be taken that the pull bar toes are not jammed against the spacer locking bail and the signal bell hammer. Replace the type basket assembly mounting screws. Replace the right ribbon spool bracket front mounting screw and tighten rear mounting screw. See that the function bar spring bracket is replaced. Replace the code bar locking lever spring, the letters pull bar spring, the space release pull bar spring, and the signal bell hammer spring. Replace the bell and break mechanism.

NOTE: If the code bar assembly is removed from the pull bar guide plate, care must be used in replacing, as excessive tightening of the code bar post nuts may cause the code bar separator

collar to become embedded in the German silver separator washers. To prevent this, tighten the nuts as follows: First back off the nuts and turn the lower nut until the lock washer is pressed flat. Then, with a wrench, hold the lower nut in this position while tightening the lock nut.

## 2.a.(16) MAIN BAIL GUIDE POSTADJUSTMENT

NOTE: This adjustment applies only to units equipped with the main bail guide post and an adjustable eccentric bushing.

2.a.(16)(a) The main bail should be free throughout its travel and the eccentric bushing should be so positioned that the following adjustments can be met:

2.a.(16)(a)1. Pull Bar Guide Adjustment - See 2.a.(17).

2.a.(16)(a)2. Main bail adjusting screw adjustment - See 2.a.(18).

2.a.(16)(b) To adjust the main bail guide post:

2.a.(16)(b)1. Position pull bar guide so that it is in the middle of the adjustment provided by its elongated mounting holes.

2.a.(16)(b)2. With the BLANK combination set up, rotate the main shaft until the main bail is opposite the humps on the unselected pull bars. Position the eccentric bushing so that the guide post is away from the bottom of the bail slot and so that the clearance between the main bail and the LETTERS and FIGURES pull bar humps is approximately equal.

2.a.(16)(b)3. With the main bail roller on the high part of its cam see that the clearance between the code bars and the LETTERS and FIGURES pull bars is approximately equal. (It may be necessary to advance the main bail adjusting screw to obtain clearance between the pull bars and the code bars.)

2.a.(16)(b)4. Recheck adjustment 2. To obtain both requirements outlined in 2 and 3, it may be necessary to relocate either the eccentric bushing, the type bar basket or the pull bar guide.

2.a.(16)(b)5. After positioning the guide post, check adjustment (a).

2.a.(17) PULL BAR GUIDE ADJUSTMENT (Figure 28) - With the BLANK combination set up, there should be .008" to .020" clearance between the unselected pull bars and the main bail, when the main bail is opposite the pull bar humps and the play of the

NOTE (B) These requirements should be checked with the type basket removed.

mainbail is taken up in a direction to make this clearance a minimum. With the LETTERS combination set up, there should be .008" to .020" clearance between the main bail and the blank pull bar.

There should be .004" to .080" clearance between the end of the No. 1 T-lever and the bottom of the slot in the code bar, measured at the point of closest approach. Also see that there is some clearance between the ends of Nos. 2, 3, 4, and 5 T-levers and their respective code bars, measured at the point of closest approach. To meet these requirements, adjust the position of the pull bar guide by means of its mounting screws.

2.a.(18) MAIN BAIL ADJUSTING SCREW ADJUSTMENT (Figure 1) - Rotate the main shaft until the main bail has reached its stop position (main bail roller on the high part of its cam). With the code bars in the MARKING position, there should be .010" to .050" clearance between the pull bars and the code bars when the play in the main bail and the pull bars is taken up to make this clearance a minimum. Check this clearance with the code bars in the SPACING position. To adjust, position the main bail adjusting screw by means of its lock nut.

2.a.(19) SPACER LOCKING PAWL BRACKET ADJUSTMENT (Figure 25) - The shoulder on the spacer locking pawl should clear the notched part of the spacer operating lever by .040" to .050" when FIGURES combination is selected and the main shaft is rotated until the spacer operating lever roller is on the high part of the main bail plunger. To adjust, position the spacer locking pawl bracket by means of its mounting screws.

2.a.(20) SPACER LOCKING BAIL FINGER ADJUSTMENT (Figure 29) - There should be .015" to .025" clearance between the latching edge of the spacer operating lever and the latching edge of the spacer locking pawl when the "E" combination is set up and the main shaft rotated until the two edges are in line. To adjust, hold the spacer locking bail by means of the No. 72574 holding tool inserted under the type bar segment, alongside the carriage shaft gear and bend the spacer locking bail finger with the No. 72575 bending tool. The bending tool should be inserted horizontally between the motor and the main casting (on the left side of the unit).

2.a.(21) SPACER LOCKING PAWL SPRING TENSION (Figure 25) - Set up the BLANK combination and rotate the main shaft until the main bail is in its extreme upper position. Place the typing unit on its back (resting on the motor). Hook an 8 oz. scale over the spacer locking pawl and pull up vertically. It should require 1-1/2 to 3-1/2 ozs. to start the pawl moving.

2.a.(22) CARRIAGE BRACKET LOCATING PLATE After the front carriage bracket has been set in a position where the carriage moves freely back and

forth in all positions of the spacing gear, the carriage bracket locating plate should be moved against the bracket so that its three projections make contact with the bracket, and fastened in place. Thus, if the bracket is moved thereafter, it may be replaced in its proper position without further adjustment.

2.a.(23) CARRIAGE LOCKING PAWL POST ADJUSTMENT (Figure 31) - When in the LETTERS position, the carriage locking pawl should set fully on the locking toe when the play of the pawl is taken up in either direction. To adjust, position the locking pawl post by means of its lock nut.

2.a.(24) LEFT TAPE GUIDE ADJUSTMENT (Figure 32) - The left tape guide should clear the platen roll by .004" to .010" throughout one complete revolution of the platen roll. Adjust by means of its mounting screw.

2.a.(25) RIGHT TAPE GUIDE ADJUSTMENT (Figure 32) - The right tape guide should be so adjusted that when a piece of tape is inserted through both right and left tape guides, it will align with the platen roll and the printing will be in the center of the tape. Adjust the right tape guide by means of its mounting screw.

There should be .010" to .020" clearance between the platen roll and the end of the right tape guide when gauged throughout one complete revolution of the platen roll. Adjust by bending the right tape guide.

2.a.(26) TAPE FEED ROLL SPRING TENSION (Figure 32) - With the tape feed roll resting on the platen, hook an 8 oz. scale over the end of the tape feed roll bearing screw and pull at right angles to the tape feed roll lever. It should require 6 to 8 ozs. to start the lever moving.

2.a.(27) TAPE CHUTE ADJUSTMENT - The exit tape-chute should be in alignment with the left hand tape guide; adjust by means of the chute mounting screws. There also should be from .015" to .040" clearance between the under surface of the left hand tape guide and the top surface of the exit chute channel when the platen assembly is in either the LETTERS or FIGURES position. If necessary, adjust by bending the chute bracket.

2.a.(28) SHIFT ROCKER POST ADJUSTMENT (Figure 33) - The sides of the shift rocker post should be parallel to the carriage shaft. Adjust by means of the shift rocker post lock nut.

2.a.(29) CARRIAGE RETURN SPRING TENSION (Figure 30) - Unhook the carriage return spring from the spring post. With the carriage in the LETTERS position, hook an 8 oz. scale in the spring eye and pull the spring to its normal position length. It should require 6-1/2 to 7-1/2 ozs. Replace spring.

2.a.(30) CARRIAGE LOCKING PAWL SPRING TENSION (Figure 31) - With the carriage held back far enough so that there is a clearance between the carriage locking toe and the carriage locking pawl, hook an 8 oz. scale over the carriage locking pawl just below the spring hole and pull up in line with the spring. It should require 1-1/2 to 2-1/2 ozs. to start the pawl moving.

2.a.(31) SHIFT ROCKER LEVER POST ADJUSTMENT (Figure 34) - The front surface of the shift rocker lever post should be parallel to the front edge of the base plate. Position the post by means of its lock nut.

2.a.(32) CARRIAGE EXTENSION ADJUSTMENT (Figure 33) - The carriage extension should travel equally on either side of a vertical line through the center of the shift rocker bearing screw, when the carriage is moved from the FIGURES to the LETTERS position. Adjust by means of the carriage extension mounting screws.

2.a.(33) SHIFT ROCKER ADJUSTMENT - With the carriage in the FIGURES position, select the LETTERS combination and rotate the main shaft until the main bail roller is on the low part of its cam. Lift the main bail by hand to its highest position. The carriage locking toe should overtravel the carriage locking pawl not more than .020". Adjust the shift rocker by means of its adjusting screw to meet this requirement. See Figure 34 for location of parts.

NOTE: On those printers arranged to unshift on SPACE as well as on LETTERS combination, determine if the UNSHIFT ON SPACE gives the carriage a shorter travel. If so, use this combination instead of the LETTERS combination in making the adjustment.

2.a.(34) TYPE BAR REMOVAL - Remove the carriage spring, the ribbon from the guide, and the two screws from the carriage front bracket. Lift off the carriage assembly. Move the type bar forward and downward until the teeth on the type bar are disengaged from those on the pull bar. The type bar may then be unhooked from the fulcrum rod and removed.

To replace a type bar, hook it over the fulcrum rod. If the teeth are meshed properly, the type bar will rest against the pad when the top of its pull bar is in line with the other pull bars. If the type bar does not rest against the pad, move the type bar downward again until the teeth are out of mesh and then raise the pull bar as many teeth as is necessary to permit the type bar to resume its correct position. Replace the carriage making sure that the bracket is against the positioning plate, and tighten the bracket mounting screws.

The type bars should be free in their segment slots with a minimum amount of side play. To

check the freeness of a type bar, move it down so that the pallet rests lightly on the platen roll. Then, when the type bar is released, it should return to its normal position against the type bar pad. If necessary, the sides of the type bar may be lapped on a fine stone to prevent binding in the segment slot.

2.a.(35) PULL BAR LOCK-OUT LEVER ADJUSTMENT (Figures 35 and 36) - With the platen in the FIGURES position, the BLANK combination selected, and the main shaft rotated until the main bail is in its uppermost position, there should be .004" to .040" clearance between the S or J pull bar (according to type) and the code bars.

There should be .004" to .040" clearance between the BELL pull bar and the code bars when the foregoing selection is applied with the platen in the LETTERS position.

With the platen in the FIGURES position, the BELL combination selected, and the main shaft rotated until the main bail has moved to approximately .010" below the bell pull bar notch, there should be at least .010" clearance between the BELL pull bar and the lock out lever roller that is in contact with the S or J pull bar. When measuring this clearance the play of the platen shaft, the shift rocker and the lock out lever should be taken up in the direction that minimizes the clearance.

To meet the foregoing requirements, position the adjusting lever by utilizing the play in its mounting holes.

NOTE: As an increase in pull bar clearance also increases the load on the platen shift return spring, the platen shift mechanism should be checked (manually) for correct operation.

2.a.(36) RIBBON GUIDE ADJUSTMENT - There should be .040" to .050" clearance between the printing surface of the platen roll and both sides of the ribbon guide. To measure this clearance, insert the gauge horizontally between the printing surface of the platen roll and both sides of the ribbon guide. To adjust, position the ribbon guide by means of its mounting screws. There should be 3/16" to 7/32" clearance between the tongue of the guide and the side of the platen roll. Bend the guide if necessary. Recheck the previous adjustment.

2.a.(37) RIBBON SPOOL CUPS ADJUSTMENT (Figure 37) - The centers of both ribbon spool cup rollers should be within 4-11/16" to 4-13/16" of the typing unit base plate. To adjust, loosen the ribbon spool cup lock nuts and rotate the cups; tighten the lock nuts.

2.a.(38) RIGHT AND LEFT RIBBON SPOOL SHAFT GEARS ADJUSTMENT (Figure 38) - The right and left ribbon spool shafts should have some end play, not

more than .004". To adjust, position the bevel gears on the ends of the shafts.

NOTE: If the unit is equipped with an end-of-line indicator or a tape feed-out control mechanism, obtain the .004" end play on the right-hand ribbon spool shaft by means of the rear set collar.

2.a.(39) RIBBON SPOOL BRACKETS ADJUSTMENT - The ribbon spool brackets should align with the edges of the base plate and there should be a minimum amount of backlash between the bevel gears on the ribbon spool shafts and the bevel gears on the ribbon feed shaft throughout a complete revolution of the ribbon spool shafts when the ribbon feed shaft is in its extreme left-hand and right-hand position, respectively. To adjust, position the ribbon spool brackets.

NOTE: If the unit is equipped with an end-of-line indicator mechanism or a tape feed-out counter mechanism, the right-hand bracket should be adjusted so that the front edge of the right-hand ribbon spool cup is approximately in line with the front edge of the left-hand ribbon spool cup, and the gear backlash should be obtained by positioning the gear on the right-hand ribbon spool shaft.

2.a.(40) RIBBON SPOOL SHAFTS SPRING COMPRESSION ADJUSTMENT (Figure 38) - Move the ribbon feed shaft to its left-hand position. Hook an 8 oz. scale over the pin in the right ribbon spool shaft and pull horizontally at right angle to a line through the center of the pin and the center of the ribbon spool shaft. It should require 2-1/2 to 5 ozs. to start the ribbon spool shaft moving. The proper compression of the ribbon spool shaft spring can be obtained by means of the spring adjusting collar. Move the ribbon feed shaft to its right-hand position and adjust the left-hand spring compression in the same manner.

2.a.(41) LEFT RIBBON REVERSE ARM SHAFT ADJUSTMENT (Figure 87) - (For Units equipped with Ribbon Reverse Arm Yield Spring) - There should be from .005" to .025" clearance between the rear of the left spool cup and the front end of the ribbon reverse shaft when the ribbon reverse shaft is held forward to make this clearance a minimum.

To adjust, loosen the set screw of the spring block, and if necessary, the set screws of the ribbon reverse shaft collar and link. Position the shaft while holding the ribbon reverse arm against the ribbon spool bracket and the spring block against the reverse arm. Tighten the spring block set screw.

2.a.(42) RIBBON REVERSE ARM SHAFTS ADJUSTMENTS (Figure 39) - (For units not equipped with Ribbon Reverse Arm Yield Spring) - The front ends of

the right and left ribbon reverse arm shafts should clear their respective ribbon spool cups by .005" to .025" when the ribbon reverse arms are held against the brackets to make the clearance a minimum. To adjust, position the ribbon reverse arms on the ribbon reverse arm shafts by means of their set screws.

2.a.(43) RIBBON REVERSE ARM SHAFT COLLAR ADJUSTMENTS (Figure 39 and 87) - Both right and left ribbon reverse arm shafts should have some end play, not more than .004" on units not equipped with yield spring and not more than .010" on units equipped with yield spring. To adjust, position the collar on each shaft by means of its set screw. Locate the set screws so that they are easily accessible when the ribbon reverse arms are against the ribbon spool cups.

2.a.(44) RIBBON REVERSE PAWL LINKS ADJUSTMENT - The ribbon reverse bail should clear both left and right-hand ribbon reverse pawls by .015" to .040" when the ribbon reverse bail is opposite the reverse pawls and the ribbon reverse arms are against the ribbon spool cups. When checking the .015" clearance between either ribbon reverse pawl and the ribbon reverse bail, the play in the ribbon reverse bail should be taken up in a direction to make the clearance a minimum. When checking for the .040" clearance, the play in the ribbon reverse bail should be taken up in a direction to make the clearance a maximum.

To adjust units equipped with ribbon reverse arm yield spring, position the spring block on the left ribbon reverse shaft and the sleeve on the right ribbon reverse shaft. See Figure 88.

To adjust units not equipped with ribbon reverse arm yield spring, position ribbon reverse arms by means of their set screws. The ribbon reverse pawl link should not bind on their shoulder screws. See Figure 40.

2.a.(45) RIBBON REVERSE ARM YIELD SPRING TENSION ADJUSTMENT (Figure 88) - Position the ribbon reverse bail so that it will block the full travel of the ribbon reverse arm, and with the ribbon reverse pawl resting against the ribbon reverse bail, apply the push end of an 8 oz. scale, held at a right angle to the ribbon reverse arm at the center where the ribbon is threaded. It should require 1-1/2 to 4-1/2 ozs. to start the ribbon reverse arm moving. If it is necessary to increase or decrease the tension, remove the spring and adjust by bending.

2.a.(46) RIBBON SPOOL SHAFT SLOT ADJUSTMENT - The ribbon spools should be held firmly in place on the ribbon spool shafts. To adjust, spread the prongs at the end of the shafts. See Figure 39.

2.a.(47) RIBBON FEED SHAFT SAFETY SPRING COMPRESSION (Figure 41) - With the main bail in its extreme upper position, slide the ribbon feed shaft to its left-hand position. Apply the push end of a 12 lb. scale to the upper end of the right ribbon reverse

pawl, and push down vertically. It should require 3 to 5 lbs. to start the spring collar moving.

NOTE: Hold the ribbon feed shaft to prevent it from moving. Slide the ribbon feed shaft to its right-hand position and check the ribbon feed shaft left safety spring in a similar manner.

2.a.(48) RIBBON FEED SHAFT DETENT PLUNGER SPRING COMPRESSION (Figure 42) - Remove the ribbon feed pawl and check pawl. With the ribbon feed shaft in its left-hand position, apply the push end of a 12 lb. scale to the left end of the shaft and push in line with the shaft. It should require 1-1/2 to 3-1/2 lbs. to move the shaft to its right-hand position.

2.a.(49) RIBBON CHECK PAWL ADJUSTMENT  
The upper end of the ribbon check pawl (Figure 43) should be 1/16" (plus or minus 1/64") below the lower surface of the pull bar guide. Adjust by means of the ribbon check pawl mounting screw.

2.a.(50) RIBBON CHECK PAWL SPRING PRESSURE (Figure 43) - With an 8 oz. scale hooked over the extreme lower end of the ribbon check pawl and pulled at right angles to the pawl, it should require 6 to 8 ozs. to start the pawl moving away from the ratchet. Make certain that the working edge of the pawl does not bind against a tooth on the ratchet when taking this pressure. Adjust by bending the pawl.

2.a.(51) RIBBON FEED PAWL ADJUSTMENT - The ribbon feed pawl should be so positioned that the ratchet will be moved one or two teeth throughout a complete revolution of the main shaft. To adjust, position the ribbon feed pawl by means of its mounting screw.

2.a.(52) RIBBON FEED PAWL SPRING PRESSURE ADJUSTMENT (Figure 43) - With the ribbon feed shaft pushed to the right, the main shaft in its stop position and an 8 oz. scale hooked over the extreme front edge of the ribbon feed pawl and pulled at a right angle to the pawl, it should require 6 to 8 ozs. to start the pawl moving away from the ribbon feed ratchet. Make certain that the feeding edge of the pawl does not bind against a tooth on the ratchet when taking this tension. To adjust, bend the ribbon feed pawl spring.

2.a.(53) RIGHT AND LEFT RIBBON REVERSE PAWLS SPRING TENSION (Figure 41) - With the ribbon feed shaft in its left-hand position, hook an 8 oz. scale over the spring post on the left ribbon reverse lever and pull in line with the spring. It should require 1-3/4 to 3-3/4 ozs. to start the lever moving. Move the ribbon feed shaft to its right-hand position and check the right ribbon reverse pawl spring in the same manner.

2.a.(54) LEFT FUNCTION PULL BAR SPRING

ADJUSTMENT (Figure 44) - With the main bail in its extreme downward position, hook an 8 oz. scale over the LETTERS pull bar, just below the hump, and pull horizontally at a right angle to the pull bar. It should require 1 to 1-1/2-ozs. to start the pull bar moving. Adjust the position of the spring bracket by means of its lock nut to meet this requirement.

2.a.(55) RIGHT FUNCTION PULL BAR SPRING BRACKET ADJUSTMENT (Figure 45) - With the main bail in its extreme upward position, hook an 8 oz. scale over the code bar locking lever just above the No. 1 code bar and pull horizontally at a right angle to the locking lever. It should require 3-1/2 to 5 ozs. to start the locking lever moving. Adjust by positioning the right function pull bar spring bracket by means of its lock nut.

2.a.(56) BELL HAMMER ECCENTRIC SCREW ADJUSTMENT (Figure 46)

2.a.(56)(a) (Units equipped with type bar operated by bell pull bar) - With the bell pull bar selected and the main shaft rotated until the main bail is in its uppermost position, there should be a clearance of .020" to .040" between the bell hammer lip and the bell hammer post when the bell type bar with pallet is held against the platen. To adjust, position the bell hammer eccentric screw by means of its lock nut. Keep the high part of the eccentric to the rear.

2.a.(56)(b) (Units not equipped with type bar operated by bell pull bar) - With the bell pull bar selected and the main bail lifted by hand to its extreme upward position, the end of the bell pull bar toe should align with the outer edge of the bell hammer eccentric screw and there should be .045" to .075" clearance between the bell hammer lip and the bell hammer post. Adjust the position of the bell hammer post for the pull bar toe and eccentric screw alignment and adjust the bell hammer eccentric screw to provide the specified clearance.

2.a.(57) SIGNAL BELL ADJUSTMENT - The signal bell should be positioned so as to obtain the most satisfactory tone. It should also be positioned to provide at least .010" clearance between the bell and all brackets and screws, and at least .004" between the bell and the tape chute or platform. Adjust by means of its mounting screw.

2.a.(58) MAIN BAIL CAM CLUTCH TORQUE (Figure 47) - Remove the gear guard and the tape container. This torque should be taken with the motor running at least 10 minutes, and when the selector magnet is energized. Press down on the main bail so as to move the main bail roller away from its cam. With a 32 oz. scale hooked into the screw hole on top of the main bail cam and pulling at right angle to the radius, it should require a pull of 10 to 24 ozs. to start the cam moving opposite to its normal direction

of rotation.

2.a.(59) SELECTOR CLUTCH TORQUE (Figure 48) The torque should be measured after the motor has been running at least ten minutes with the selector cam sleeve stationary. Hook a 32 oz. scale to the selector cam sleeve stop arm. It should require a pull of 14 to 18 ozs. to hold the selector cam sleeve stationary. To adjust, position the capstan nut in the proper direction with a screwdriver.

On units equipped with the 72515 nut and 72517 keyed nut, the selector clutch torque may be adjusted by use of shims which may be placed between the clutch spring and the 72515 nut. The selector clutch spring must be removed from the shaft in order to install the shims. Shims are available under the following numbers:

96763	Shim - .012" thick
96764	Shim - .016" thick
96765	Shim - .020" thick

#### 2.a.(60) BELL-AND-BREAK CONTACT MECHANISM ADJUSTMENTS

##### 2.a.(60)(a) DOUBLE-CONTACT MECHANISM

2.a.(60)(a)1. DETENT ARM SPRING TENSION (Figure 49) - Unhook the detent arm spring from the spring post and hook a 32 oz. scale in the spring eye. It should require 18 to 22 ozs. to pull the spring to its position length. When taking this tension, the finger arm should be against its upper stop. Replace the spring.

2.a.(60)(a)2. BELL HAMMER ADJUSTMENT (Figure 50) - With the finger arm against its lower stop, there should be some clearance, not more than .010", between the bell and the bell hammer. This clearance may be obtained by bending the bell hammer wire.

2.a.(60)(a)3. CONTACT MOUNTING SCREWS ADJUSTMENT (Figure 50) - The contact arm should clear the ends of the contact guards by at least .020" when all of the play in the contact arm is taken up in a direction to make this clearance a minimum. This adjustment can be made by means of the contact mounting screws.

2.a.(60)(a)4. CONTACT SPRINGS ADJUSTMENT - With the finger arm against the upper stop (See Figure 49), there should be a gap of .015" to .020" between the break contacts (left pair of contacts). Adjust the upper contact spring of these break contacts to obtain the clearance. Place the finger arm against its lower stop (See Figure 50). There should be a gap of .015" to .020" between the transmitter distributor contact springs (right pair of contacts), and the break contacts should be closed. Adjust, by bending, the transmitter distributor contact springs. Again place the finger arm in its upper position (See Figure 49), and recheck the break contacts

gap. Under this condition, the transmitter distributor contacts should be closed. To adjust, bend the lower contact spring.

2.a.(60)(a)5. BREAK SIGNAL CONTACT SPRING TENSION (Figure 50-A) - Place the finger arm against its lower stop. Place the push end of an 8 oz. scale vertically on the fibre extension of the lower contact spring just in front of the contact arm, and push downward. It should require 3 to 4 ozs. to break the contact.

2.a.(60)(b) SINGLE-CONTACT MECHANISM The adjustments for the single contact bell and break mechanism are the same as those for the double contact mechanism with the exception of the Contact Springs Adjustment. This adjustment should read as follows:

2.a.(60)(b)1. CONTACT SPRINGS ADJUSTMENT FOR SINGLE CONTACT MECHANISM (Figure 50-B) - With the finger arm against the upper stop, adjust the upper contact spring so that there will be .015" to .020" clearance between the contacts.

2.a.(61) MECHANICAL END-OF-LINE INDICATOR ADJUSTMENTS (Located to the Right of the Right Hand Ribbon Spool Shaft)

2.a.(61)(a) WORM SHAFT ENDPLAY - The worm shaft should be free to rotate, with a minimum amount of end play, when the worm shaft spring is detached from the contact bracket. Adjust by means of the worm shaft collar and set screw. See Figure 51.

2.a.(61)(b) LAMP CONTACT ADJUSTMENT (Figure 51) - With the push end of an 8 oz. scale applied to the front contact spring near the contact point, it should require 3 to 4 ozs. to start the spring moving away from its stiffener. To adjust, remove the spring from the contact assembly and bend it.

There should be a gap of .015" to .025" between the contacts. Adjust the rear contact spring, by bending, to meet this requirement.

2.a.(61)(c) CONTACT BRACKET ADJUSTMENT (Figure 52) - With the worm follower resting in the groove at the front end of the worm, the lamp contacts should be closed and there should be some to 0.010 clearance between the front lamp contact spring and the lower end of its stiffener. To adjust, position the contact bracket by means of its mounting screws.

2.a.(61)(d) WORM FOLLOWER ADJUSTMENT - The lamp contacts should close, not sooner than with the 62nd operation of the printer and not later than the 67th operation when the printer is operated under power.

To adjust, rotate the main shaft to a position where the manual operation of the cam lever will advance the worm shaft ratchet one tooth at a



time. With the worm follower in its rearmost position, operate the cam lever by pressing toward the left at its forward end until the pin on the worm follower just enters a thread on the worm. Continue to operate the cam lever 62 additional times. Then adjust the position of the release bail, by means of the sleeve and the adjusting bracket mounting screws, so that the contacts just close. Check the adjustment several times with the printer operating under power. See Figure 51.

2.a.(61)(e) WORM FOLLOWER SPRING TENSION (Figure 53) - Hook an 8 oz. scale over the end of the worm follower and pull approximately parallel to the spring, holding the release bail so that the follower pin is away from the worm. It should require 1-1/2 to 3-1/2 ozs. to move the worm follower to a point where it touches the rear contact spring insulator.

2.a.(61)(f) RELEASE BAIL SPRING TENSION - (Figure 54) - Hook a 32 oz. scale over the edge of the release bail near the spring hole, and pull up. It should require 7 to 11 ozs. to start the bail moving.

2.a.(61)(g) FEED PAWL SPRING TENSION - (Figure 55) - With the cam lever roller on the high part of the main bail cam, hook an 8 oz. scale over the end of the feed pawl at the spring holes, and pull in line with the spring. It should require 3 to 5-1/2 ozs. to start the feed pawl moving.

2.a.(61)(h) CAM LEVER SPRING TENSION - (Figure 56) - With the cam lever roller on the low part of the main bail cam, hook a 64 oz. scale over the cam lever at the spring hole and pull in line with the spring. It should require 28 to 38 ozs. to start the cam lever moving.

2.a.(62) MECHANISM TO PREVENT PRINTING AND SPACING ON LOWER CASE BLANK ADJUSTMENTS - (On units so equipped substitute the following paragraph for the Spacer Locking Bail Spring Tension on Page 9  
With an 8 oz. scale hooked in the locking bail spring eye, pulling upward, a tension of 7-1/2 to 8-1/2 ozs. should be required to stretch the spring to its normal position length.

2.a.(62)(a) SPACE SUPPRESSION LEVER STOP ARM ADJUSTMENT (Figure 57-A) - With the printer in its stop position (pull bars held away from the code bars) and the carriage in its unshifted position, there should be .010" to .075" clearance between the lower edge of the space suppression lever and the upper edge of the blank pull bar projection. Adjust the space suppression lever stop arm, by bending, to meet this requirement.

2.a.(62)(b) SPACE SUPPRESSION LEVER ADJUSTMENT (Figures 57-B and 57-C)

2.a.(62)(b)1. With the blank combination set

up and the carriage in the FIGURES position, rotate the main shaft until the blank pull bar moves into the path set up for it in the code bars. There should be .006" to .040" clearance between the rear edge of the space suppression lever and the blank pull bar.

2.a.(62)(b)2. Rotate the main shaft until the pull bars are resting against the code bars. The end of the space suppression lever should clear the vertical edge of the blank pull bar by .006" to .020" when the carriage is moved to a position to bring the space suppression lever opposite the pull bar.

2.a.(62)(b)3. The requirements given in 1. and 2. may be obtained by positioning the space suppression lever by means of the suppression lever mounting plate clamp screws. Both requirements should be checked before tightening the clamp screws.

2.a.(63) MECHANICAL MOTOR CONTROL MECHANISM WHICH FUNCTIONS ON UPPER CASE "H" ADJUSTMENTS

2.a.(63)(a) CONTACT LEVER BRACKET ADJUSTMENT - With the main bail roller on the high part of its cam, the contact lever should rest approximately in the middle of the upper end of the latch lever extension, and there should be .010" to .045" clearance between the side of the contact lever and the side of the spacer release pull bar. (See Figure 58 for location of parts.) To adjust, position the contact lever bracket by means of its mounting screws.

2.a.(63)(b) LATCH LEVER BRACKET EXTENSION ADJUSTMENT (Figure 58) - With the main bail roller on the high part of its cam and the contact lever resting against the main bail, there should be .015" to .030" clearance between the upper end of the latch lever extension and the lower latching surface of the contact lever. To adjust, loosen the latch lever extension clamping screws and set the extension approximately at the mid-point on its adjustable limits, then position the bell bracket extension by means of its mounting screws to meet the foregoing requirements.

2.a.(63)(c) LATCH LEVER EXTENSION ADJUSTMENT (Figure 59) - With the carriage in the FIGURES position, the main bail roller on the high part of its cam, and the H type bar resting on the platen roller, the latch lever extension should overtravel the lower latching surface of the contact lever by .010" to .025". To adjust, position the latch lever extension by means of its clamping screws, and recheck the Bell Bracket Extension Adjustment.

2.a.(63)(d) CONTACT LEVER SPRING TENSION (Figure 58) - With the main bail in its downward position, hook a 32 oz. scale under the end of the contact lever and pull up vertically. It should require 9 to 12 ozs. to start the lever moving.

2.a.(63)(e) LATCH LEVER SPRING TENSION (Figure 58) - With the main bail in its downward position, hook an 8 oz. scale over the latch lever at the

spring eye, and pull horizontally. It should require 1 to 2 ozs. to start the lever moving.

2.a.(63)(f) OPERATING LEVER SPRING TENSION (Figure 58) - Hook an 8 oz. scale under the right edge of the operating lever and pull up vertically. It should require 1/2 to 1-1/2 ozs. to start the lever moving.

2.a.(63)(g) MOTOR CONTROL CONTACT ADJUSTMENTS (Figure 60) - With the motor control contact guard removed and the main bail roller on the high part of its cam, the motor control contacts should meet the following requirements.

2.a.(63)(g)1. The fibre insulator on the lower long contact spring should align with the head of the contact lever adjusting screw. To adjust, position the contact assembly by means of its mounting screws.

2.a.(63)(g)2. The lower short contact spring should be straight and should bear against its stiffener with a perceptible tension when the other contact springs are held off. To adjust, bend the lower short contact spring and stiffener.

2.a.(63)(g)3. With an 8 oz. scale hooked under the lower long contact spring at the contact and pulled up vertically, it should require 3/4 to 1-1/2 ozs. to separate the contacts with the upper long contact spring held off. To adjust, bend the lower long contact spring.

2.a.(63)(g)4. With an 8 oz. scale hooked under the upper long contact spring at the contact and pulled up vertically, it should require 1/2 to 1 oz. to start the fibre insulator on the upper long spring moving away from the lower long spring. When taking this reading, hold off the upper contact spring. To adjust, bend the upper long contact spring.

2.a.(63)(g)5. With an 8 oz. scale hooked under the upper contact spring at the contact and pulling vertically upward, it should require 1 to 2 ozs. to start the spring moving away from the stiffener, and there should be .010" to .020" gap between the contacts of the two upper contact springs. To adjust, bend the upper contact spring and stiffener.

2.a.(63)(h) CONTACT LEVER ADJUSTING SCREW ADJUSTMENT (Figure 61) - With the main bail raised by hand to its extreme upward position and the latch lever latched on the upper latching surface of the contact lever, there should be .008" to .015" space between the upper short contact spring and its stiffener. Adjust by means of the contact lever adjusting screw. Replace the motor control contact guard.

2.a.(63)(i) MAIN BAIL SPRING ADJUSTMENT The printing blow, i.e., the force with which the type bars strike the platen, can be adjusted by means of the main bail spring adjusting screw. This adjust-

ingscrew is mounted just to the left of the upper clutch throw-out lever pivot screw, which is shown in Figure 2A.

While the printer is printing, loosen the lock nut holding the main bail spring adjusting screw, and turn the screw in a counterclockwise direction until the printer starts to fail to print. Now turn this screw in a clockwise direction until a good clear copy is obtained without embossing the paper. Tighten the lock nut.

2.a.(64) PUSH TAPE FEED MECHANISM ADJUSTMENTS

2.a.(64)(a) RIGHT TAPE GUIDE (Figure 89)

2.a.(64)(a)1. When a piece of tape is inserted through both tape guides, it should align with the platen and the printing should be in the center of the tape. To adjust, position the right tape guide and tighten the mounting screw.

2.a.(64)(a)2. The free end of the right tape guide should align with the point of contact between the platen and the feed roll. Adjust if necessary by bending the guide.

2.a.(64)(b) CENTER TAPE GUIDE (Figure 89) - The center tape guide should clear the platen by .006" to .012" when the feed roll is resting on the platen. To adjust, loosen the nut on the rear end of the feed roll journal and position the guide.

2.a.(64)(c) TAPE FEED ROLL SPRING TENSION With the feed roll resting on the platen, hook a 32 oz. scale over the end of the feed roll bearing screw and pull at right angle to the right tape guide, away from the platen roll. It should require 10 to 14 ozs. to start the feed lever moving.

2.a.(65) POSITIVE CARRIAGE SHIFT MECHANISM ADJUSTMENTS

2.a.(65)(a) LOCKING PAWL POST (Figure 90) The side of the figures locking pawl should be parallel to the side of the carriage shift plate. Adjust by positioning the locking pawl post.

2.a.(65)(b) FIGURES STOP SCREW ADJUSTMENT (Figure 30) - The figure "2" should print in the middle of the platen roll. Adjust by means of the FIGURES stop screw and gauge by printing directly on the platen roll.

2.a.(65)(c) CARRIAGE LOCKING TOE ADJUSTMENT (Figure 31) - With the platen in the LETTERS position, the letter W should print in the middle of the platen roll, when printed directly on the platen and gauged by eye. To adjust, loosen the carriage locking toe mounting screw and position the carriage locking toe. Tighten the mounting screw.

2.a.(65)(d) CARRIAGE CAPSTAN NUTS ADJUSTMENT (Figure 31) - The carriage locking toe should overtravel the notch in the carriage locking pawl by .020" to .025" when the carriage capstan nuts are against the front carriage bearing. Adjust by means of the carriage capstan nuts.

2.a.(65)(e) SHIFT PLATE (Figures 90 and 91) - (For units not equipped with #84584 release pull bar assembly)

2.a.(65)(e)1. With the carriage in the FIGURES position and the figures locking pawl held downward against the projection on the shift plate, there should be from .010" to .020" clearance (Figure 90) between the locking surface of the locking pawl and the vertical surface of the projection on the carriage shift plate.

2.a.(65)(e)2. With the carriage in the LETTERS position, set up the BLANK combination and rotate the motor until the main bail is in its uppermost position. There should then be .010" to .020" clearance (Figure 89) between the lower surface of the pawl and the upper surface of the projection on the shift plate when the carriage is being moved manually from the LETTERS TO THE FIGURES position.

2.a.(65)(e)3. To adjust, loosen the two screws that attach the carriage-locking toe and the carriage shift plate to the carriage. Position the shift plate horizontally toward the front or rear to meet the first requirement and vertically to meet the latter requirement. Tighten the shoulder screw (rear) only; reposition the tape guide and tighten the shoulder screw lock nut.

2.a.(65)(f) SHIFT PLATE ECCENTRIC (Figure 91) (For units not equipped with #84584 release pull bar assembly) - With the carriage in the FIGURES position, FIGURES combination selected, and the motor rotated until the main bail has attained its extreme upward position (assist the bail manually), there should be .010" to .040" clearance (Figure 91) between the head of the eccentric screw and the upper extension of the shift lock lever. To adjust, position the eccentric screw.

NOTE: In order to assure alignment of the shift lock lever and the eccentric on the shift plate, shims No. 8896 are provided for use as required to take up any excessive play that may be present between the lock lever and the spacer washer.

2.a.(65)(g) SHIFT PLATE (Figures 91 and 93) (For units equipped with 84584 release pull bar assembly)

2.a.(65)(g)1. Select the FIGURES combination and rotate the motor until the main bail is in its uppermost position. With the FIGURES locking pawl held against the projection on the shift plate there should

be from .010" to .020" clearance (Figure 91) between the locking surface of the locking pawl and the vertical surface of the projection on the carriage shift plate.

2.a.(65)(g)2. With the carriage shift plate eccentric rotated so that it does not interfere with the shift lock lever and with the carriage in the LETTERS position, select the FIGURES combination and rotate the motor until the shift lock lever just disengages from the carriage locking toe. In this position the FIGURES locking pawl should rest against the upper surface of the carriage shift plate extension and there should be from .020" to .040" clearance (Figure 93) between the lower surface of the release pull bar and the top surface of the rear portion of the FIGURES locking pawl at the closest point. When checking this clearance take up the play between the carriage frame and the front bracket guide post, to make the clearance a minimum.

2.a.(65)(g)3. To adjust, loosen the two screws that attach the carriage locking toe and the shift plate to the carriage. With the play of the plate taken in the upward direction, position the shift plate horizontally toward the front or rear to meet the first requirement and vertically to meet the latter requirement. Tighten the screw and shoulder screw; reposition the tape guide and tighten the shoulder screw lock nut. Recheck the carriage locking toe adjustment.

2.a.(65)(h) SHIFT PLATE ECCENTRIC (Figure 92) (For units equipped with 84584 release pull bar assembly - Figure 93) - With the carriage in the LETTERS position, select the FIGURES combination and rotate the motor shaft until the shift lock lever just disengages from the carriage locking toe. There should be from .065" to .075" clearance (Figure 91) between the carriage shift plate eccentric screw and the shift lock lever. Adjust by positioning the eccentric screw.

NOTE: Refer to note following previous SHIFT PLATE ECCENTRIC adjustment.

2.a.(65)(i) FIGURES LOCKING PAWL SPRING TENSION (Figure 90) - With the carriage in the LETTERS position and the FIGURES pull bar in its unoperated position, hook an 8 oz. scale over the spring post on the FIGURES locking pawl and pull vertically upward. It should require from 1-1/2 to 5 ozs. to start the pawl moving.

NOTE: After the completion of these adjustments, place the carriage in the LETTERS position, select the FIGURES combination and slowly rotate the motor; observe that the shift lock lever disengages from the locking toe before the vertical shift lock lever extension touches the carriage shift plate eccentric. If necessary, readjust the applicable SHIFT PLATE ECCENTRIC.

2.a.(66) UNSHIFT ON SPACE PULL BAR BLOCKING MECHANISM (On units so equipped) - Set up blank combination and rotate motor governor or fan until main bail is in its uppermost position. Position eccentric on blocking mechanism so that with blocking arm in operated position (in) the unshift on space pull bar clears the code bars by .020" to .070".

## 2.b. KEYBOARD BASE ADJUSTMENTS

### REMOVE THE KEYBOARD BASE PLATE

2.b.(1) UNIVERSAL BAR PILOT SCREWS ADJUSTMENT - See Note (C) - The trip-off pawl should be approximately midway between the sides of the slot in the casting, and the universal bar should have some endplay, not more than .010". Adjust by means of the universal bar pilot screws (See Figure 62 for location of parts).

2.b.(2) TAPE LEVER ADJUSTING CLAMP ADJUSTMENT (Figure 63) - See Note (C) - There should be a clearance of 1/4" (plus or minus 1/32") between the tape lever roller and the tape roller, with the locking pawl touching the front face of the bell hammer extension and the play of the bell hammer taken up in a direction away from the bell. To adjust, position the adjusting clamp by means of its clamping screw, making sure that the locking pawl bushing has no end play between the shoulder on the shaft and the adjusting clamp, when the clamping screw has been tightened.

2.b.(3) TRIP-OFF PAWL STOP PLATE ADJUSTMENT (Figure 62) - See Note (C) - There should be .040" to .060" clearance between all key levers and the universal bar. Adjust by means of the trip-off pawl stop plate.

2.b.(4) GEAR GUARD ADJUSTMENT (Figure 64) There should be some clearance, not more than .008", between the bell hammer extension and the bell operating post, when the bell hammer is held in its locked position by the locking pawl and the play is taken up to make this clearance a minimum. To adjust, remove the tape reel container and position the gear guard.

2.b.(5) TAPE-OUT BELL ADJUSTMENT (Figure 65) There should be .002" to .004" clearance between the bell hammer and the bell when the bell hammer is resting against the gear guard. To adjust, position the bell by means of its mounting screw.

2.b.(6) BELL HAMMER EXTENSION STOP ADJUSTMENT (Figure 64) - See Note (D) - With the locking pawl engaging the bell hammer extension, there should be .020" to .040" clearance between the lower side of the bell hammer extension and the bell hammer extension stop. To adjust, position the bell hammer extension stop.

2.b.(7) BELL HAMMER SPRING TENSION (Figure 64) - See Note (D) - Remove the tape lever and locking pawl springs. With the bell hammer resting

NOTE (C) This requirement should be checked with the keyboard base plate removed.

against the gear guard, hook an 8 oz. scale at the springhole and pull in line with the spring. It should require 3 to 5 ozs. for the one-piece design which measures approximately 2 inches in length between the pivot points, or 2 to 4 ozs. for the two-piece design which measures approximately 1 inch between the pivot points, to start the hammer moving.

2.b.(8) TAPE LEVER SPRING TENSION - See Note (D) - Remove the locking pawl spring. Hook an 8 oz. scale at the locking pawl spring hole and pull toward the rear of the base at right angle to the front edge of the pawl. With the bell operating post rotated out of the way, it should require 3 to 4-1/2 ozs. to cause the locking pawl to just butt against the bell hammer extension. Replace the locking pawl spring.

NOTE: On units equipped with tape out contact assembly the tension should be 6 to 8 ozs.

2.b.(9) LOCKING PAWL SPRING TENSION (Figure 66) - With the locking pawl resting against the front face of the bell hammer extension and the tape lever held down, hook an 8 oz. scale at the spring hole and pull in line with the spring toward the front. It should require 1/2 to 1-1/2 ozs. to start the pawl moving.

2.b.(10) LOCK LOOP SPRING TENSION (Figure 67) - Rotate the transmitting shaft until the lock loop roller is resting on the low part of its cam. Hook an 8 oz. scale under the lock loop spring hole and pull in line with the spring. It should require 4 to 5 ozs. to start the lock loop moving.

2.b.(11) TRANSMITTING CAM CYLINDER ADJUSTMENT (Figure 68) - The transmitting cam cylinder should have some end play, not more than .002". Adjust the bushing in the rear bearing bracket by means of its adjusting nuts.

2.b.(12) LOCKING LEVER SHAFT ADJUSTMENT (Figure 67) - With all the contact levers on the high part of their cams and the locking levers in their spacing position, there should be some clearance, not more than .010", between the locking levers and the contact levers when the locking levers are pressed downward by hand to make the clearance a minimum. Adjust the position of the locking lever shaft to meet this requirement.

2.b.(13) LOCKING LEVER TRAVEL (Figure 67) - With the LETTERS key depressed and the lock loop roller resting on the low part of its cam, there should be at least .010" clearance between any locking lever finger and the lock loop blade. Make a similar check when the BLANK key is depressed. This adjustment can be made by loosening the four screws which hold the main bracket and shifting the bracket.

2.b.(14) TRANSMITTING CONTACTS GAP ADJUSTMENT (Figure 67) - With each contact lever on the high part of its cam, the contact gap should be

NOTE (D) These requirements should be checked with the tape reel container removed.

.017" to .025" (.015" to .025" for start-stop contacts).

NOTE: If no signal measuring device is available, ALL contact gaps should be: .017" to .023" for units operating at 60 or 75 WPM. .020" to .025" for units operating at 100 WPM. To adjust, bend the shorter contact springs.

2.b.(15) TRANSMITTING CONTACT SPRING PRESSURE (Figure 69) - With each contact lever in the low part of its cam, it should require a pressure of 4-1/2 to 5-1/2 ozs. to open the contacts when pressing against the spring above the contact point. To adjust, bend the longer contact spring. Recheck the contact gaps adjustment.

2.b.(16) CLUTCH THROW-OUT LEVER ADJUSTMENT (Figure 62) - There should be .005" to .015" clearance between the clutch teeth when the clutch is fully disengaged. To adjust, position the clutch throwout lever by means of shims placed between the throwout lever post and the bracket.

2.b.(17) CLUTCH SPRING COMPRESSION (Figure 70) - It should require 9 to 12 ozs. to separate the clutch teeth. Hook a 32 oz. scale to the driven member projection and pull directly in line with the shaft.

#### 2.b.(18) LOCK LOOP ROLLER ADJUSTMENT

NOTE: This adjustment applied only to those keyboards equipped with lock loops having an elongated hole for the roller pivot screw. Rotate the keyboard shaft until the clutch teeth are disengaged. Press the lock loop roller against the cam to fully disengage the clutch teeth and position the locking levers directly below the lock loop blade to make the clearance a minimum. Under these conditions, there should be .008" to .015" clearance between the lock loop blade and the locking lever having the least clearance. To adjust, position the roller pivot screw by means of its elongated mounting hole.\* (See Figure 67 for location of parts.)

\* On some keyboards an eccentric roller pivot screw is used which provides extra adjusting margin. In these cases the shoulder screw should be mounted with the high part of its eccentric extending toward either end of the slot in the lock loop, depending upon which direction the additional margin of adjustment is required.

2.b.(19) INTERMEDIATE PAWL ECCENTRIC ADJUSTMENT (Figure 62) - There should be .050" to .060" clearance between the trip-off pawl and the intermediate pawl, when the trip-off pawl is resting against the stop plate and the intermediate pawl is against its eccentric. Adjust by means of the intermediate pawl eccentric.

2.b.(20) CLUTCH THROWOUT LEVER ECCENTRIC ADJUSTMENT - With the transmitter shaft in the stop position and the clutch fully disengaged, hold the clutch throwout lever against the driven clutch member. Under this condition the intermediate pawl should be held firmly between the clutch throwout lever and the intermediate pawl eccentric. See Figure 62.

NOTE: On some units the driven clutch member has a tendency to settle back when the clutch throwout lever is held against it, slightly altering the stop position. On units where this condition prevails, the clutch throwout lever eccentric adjustment shall be made and checked after this settling has occurred. Adjust by means of the eccentric.

2.b.(21) TRIP-OFF PAWL ECCENTRIC ADJUSTMENT - Hold the clutch throwout lever against the high part of the cam on the driven clutch member, and at the same time hold the clutch throwout lever eccentric against the clutch throwout lever. Under this condition, the point on the trip-off pawl should clear the point on the intermediate pawl by not more than .004" when a key lever is being depressed. Adjust by means of the trip-off pawl eccentric. (See Figure 62 for location of parts.)

NOTE: When making this adjustment, the high part of the eccentric should be positioned toward the rear of the keyboard.

2.b.(22) CLUTCH THROWOUT LEVER SPRING TENSION - With the clutch teeth engaged and the clutch throwout lever resting against the low part of the driven clutch member, hold the intermediate pawl against its eccentric; at the same time hook an 8 oz. scale over the throwout lever just above the spring hole and pull in line with the spring. It should require 1-1/2 to 2-1/2 ozs. to start the throwout lever moving. (See Figure 62 for location of parts.)

2.b.(23) TRIP-OFF PAWL SPRING TENSION (Figure 71) - Unhook the trip-off pawl spring. With an 8 oz. scale hooked in the spring eye, it should require 2-3/4 to 3-3/4 ozs. to pull it to its normal position length. Replace the spring.

2.b.(24) REPEAT ON SPACE MECHANISM (On keyboard bases so equipped)

### 2.b.(24)(a) REPEAT SPACE ROD ADJUSTMENT

With the push end of a 32 oz. scale placed at the approximate center of the spacer bar and when applying 10 ozs. of pressure to depress the spacer bar against its rubber stop, there should be .010" to .020" clearance between the clutch throwout lever and the high part of the throwout cam. Adjust by means of the adjusting nuts on the repeat space rod. (See Figure 62)

2.b.(24)(b) REPEAT SPACE ROD BRACKET ADJUSTMENT - The repeat space rod bracket should be adjusted so that the face of the section with the elongated hole is parallel to the rear edge of the rear transmitter bracket in order to assure free movement of the repeat space rod. The repeat space rod end should engage the intermediate pawl at least 1/2 the thickness of the pawl when the space bar is fully depressed.

2.b.(24)(c) TAPE GUIDE TUBE ADJUSTMENT The right-hand end of the tape guide tube should be approximately 1/32" from the outside edge of the keyboard. Adjust the position of the tape guide tube by means of the adjusting clamp.

2.b.(24)(d) JACK SPRING TENSION - A pressure of 1-1/2 to 3 lbs. should be required to open the jack to the extent of .030" when pressure with a 12 lb. scale is applied to the curved portion of the jack. To adjust, remove and bend the jack spring.

2.b.(24)(e) TYPING UNIT SLIP CONNECTIONS SPRING TENSION ADJUSTMENT - The slip connection springs should be adjusted so that there is a space of 7/16" to 15/32" between a line across the inside of the two mounting posts of the slip connection block and the high part of the crimped portion of the two end springs that make contact with the terminal screws on the typing unit, when measured with a 6" scale held against a post and parallel to the front edge of the keyboard casting. There should be some clearance, not more than .015", between the inner springs and a straight edge placed against the crimped part of the two end springs. Adjust the slip connection springs by bending.

2.b.(24)(f) KEY LEVER SPRING ADJUSTMENT (Figure 72) - See Note (C) - The opening between the ends of all key lever springs, excepting the spacer key lever spring, should measure 1-3/16". The spacer key lever spring should measure 1-15/16" across the opening between the ends. Adjust by bending.

2.b.(25) REPEAT ON S MECHANISM (On keyboard bases so equipped)

2.b.(25)(a) REPEAT SPACE ROD SPRING TENSION (Figure 73) - Hold the repeat yoke unoperated. Hook an 8 oz. scale over the repeat space rod, just below the spring, and pull horizontally toward the front of the keyboard. It should require 3/4 to 1-3/4

ozs. to start the rod moving.

2.b.(25)(b) REPEAT YOKE LUG ADJUSTMENT (Figure 74) - See Note (C) - With the push end of a 32 oz. scale placed at the approximate center of the "S" keytop and when applying 26 ozs. of pressure to depress the "S" keylever (until it bottoms in the code bar slots), there should be .010" to .020" clearance between the clutch throwout lever and the high part of the throwout cam. Adjust by means of the lug mounting screws on the repeat yoke.

2.b.(26) CONTROL RELAY ADJUSTMENTS (Figure 75)

2.b.(26)(a) For BREAK operation, the control relay should be adjusted to meet the following requirements: - See Note (C)

2.b.(26)(a)1. There should be a gap of .005" to .015" between the outer spring contact and the middle spring contact, when the plunger is held operated. Adjust by bending the outer spring.

2.b.(26)(a)2. There should be a gap of .025" to .030" between the inner spring contact and the middle spring contact, when the plunger is held operated. Adjust by bending the inner spring.

2.b.(26)(a)3. With the relay plunger in unoperated position hook an 8 oz. scale over the middle contact spring as close as possible to the wiper contact and pull horizontally at right angle to the contact spring. A pull of 5 to 6 ozs. is required to cause the middle contact to break with the inside contact. To adjust, bend the middle contact spring and recheck adjustment (2).

2.b.(26)(b) For MAKE operation, the control relay should be adjusted to meet the following requirements: - (Figure 76) - See Note (C)

2.b.(26)(b)1. With the magnet plunger held operated (See Figure 76), a pull of 12 to 16 ozs. should be required to cause the outer spring to just break contact with the middle spring when a 32 oz. scale is hooked over the end of the outer spring and pulled horizontally at right angle to the spring. Adjust by bending the outer spring.

2.b.(26)(b)2. There should be .030" to .040" gap between the contacts of the inner and middle spring, when the magnet plunger is held operated. Adjust by bending the inner spring.

2.b.(26)(b)3. A pull of 1-1/2 to 2 ozs. should be required to cause the middle spring to just break contact with the inner spring when an 8 oz. scale is hooked over the middle spring at the side of the contact and pulled horizontally at right angle to the

NOTE (C) These adjustments should be made with the keyboard base cover plate removed.

spring. Adjust by bending the middle spring and re-check adjustment 2.

The value of the operating current for the control relay should be between .050 and .060 amperes when adjusted for either MAKE or BREAK operation.

2.b.(27) MECHANICAL MOTOR CONTROL MECHANISM ADJUSTMENTS (Functions on Upper Case H)

2.b.(27)(a) START MAGNET CORE ADJUSTMENT - See Note (C) - With the start magnet armature held in the operated position, there should be not more than .004" clearance between the start magnet armature and the shorter core. Adjust by varying the number of shims between the start magnet cores and the yoke. (See Figure 77 for location of parts.)

2.b.(27)(b) STOP MAGNET CORE ADJUSTMENT - See Note (C) - With the stop magnet armature held in the operated position, there should be not more than .004" clearance between the stop magnet armature and the stop magnet core or yoke. Adjust by varying the number of shims between the rear end of the stop magnet core and the yoke. (See Figure 77 for location of parts.)

2.b.(27)(c) START MAGNET BRACKET ADJUSTMENT (Figure 77) - See Note (C) - With the start magnet armature held operated and the stop magnet armature held so that its inner edge aligns with the outer shoulder on the start magnet armature, there should be .004" to .008" clearance between the end of the stop magnet armature and the start magnet armature. To adjust, position the start magnet bracket by means of its mounting screws.

2.b.(27)(d) STOP MAGNET BRACKET ADJUSTMENT (Figure 78) - See Note (C) - With the stop magnet armature held in the operated position by its latch, there should be .004" to .008" clearance between the stop magnet armature and the outer face of the yoke when measured at the closest point. To adjust, remove the resistor and position the stop magnet bracket by means of its mounting screws. Replace the resistor.

2.b.(27)(e) ARMATURE STOP ADJUSTMENT (Figure 77) - See Note (C) - With the stop magnet armature against the armature stop, there should be .070" to .080" clearance between the stop magnet armature and the outer face of the yoke. Adjust the armature stop by means of its mounting screws.

2.b.(27)(f) LATCH BACKSTOP SCREW ADJUSTMENT (Figure 79) - See Note (C) - With the stop magnet armature held in the operated position by the notch in the start magnet armature, there should be some clearance, not more than .008" between the high part of the latching surface of the latch and the end of the slot in the stop magnet armature. Adjust

by means of the latch backstop screw.

2.b.(27)(g) STOP MAGNET ARMATURE SPRING TENSION (Figure 78) - See Note (C) - With the stop magnet armature held operated and the stop magnet armaturespring unhooked, hook a 32 oz. scale in the spring eye and pull the spring to its normal position length. This requirement should be 14 to 16 ozs. Adjust by means of the adjustable spring post.

2.b.(27)(h) START MAGNET ARMATURE SPRING TENSION (Figure 78) - See Note (C) - With the stop magnet armature held against its pole faces, hook an 8 oz. scale over the end of the spring post on the start magnet armature and pull horizontally in line with the spring. It should require 3-1/2 to 4-1/2 ozs. to start the armature moving.

2.b.(27)(i) LATCH SPRING TENSION (Figure 77) - See Note (C) - With both armatures released, hook an 8 oz. scale over the latch between the spring and the shoulder and pull horizontally. It should require 1-1/2 to 2-1/2 ozs. to start the latch moving.

2.b.(27)(j) INNER CONTACT ASSEMBLY ADJUSTMENTS (Figure 79) - See Note (C)

2.b.(27)(j)1. With the stop magnet armature held in the operated position by the notch in the start magnet armature, hook an 8 oz. scale over the spring alongside the insulator and pull at right angle to the spring. It should require 1-1/2 to 2 ozs. to start the long spring moving away from the stop magnet armature. To adjust, remove the outer contact assembly, if necessary, and bend the long contact spring.

2.b.(27)(j)2. With the stop magnet armature held in the operated position by the notch in the start magnet armature, there should be a gap of .015" to .020" between the contacts. To adjust, bend the short contact spring.

2.b.(27)(k) OUTER CONTACT ASSEMBLY ADJUSTMENTS (Figure 80) - See Note (C)

NOTE: The stop magnet armature should be held operated by the notch in the start magnet armature during each of the following adjustments:

2.b.(27)(k)1. The short contact spring nearest the armature should bear against its stiffener with perceptible pressure when the other springs are held off. Adjust by bending the short contact spring.

2.b.(27)(k)2. There should be some clearance, not more than .006", between the insulator on the long contact spring and the stop magnet armature. Adjust by bending the spring stiffener nearest the armature. Recheck (1).

NOTE (C) These requirements should be checked with the keyboard base plate removed.

2.b.(27)(k)3. With an 8 oz. scale hooked over the long contact spring nearest the stop magnet armature at the contact point and pulled at right angle to the spring, it should require 1 to 1-1/2 ozs. to separate the contacts when the long contact spring farthest from the stop magnet armature is held away. Adjust by bending the long contact spring nearest the armature.

2.b.(27)(k)4. The long contact spring farthest from the stop magnet armature should bear lightly against the long contact spring nearest the stop magnet armature. Adjust by bending the long contact spring farthest from the armature.

2.b.(27)(k)5. Hook an 8 oz. scale over the short contact spring farthest from the stop magnet armature at the contact and pull at right angle to the spring. It should require 1 to 2 ozs. to start the spring moving away from its stiffener. Adjust by bending the short contact spring and stiffener. Recheck adjustment 2.

#### REPLACE THE KEYBOARD BASE PLATE

#### 2.c. GOVERNOR ADJUSTMENT

REMOVE THE GOVERNOR ADJUSTING BRACKET, BRUSH SPRING PLATE, TARGET, GOVERNOR COVER, AND GOVERNOR

2.c.(1) ALIGNMENT AND SQUARENESS OF GOVERNOR CONTACTS - All governor contacts can be adjusted for alignment of edges; only those governor shells which provide elongated mounting holes for the fixed contact bracket permit adjustment of the contact for height by positioning the contact bracket.

The governor contacts should be in line and meet squarely so that maximum contact surface is provided. (Check with the retractile spring tension adjusted so that the contacts just make, or to the limit of the adjusting screw.)

2.c.(1)(a) Line up edges of contacts by means of the floating contact hinge mounting screw.

2.c.(1)(b) Adjust contacts for squareness from right to left by positioning the height of the fixed contact bracket using the elongated mounting holes in the governor shell.

2.c.(1)(c) To adjust from front to back, twist the floating contact hinge, applying pressure to the arm near the contact.

NOTE: Check by use of a .002" gauge (smaller if available). Check with gauge between edges of the contacts to see that the gauge enters (or does not enter) equally on all sides.

#### 2.c.(2) SPEED ADJUSTING WHEEL FRICTION

WASHER SPRING TENSION ADJUSTMENT (Figure 81) - Turn the adjusting wheel so that the tension on the governor contact is 13 to 14 ozs. Measure by hooking a 32 oz. scale over the contact spring arm next to the contact and pulling parallel to the speed adjusting spring.

To measure the pressure of the speed adjusting wheel friction washer, insert a bank pin in the leather rim (radially), and hook a 32 oz. scale over the pin at the periphery of the adjusting wheel and pull at right angle to the radius. It should require 16 to 24 ozs. to start the wheel moving. To adjust this tension, remove the friction washer and bend the large projections.

2.c.(3) GOVERNOR BRUSH SPRING REQUIREMENT (Figure 82) - (Collector Ring Governor Only) It should require 3 to 4 ozs. pressure, using an 8 oz. scale, to depress a brush spring to its required position; that is, to within .015" to .050" of the brush holder. The pigtailed should be soldered to both the carbon brush and the brass inserts of the brush screws. Replace the governor.

2.c.(4) GOVERNOR SHIMS ADJUSTMENTS - There should be at least .006" clearance between the adjusting lever wearing strip and the adjusting wheel when the adjusting wheel is opposite the wearing strip and the play of the armature is taken up in a direction to make this clearance a minimum by overcoming the armature end thrust spring. To adjust, install shims on the armature shaft between the governor hub and the motor end frame casting if necessary. See Figure 85 for location of parts.

2.c.(5) SPEED ADJUSTING LEVER STOP PLATE ADJUSTMENT - There should be .006" to .050" clearance between the adjusting lever wearing strip and the governor shell when the speed adjusting lever is held against the stop plate. To adjust, loosen the stop plate mounting screws and position the plate. Tighten the screws. See Figure 85 for location of parts.

2.c.(6) GOVERNOR BRUSH POSITION (Collector Ring Governor Only) - The governor brushes should ride in the center of the collector rings and should project .015" to .050" beyond the brush holder. Elongated holes are provided in the brush holder bracket to allow for this adjustment. See Figure 82 for location of parts.

#### 2.c.(7) INNER AND OUTER DISC CONTACT SPRING ADJUSTMENT (Figure 83)

NOTE: These requirements should be checked with the governor adjusting bracket, brush spring plate, target and governor cover removed.

2.c.(7)(a) The distance from the inside surface of the governor cover to the highest point on the contact



springs should be  $25/32''$  to  $27/32''$ .

2.c.(7)(b) Place a D (89955) socket wrench over the nut (located in the center of the governor cover) that is used to hold the contact springs in place. With a 6" scale, measure the radial distance from the vertical surface of the wrench to the point where the scale touches the curved surface of the inner disc contact spring. This should be  $17/32''$  to  $19/32''$ .

2.c.(7)(c) In a similar manner, measure the distance from the wrench to the point of contact on the outer disc contact spring. This should be  $7/16''$  to  $1/2''$ .

These requirements may be obtained by bending the contact springs. Replace the governor cover, target, and brush spring plate.

2.c.(8) GOVERNOR BRUSH SPRING PLATE BRACKET ADJUSTMENT - The governor brush spring plate bracket should be set so that:

2.c.(8)(a) A line established by the center of the outer disc and the center of one of the brushes should pass through some portion of the other brush. (Figure 84).

2.c.(8)(b) The surface of the brush spring plate bracket, on which the brush spring plate is mounted, aligns with the outer surface of that part of the governor cover on which the target is mounted. (Figure 85).

2.c.(8)(c) The bracket is parallel to the edge of the motor base plate. Adjust the brush spring plate bracket by means of its enlarged mounting holes. See Figure 85 for location of parts.

2.c.(9) GOVERNOR BRUSH SPRING PRESSURE (Figure 85)

2.c.(9)(a) INNER DISC BRUSH SPRING - Hook an 8 oz. scale over the inner spring just in front of the carbon contact brush. Pulling horizontally away from the motor, it should require  $4-1/2$  to  $5-1/2$  ozs. to start the brush moving away from the disc.

2.c.(9)(b) OUTER DISC BRUSH SPRING - Apply the push end of an 8 oz. scale against the outer brush spring, just in front of the carbon contact brush. Pushing horizontally toward the motor, it should require  $4-1/2$  to  $5-1/2$  ozs. to start the brush moving away from the disc.

To obtain the correct brush spring pressure, remove and bend the brush springs. When the springs are replaced and the pressure obtained, take care that the contact brushes lie flat against their respective discs, and that the outer edges of the brushes are either flush with, or not more than  $3/64''$  inside, the outer edges of the discs.

NOTE: If necessary, level off the brushes by passing a piece of No. 0000 sandpaper between the brush and the disc.

## REPLACE THE GOVERNOR ADJUSTING BRACKET

2.c.(10) GOVERNOR ADJUSTING BRACKET ADJUSTMENT (Figure 85) - The adjusting surface of the governor adjusting bracket should clear the speed adjusting wheel by  $.020''$  to  $.060''$ . Bend the governor adjusting bracket if necessary to secure this clearance.

## 2.d. SYNCHRONOUS MOTORS

### 2.d.(1) STARTING SWITCH ADJUSTMENTS

NOTE: These requirements should not be checked unless there is reason to believe the starting switch is out of adjustment.

2.d.(1)(a) Remove the motor from the base and remove the motor fan and pinion.

2.d.(1)(b) Remove the switch end shield screws and the switch commutator mounting screws, also the switch end shield.

2.d.(1)(c) Pull out the rotor until the brush holder spring is accessible and remove the spring.

2.d.(1)(d) Spring tension for 50 and 60 cycle motors should be  $1-3/4$  to 2 ozs., and 2 to  $2-1/2$  ozs. respectively, when extended to a length of 5 inches, using an 8 oz. scale.

2.d.(1)(e) The brush holders should be mounted by means of the center set of mounting holes and should be free.

2.d.(1)(f) The brush holder stop pins should be safely within the holes of the fibre disc when all the play in the brush holders has been taken up to make the engagement of the pins with the disc a minimum.

2.d.(1)(g) Replace the brush holder spring, making certain that the spring eyes are fully engaged with each other.

2.d.(1)(h) Replace the switch commutator screws and tighten the two screws alternately, a little at a time, until both screws are tight.

2.d.(1)(i) Replace the switch end shield screws, using the same precaution in tightening as above.

2.d.(1)(j) Apply the push end of a 12 lb. scale against the fan end of the shaft and push parallel with the shaft. It should require at least 7 lbs. pressure to start the shaft moving.

2.d.(1)(k) Replace the motor fan and pinion. Replace the motor unit on the base and check the motor

plate adjustment.

sleeve, oiling the clutch and the sleeve.

### 3. LUBRICATION

The oil and grease specified in the supplement furnished with this bulletin should be used to lubricate the Model 14 printer.

Unless otherwise specified, one or two drops of oil at each of the places indicated will be sufficient. Use oil for lubrication at all of the places listed below, except where the use of grease is specified.

Oil both loops of all helical springs that exert a nominal tension of less than 2-1/2 pounds.

Apply grease to both loops of all helical springs that exert a nominal tension of 2-1/2 pounds or more.

#### 3.a. TYPING UNIT

3.a.(1) Stop lever, trip latch, trip latch bell crank, and trip latch plunger of range finder assembly.

3.a.(2) Selector cam sleeve - drop of oil on each cam peak.

3.a.(3) Locking cam felt oiler - saturate.

3.a.(4) Pivots of locking lever and selector levers.

3.a.(5) Selector sword bearings - drop oil through rear end of slots in separator plates.

3.a.(6) Selector "T" levers - pivots and all points of contact.

3.a.(6A) Selector Arm - 2 pivot screws, 2 sword contact points, locking tip and detent. (ON HOLD-ING TYPE SELECTOR only).

3.a.(7) Locking wedge.

3.a.(8) Code bars - at posts.

3.a.(9) Armature bearings - very sparingly.

3.a.(10) Main shaft - remove rear screw of orientation plate and swing plate to expose top of main shaft. Fill shaft through hole in center of retaining disc. Wipe excess oil off top of retaining disc.

NOTE: In printers not equipped with drilled main shafts, lubricate the main shaft clutch and sleeve as follows:

Oil liberally through the two opposite oil holes in sleeve just above the main shaft gear. Also squirt oil liberally on top of ball bearing just above the clutch. This oil will work down through the groove in the

3.a.(11) Selector clutch felt friction washers - pry the driving discs apart with screw driver and saturate felts with oil. Do this at two diametrically opposite places at both top and bottom felt washers.

3.a.(12) Clutch throwout lever - 2 pivots.

3.a.(13) Main bail cam clutch - saturate felt washer by applying oil between edge of disc and main shaft gear. A drop of oil should be applied through the spring to each disc prong.

3.a.(14) Main bail cam prongs - apply oil through spring. Swing motor back.

3.a.(15) Main bail roller - oil, grease, oil.

3.a.(16) Main bail plunger

3.a.(16)(a) Earlier designed mechanism - fill oil cup.

3.a.(16)(b) On units equipped for more efficient lubrication, remove the 1/4 x 32 screw and lock washer from the plunger bushing. Saturate oil wicks and fill plunger with oil. Replace lock washer and screw.

3.a.(17) Main bail lever - fill oil cup just above typing unit terminal block. Also oil end of lever in main bail plunger.

3.a.(18) Main bail - fill groove with oil and put drop of oil on top of square vertical guide post.

3.a.(19) Pull bars - one drop of oil on top of each pull bar.

3.a.(20) Type bar gears - pull each type bar down against platen. Put drop of oil on top of type bar gear at rear of segment slot.

3.a.(21) Ribbon feed ratchet and ribbon feed gears - drop of oil on teeth.

3.a.(22) Ribbon feed shaft detent plunger.

3.a.(23) Ribbon feed shaft - 2 oil holes.

3.a.(24) Ribbon feed lever - oil hole.

3.a.(25) Ribbon feed lever roller.

3.a.(26) Ribbon spool shafts - 2 bearings each.

3.a.(27) Ribbon reverse pawls and links - 4 bearings each side of printer.

3.a.(28) Ribbon reverse shafts - 2 bearings each.

3.a.(29) Tape feed roll - oil hole.

3.a.(30) Shift rocker and shift rocker lever - 2 pivot bearings.

3.a.(31) Pull bar lock-out lever - pivot and 2 rollers.

3.a.(32) Signal bell hammer - pivot.

3.a.(33) Carriage locking pawl - 1 pivot bearing.

3.a.(34) Spacer locking bail - 2 pivots.

3.a.(35) Spacer locking pawl - 1 pivot bearing.

3.a.(36) Platen shaft - 4 bearings.

3.a.(37) Platen guide.

3.a.(38) Spacer shaft - 2 bearings and gear. The rear bearing may be oiled from the rear of the printer.

3.a.(39) Spacer detent lever - pivot and roller.

3.a.(40) Spacer operating lever and roller.

3.a.(41) Spacer feed pawl.

3.a.(42) Motor bearings - two ball oilers - use grease according to instructions contained in the supplement furnished with this bulletin, or one drop of oil in each ball oiler.

3.a.(43) Keyboard driving gears - 2 oil cups.

3.a.(44) All spring anchors.

3.a.(45) Grease:

3.a.(45)(a) Five large gears at right rear of typing unit.

3.a.(45)(b) Main bail adjusting screw - end of screw.

3.a.(45)(c) Each anchor for main bail spring, spacer lever spring, and spacer detent lever spring.

3.a.(45)(d) Code bar locking lever where it bears on main bail.

3.a.(45)(e) Trace of grease on surface of each cam of the transmitting cam sleeve.

3.a.(45)(f) Ribbon feed shaft detent.

3.a.(45)(g) Clutch throwout lever - end of lever on camming surface.

3.a.(46) Bell and break contact mechanism adjustments - (If so equipped)

3.a.(46)(a) Finger arm, detent arm, and contact

arm pivots.

3.a.(46)(b) Extension of detent arm in finger arm fork.

3.a.(47) Mechanical end-of-line indicator mechanism (If so equipped)

3.a.(47)(a) Worm shaft and release bail - 2 bearings each.

3.a.(47)(b) Feed pawl.

3.a.(47)(c) Cam lever roller.

3.a.(47)(d) Grease worm shaft, detent drag spring, feed ratchet, and cam lever roller surface.

3.a.(48) Suppression of printing and spacing on lower case of blank mechanism (If so equipped)

3.a.(48)(a) Space suppression lever - 2 bearings.

3.a.(49) Motor control on upper case "H" mechanism (If so equipped)

3.a.(49)(a) Contact lever, latch lever, operating lever - 2 bearings each.

3.a.(50) Push tape feed mechanism

3.a.(50)(a) Feed roll and feed roll lever bearings - oil.

3.a.(51) Excess oil should be wiped off:

3.a.(51)(a) Magnet armature and cores. This may be done by pulling printer tape between armature and cores.

3.a.(51)(b) Type bar segment.

3.a.(51)(c) Printer base.

### 3.b. KEYBOARD

3.b.(1) Keyboard shaft bearings - 2 oil cups.

3.b.(2) Driven clutch - 2 drops of oil through coils of spring.

3.b.(3) Intermediate pawl - pivot.

3.b.(4) Trip-off pawl - pivot and surface bearing on trip-off pawl eccentric.

3.b.(5) Clutch throwout lever - 2 bearings.

3.b.(6) Lock loop - 2 bearings.

3.b.(7) Lock loop roller.

3.b.(8) Tape lever - drop of oil either side of

bearing.

- 3.b.(9) Tape bell hammer - 2 pivots.
- 3.b.(10) Locking levers - 5 bearings.
- 3.b.(11) Contact levers - one drop of oil on side of each lever placed so that the oil will run down on pivot.
- 3.b.(12) Spacerbar - 4 pivots and rivet for spacer key lever. Tip keyboard up on back. Remove base plate.
- 3.b.(13) Universal bar - 2 pivots.
- 3.b.(14) Selector bar rollers - 1 pivot each.
- 3.b.(15) Selector bars - at each guide bracket.
- 3.b.(16) Key levers - drop of oil on each key lever just in front of selector bars.
- 3.b.(17) Rear key lever bearing - drop of oil on bearing rod at four equidistant points.
- 3.b.(18) Repeat space rod - at bearing points and points of contact.
- 3.b.(19) Keyboard gear - grease.
- 3.b.(20) Cams - apply light film of grease to surface of cams.
- 3.b.(21) Motor control on upper case H (if so equipped)
  - 3.b.(21)(a) Stop magnet armature.
  - 3.b.(21)(b) Start magnet armature.
  - 3.b.(21)(c) Latch.
  - 3.b.(21)(d) Apply grease to the keyboard gear.

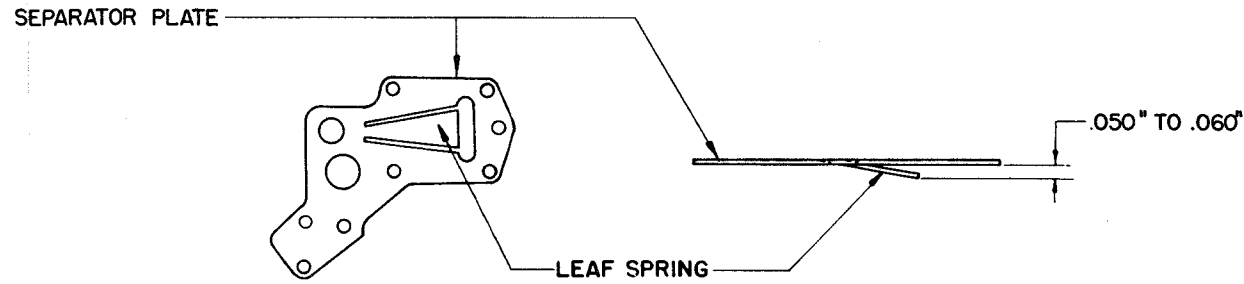


FIGURE 1

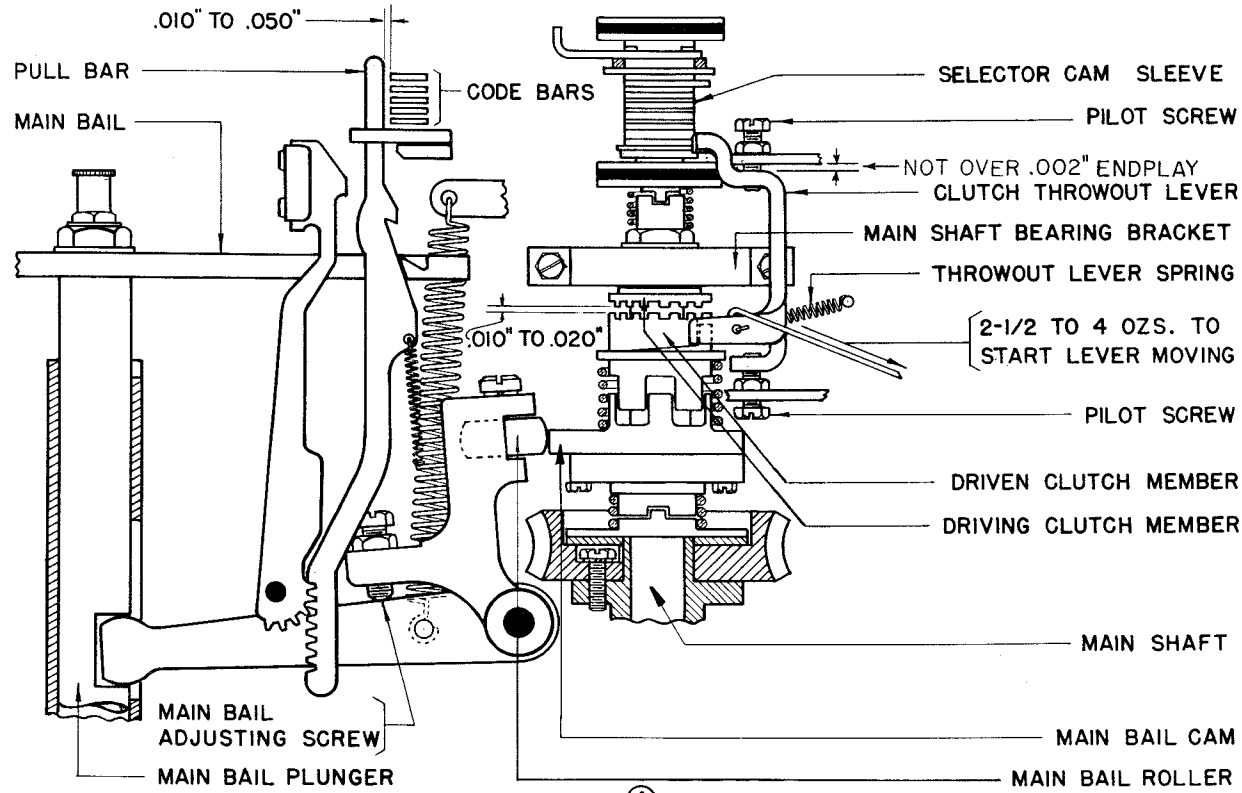


FIGURE 2

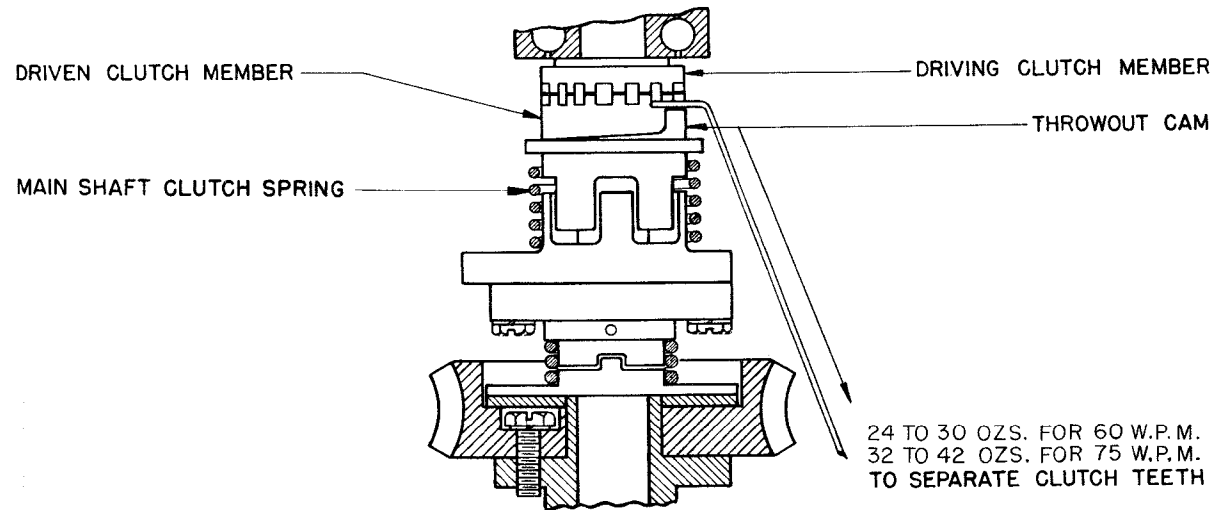


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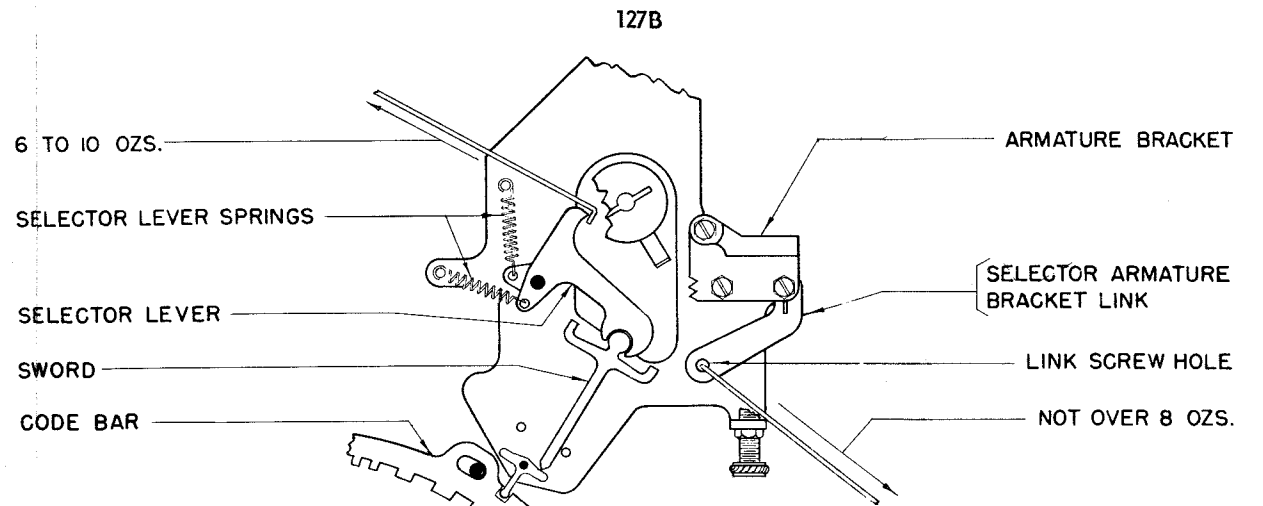


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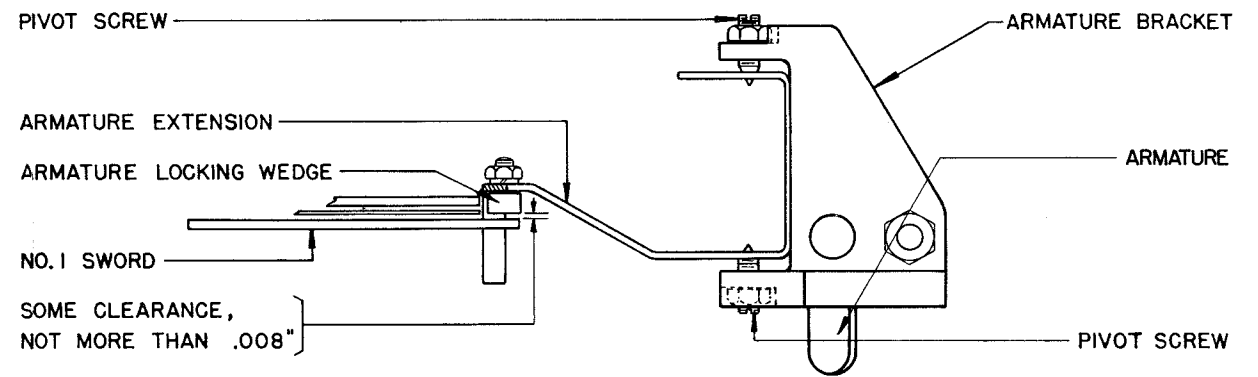


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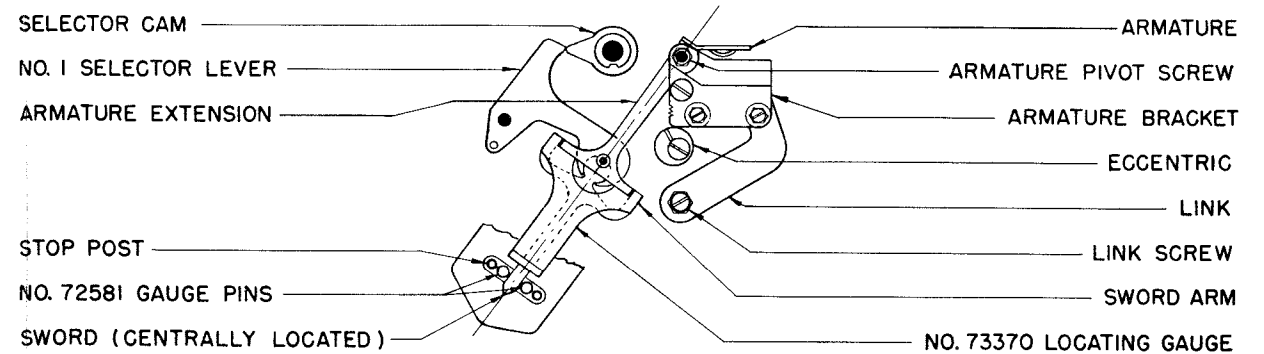


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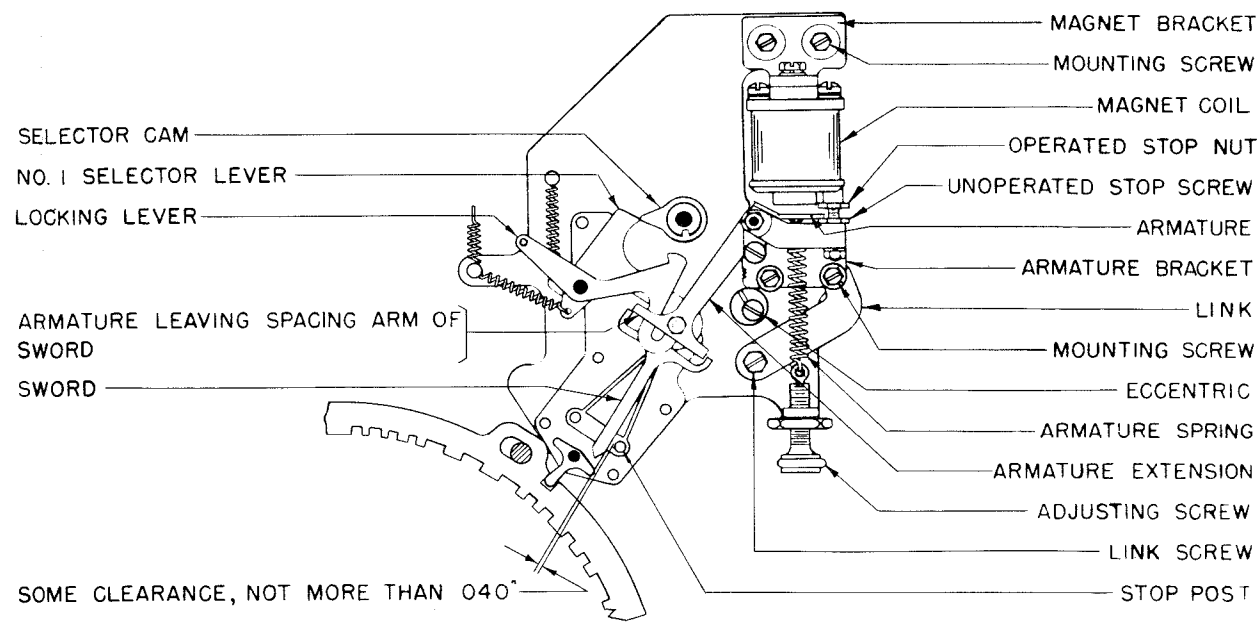


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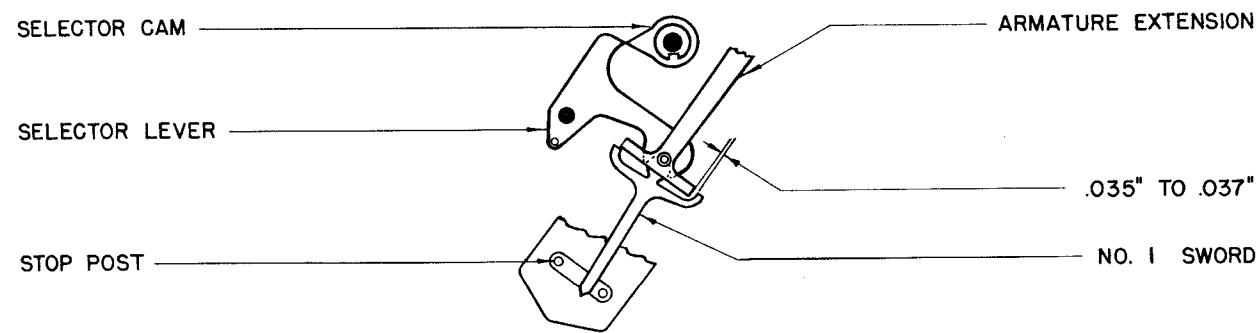


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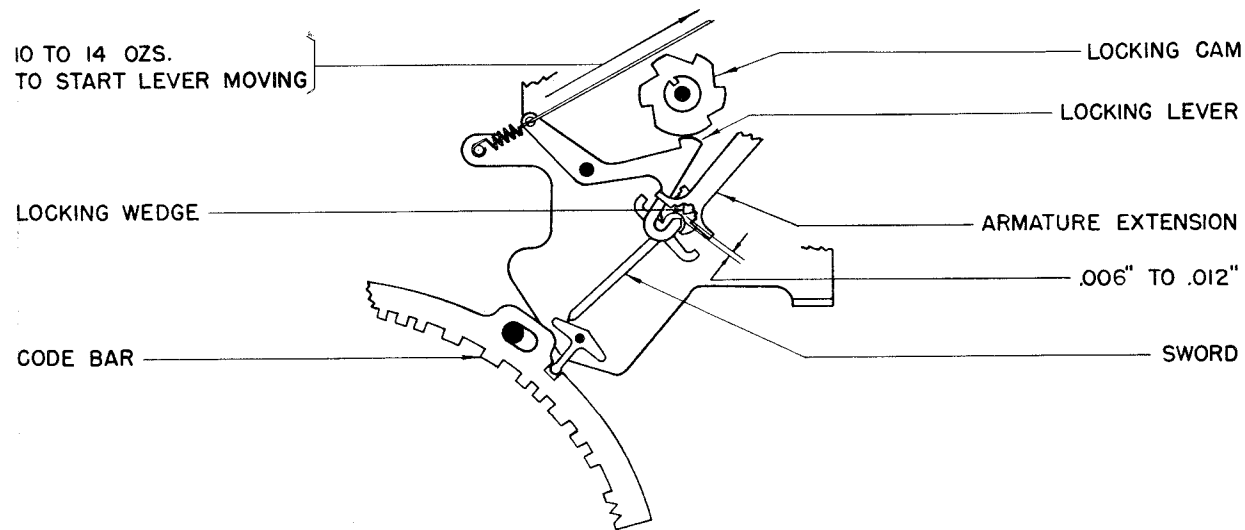


FIGURE 8

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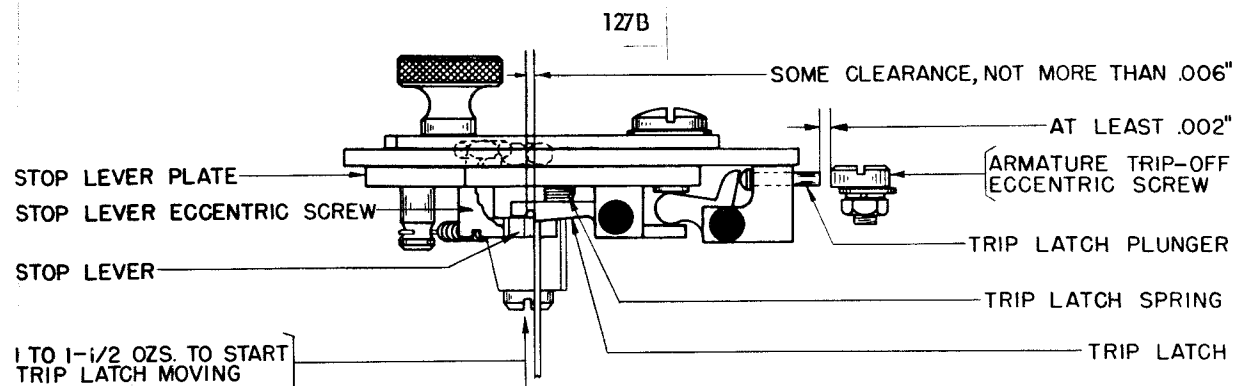


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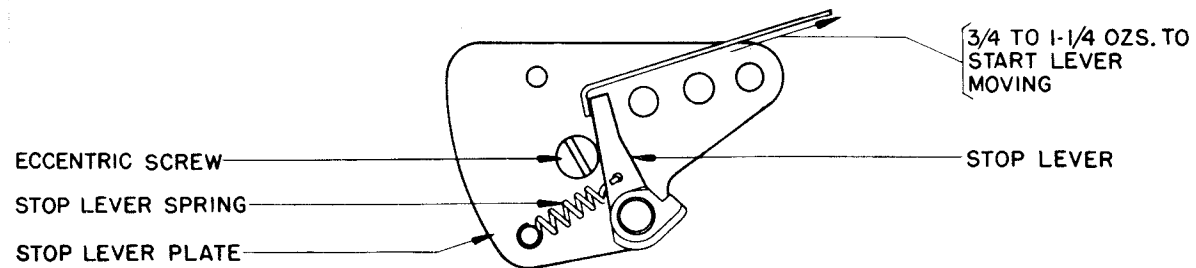


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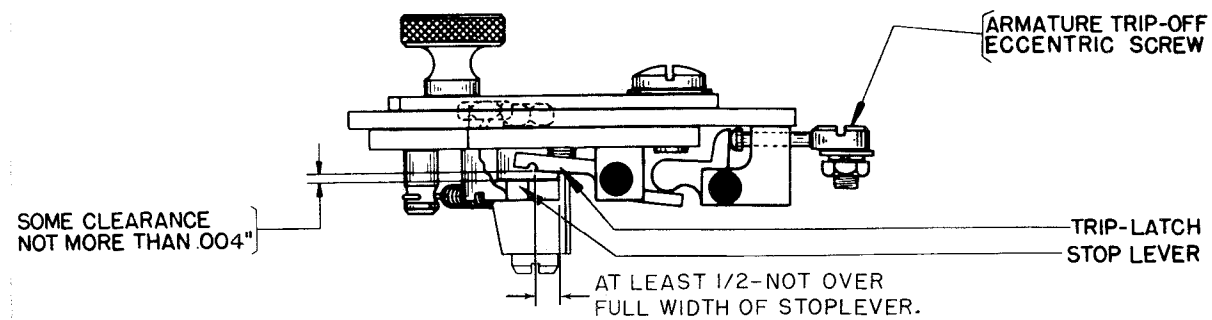


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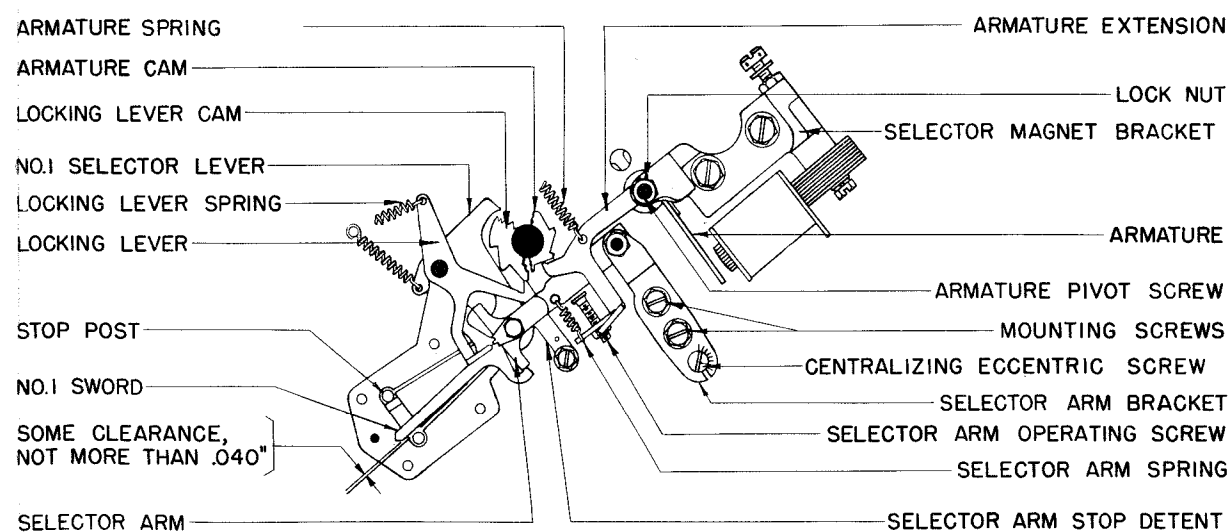


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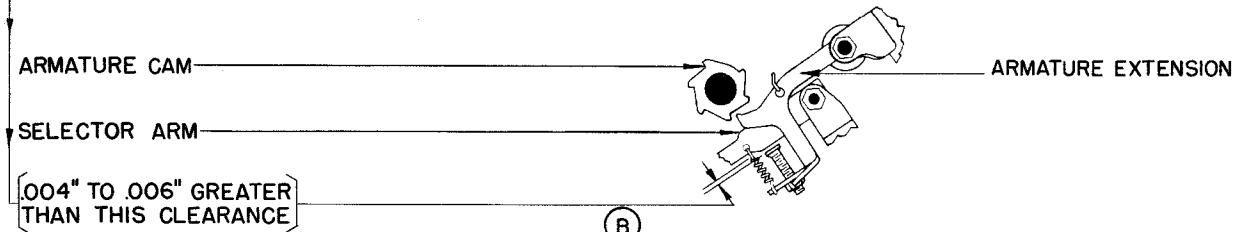
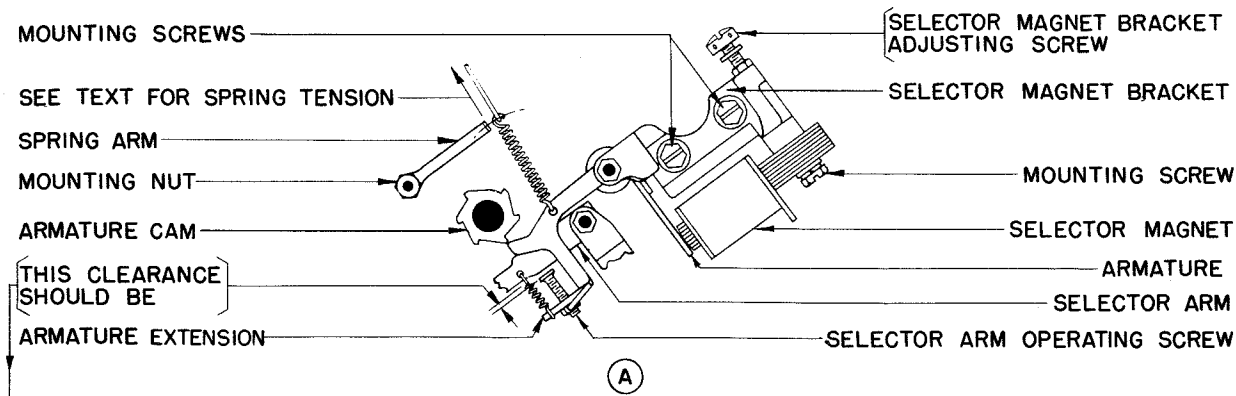


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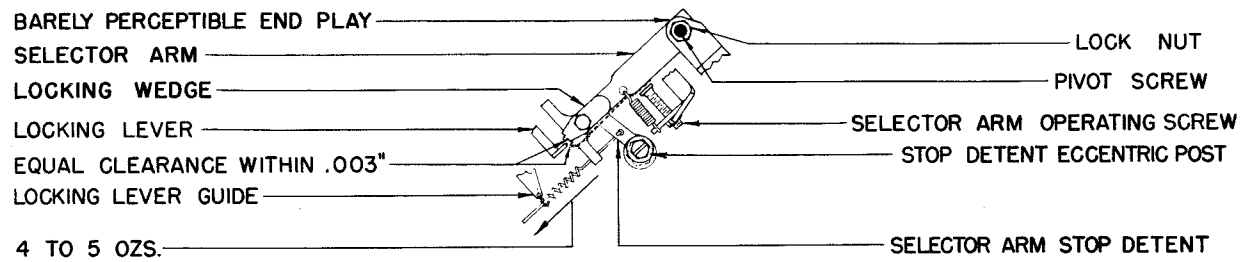


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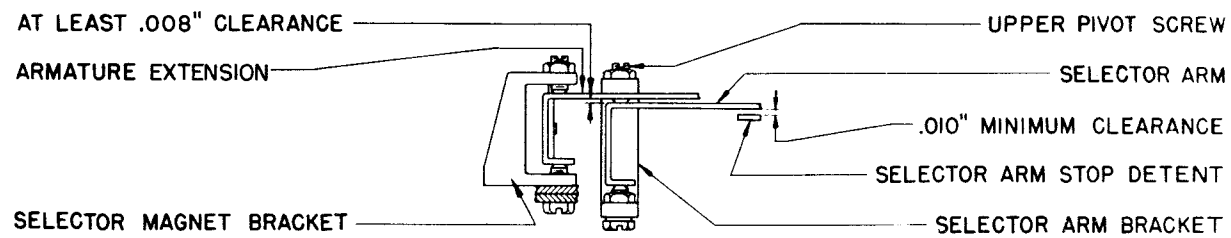


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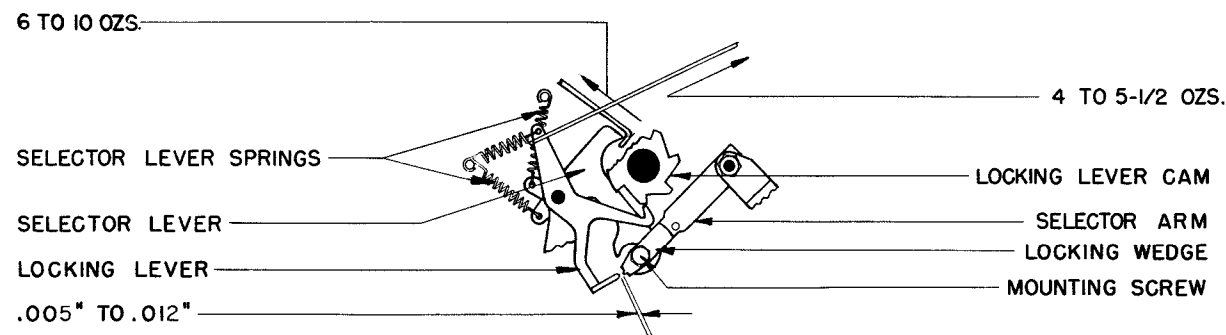


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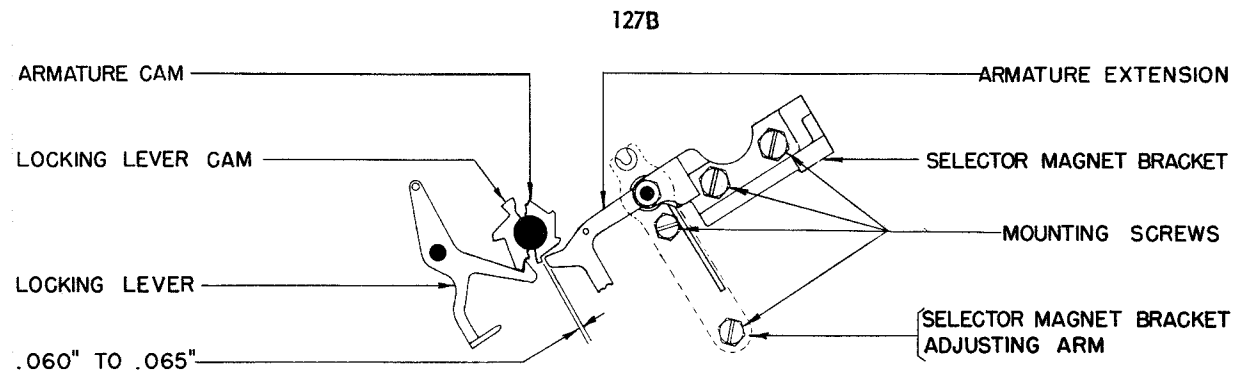


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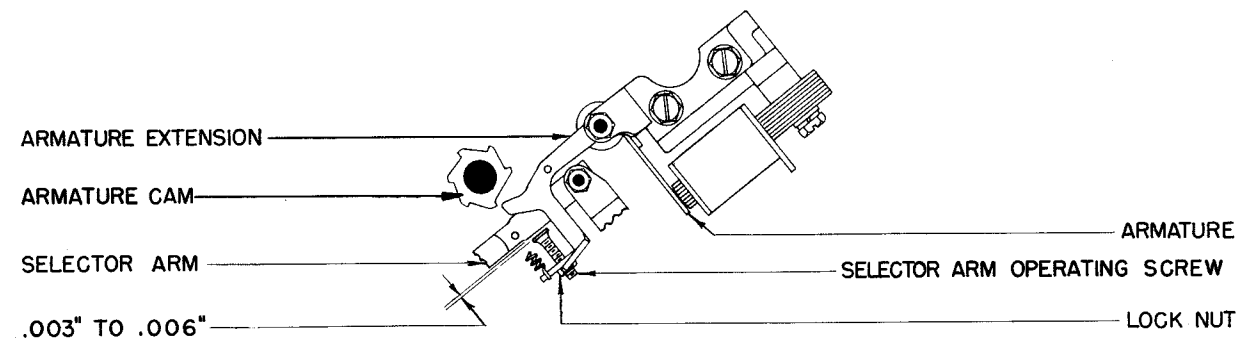


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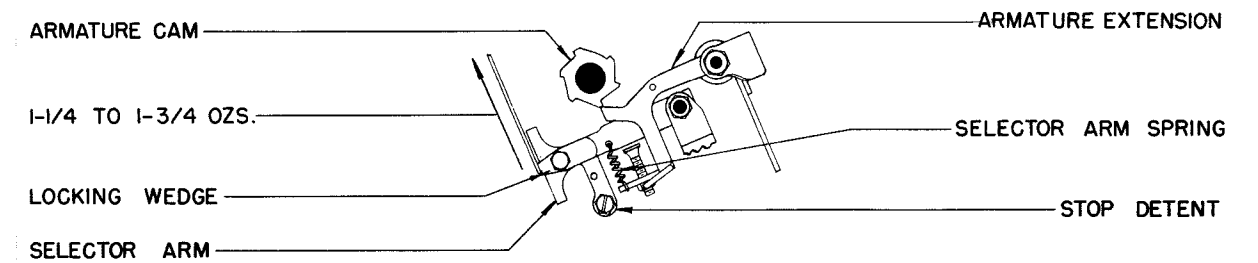


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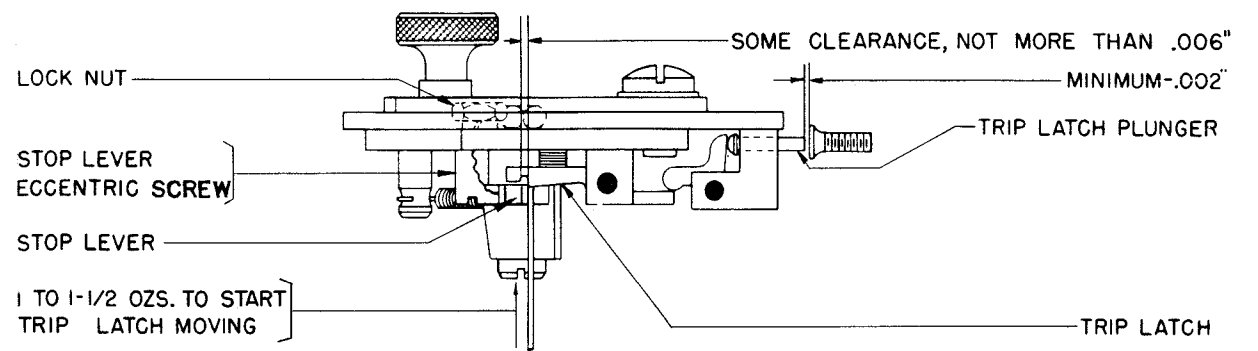


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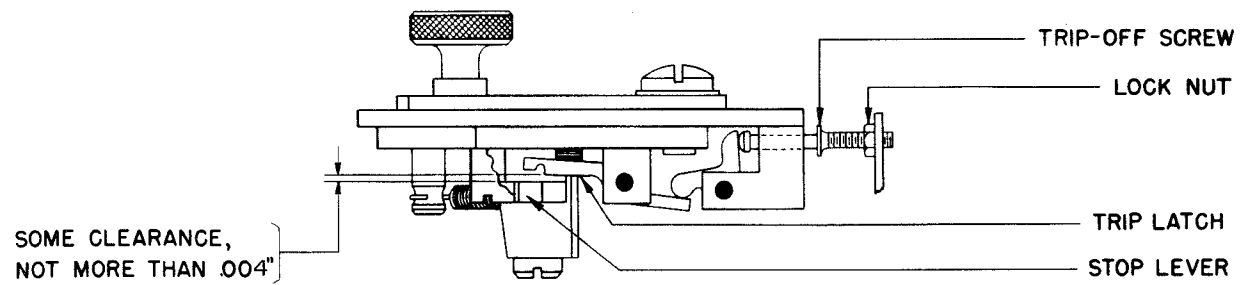


FIGURE 21

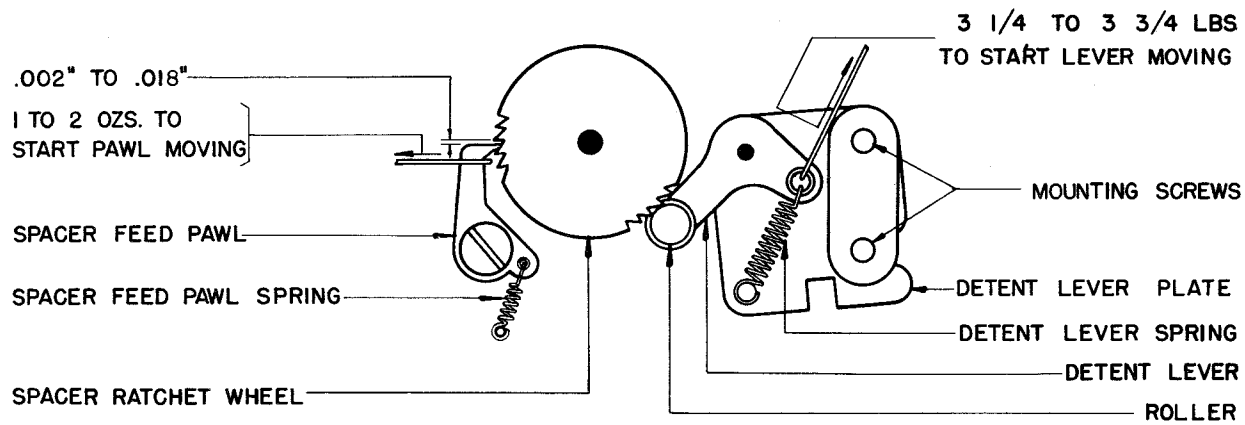


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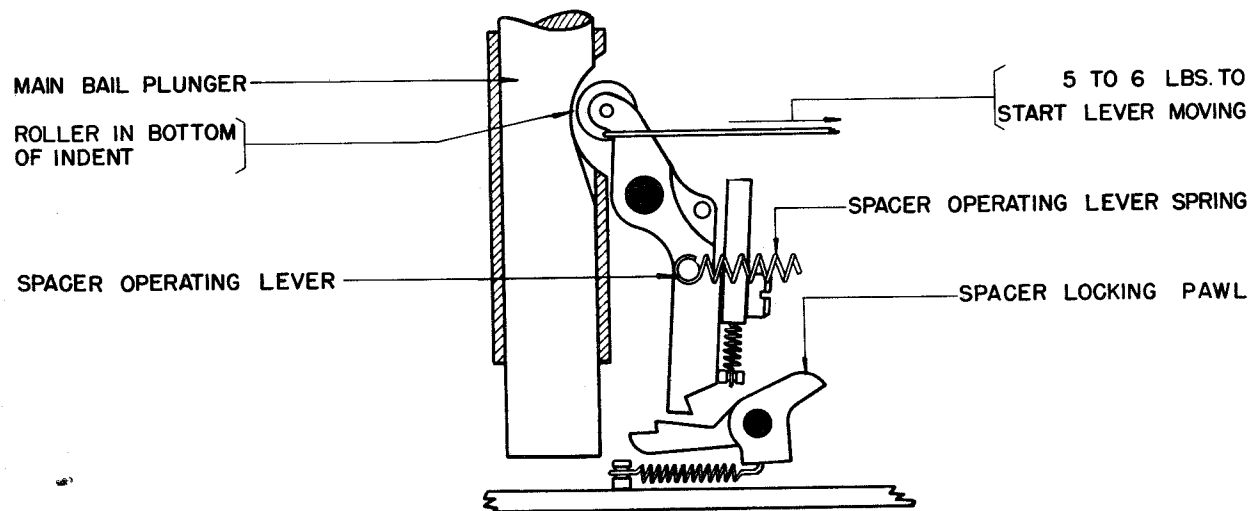


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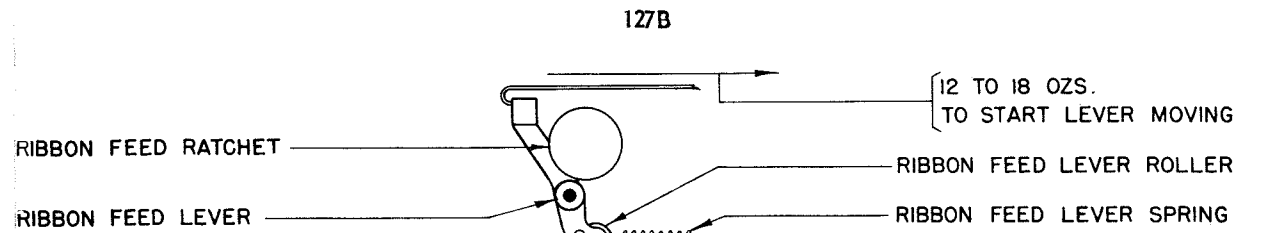


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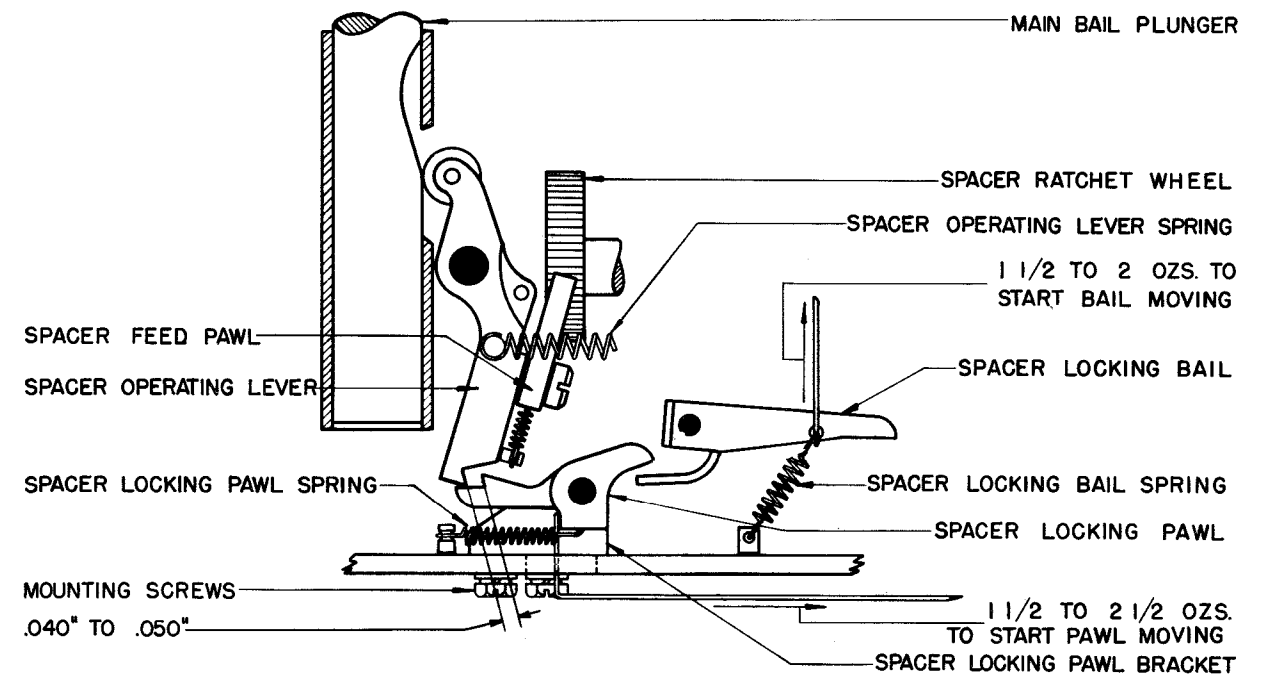


FIGURE 25

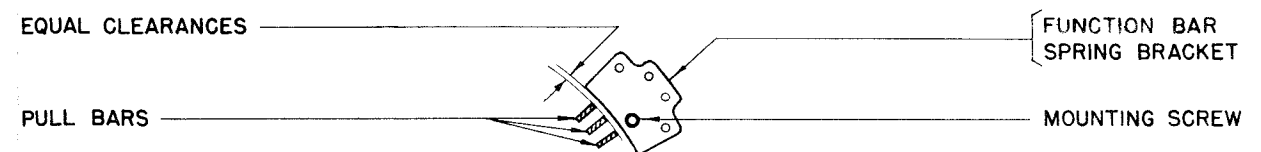


FIGURE 26



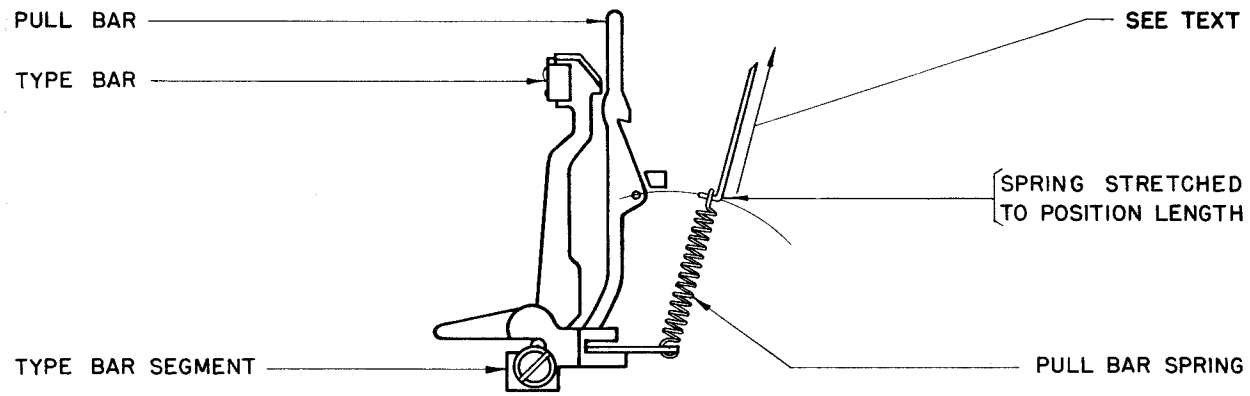


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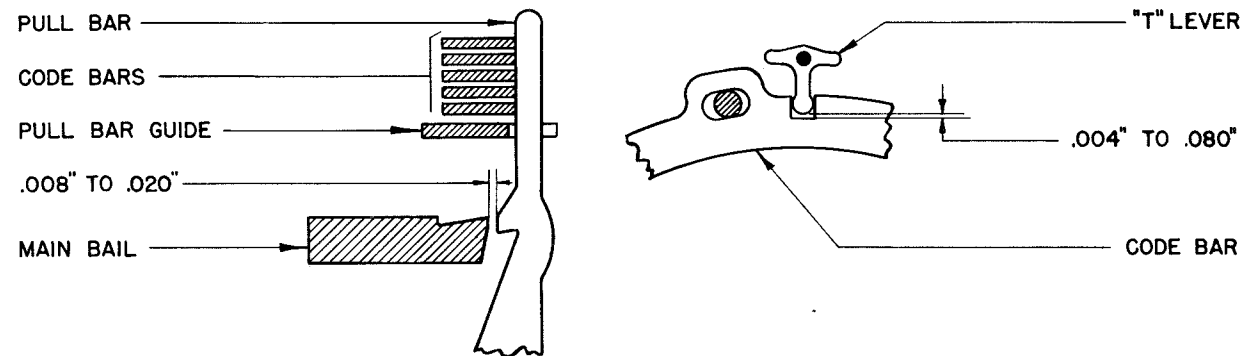


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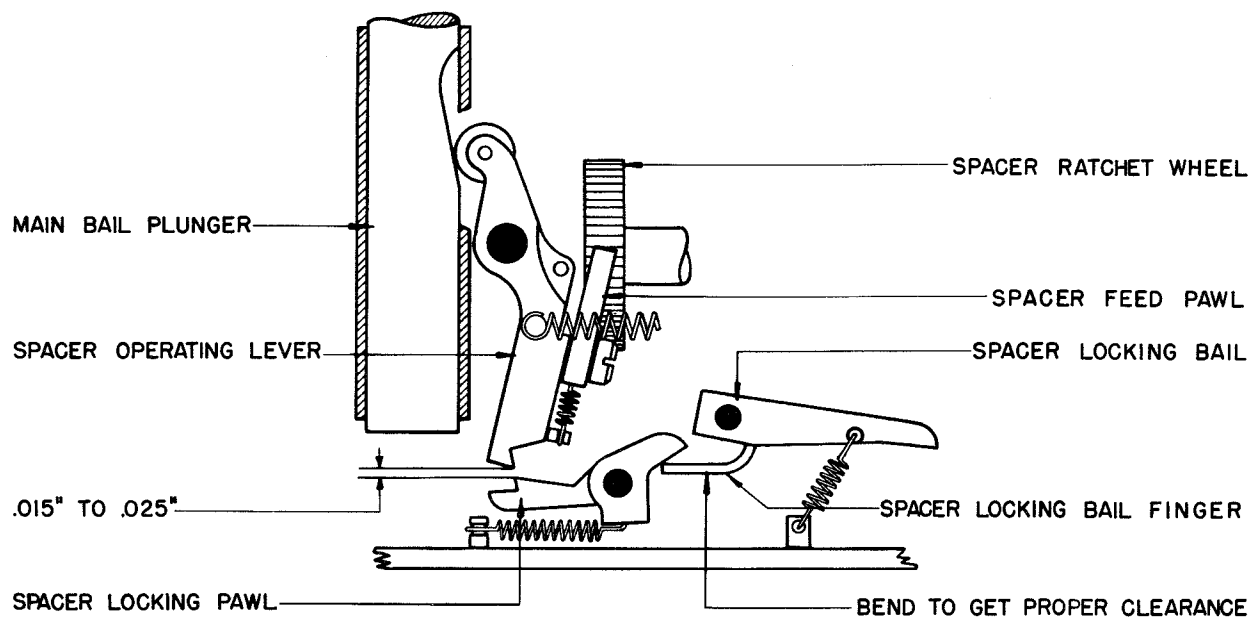


FIGURE 29

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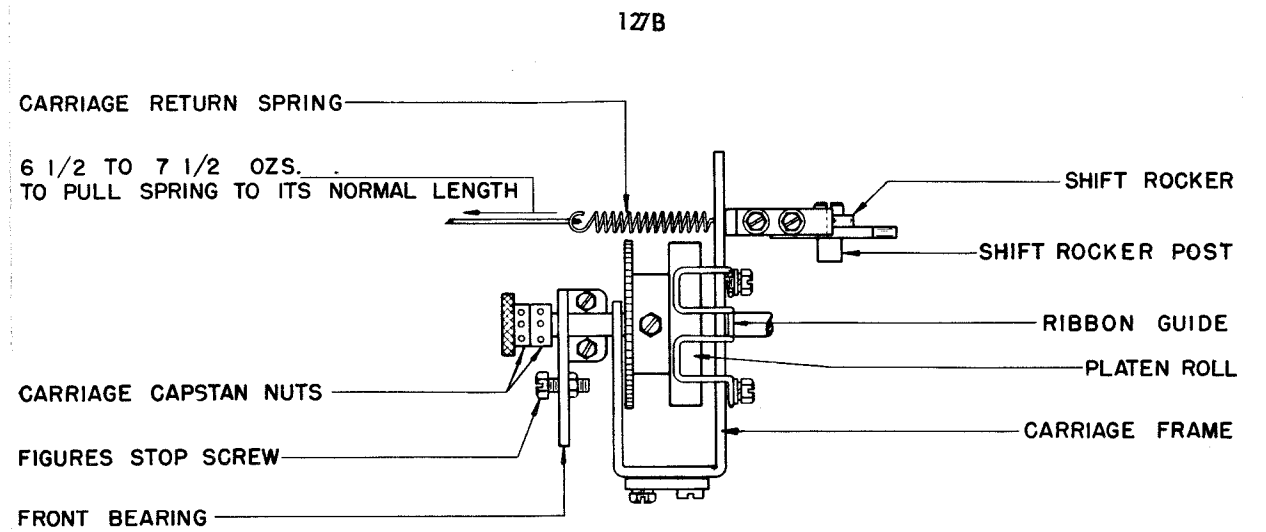


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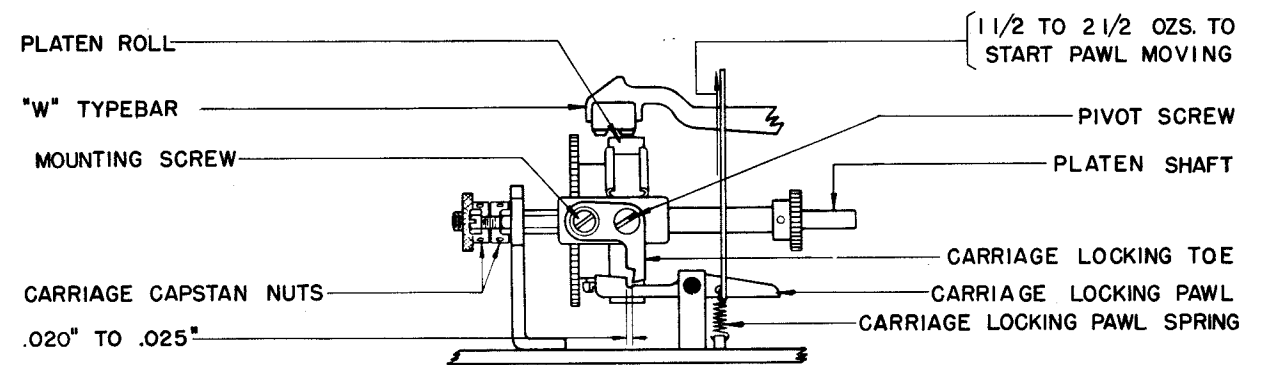


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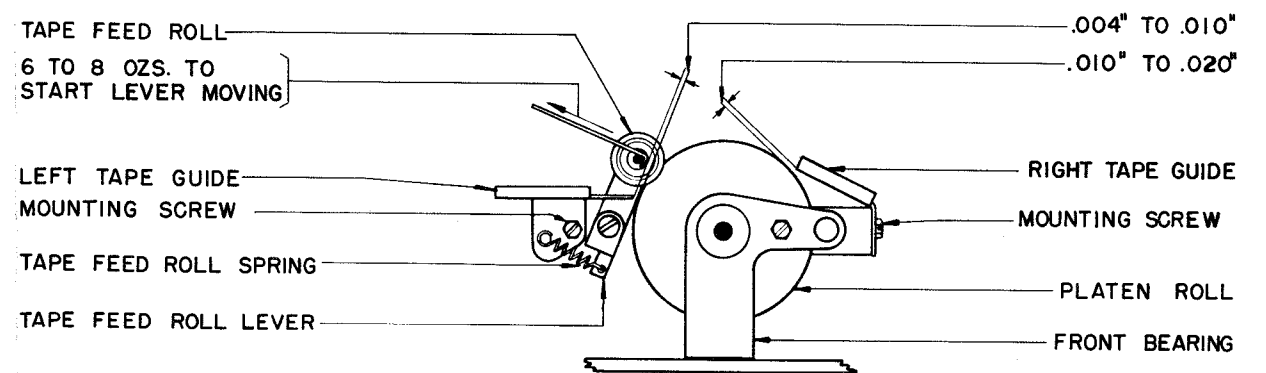


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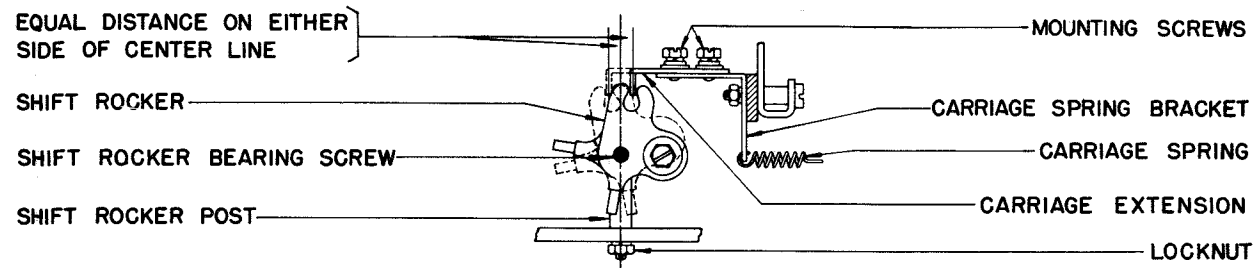


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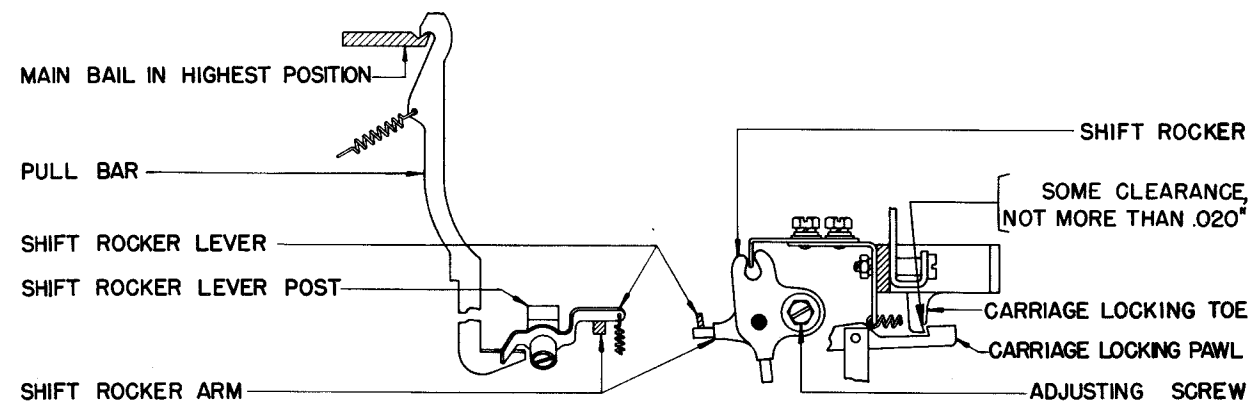


FIGURE 34

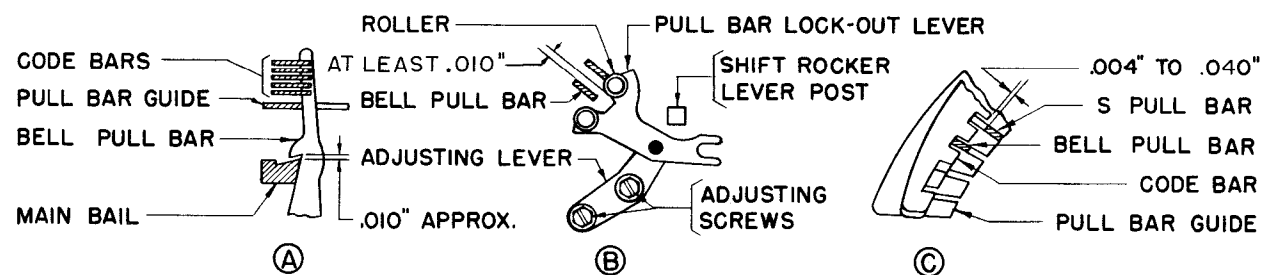


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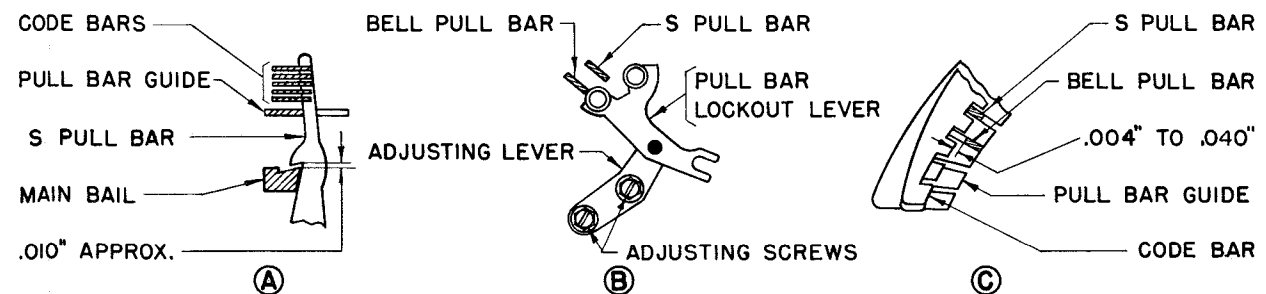


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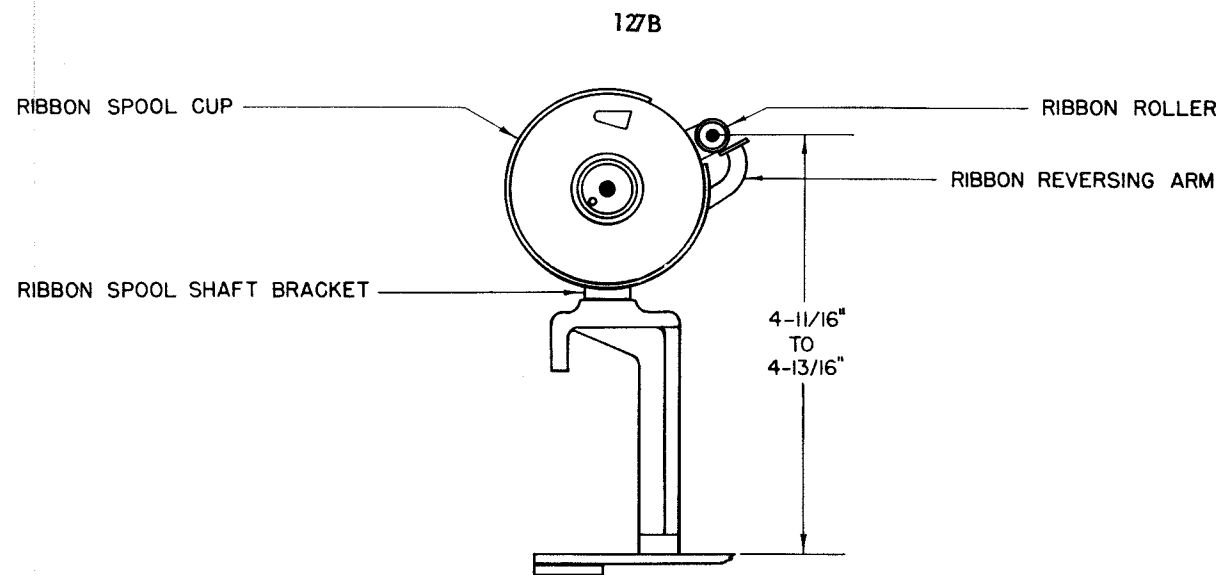


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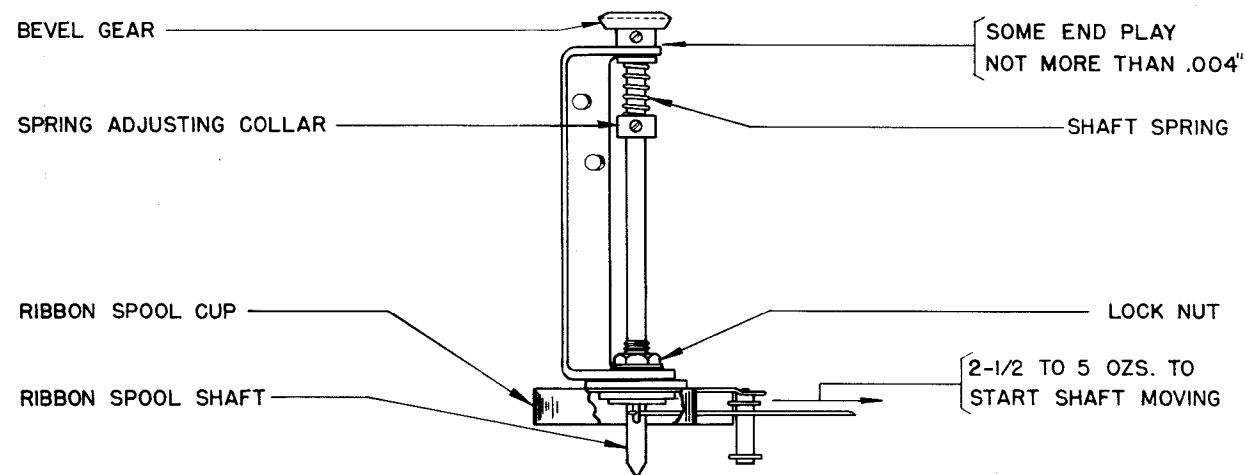


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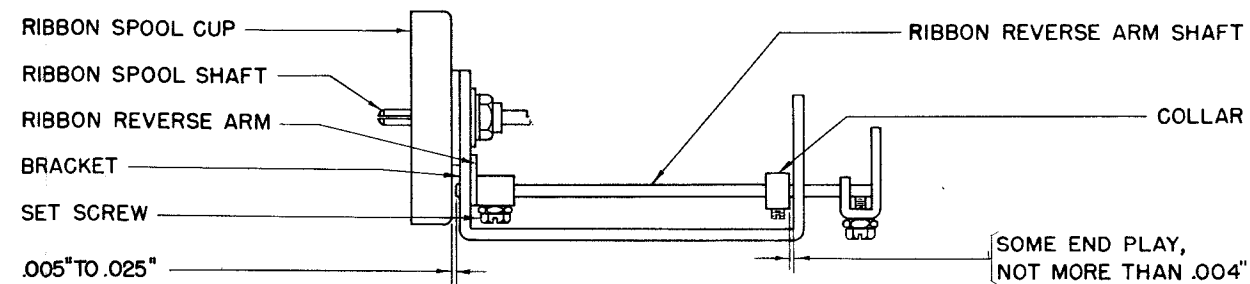


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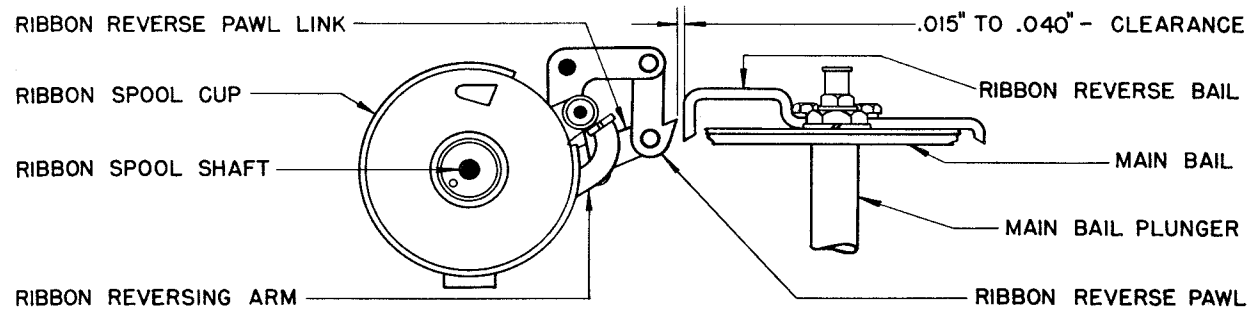


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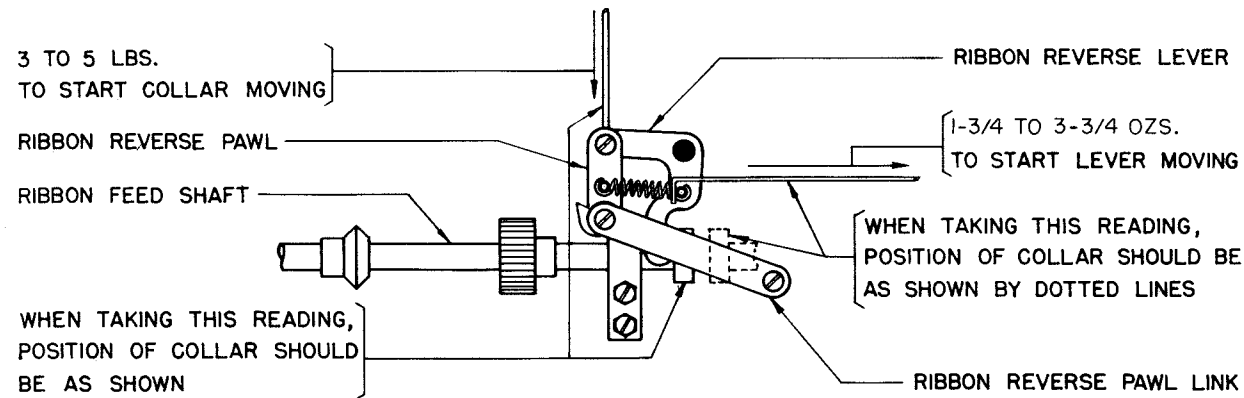


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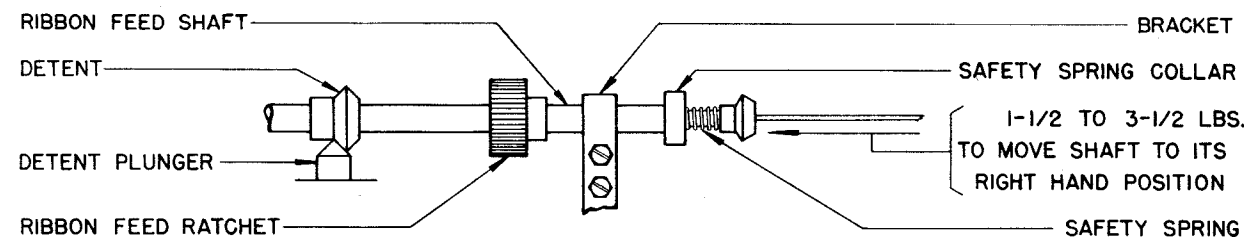


FIGURE 42

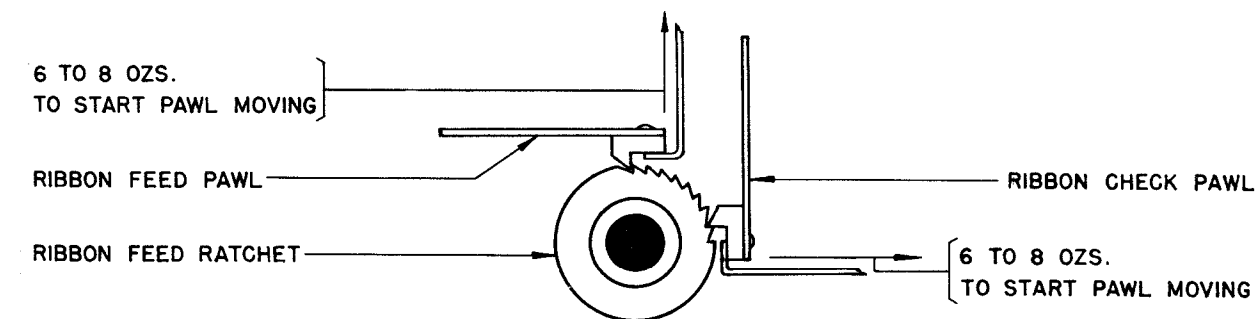


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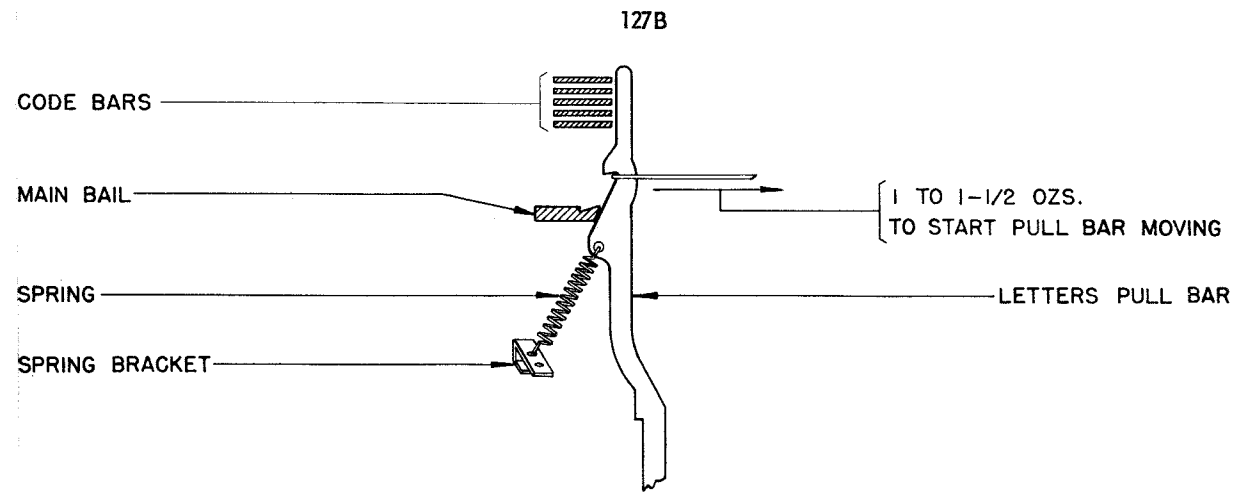


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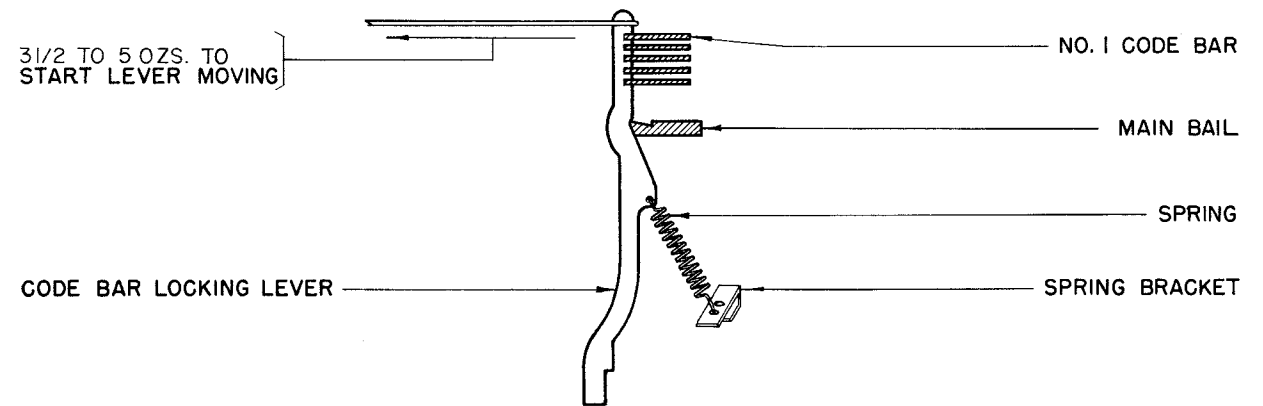


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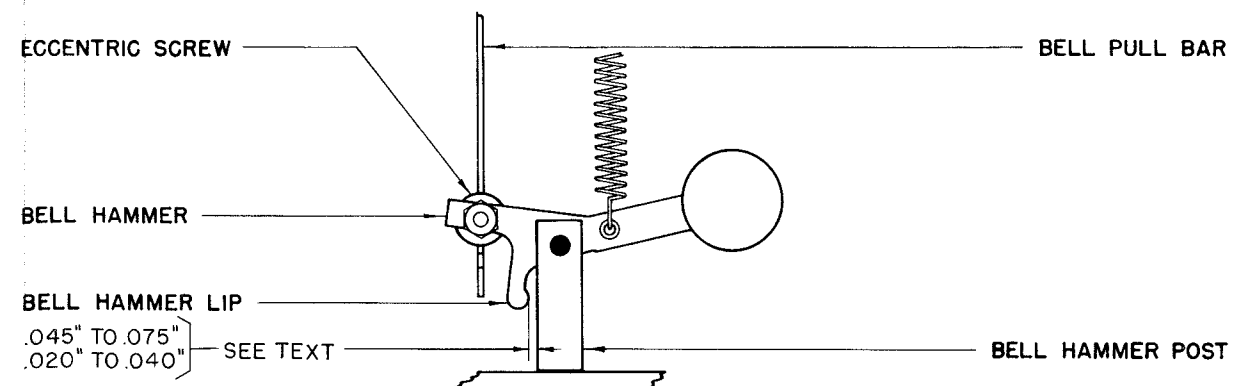


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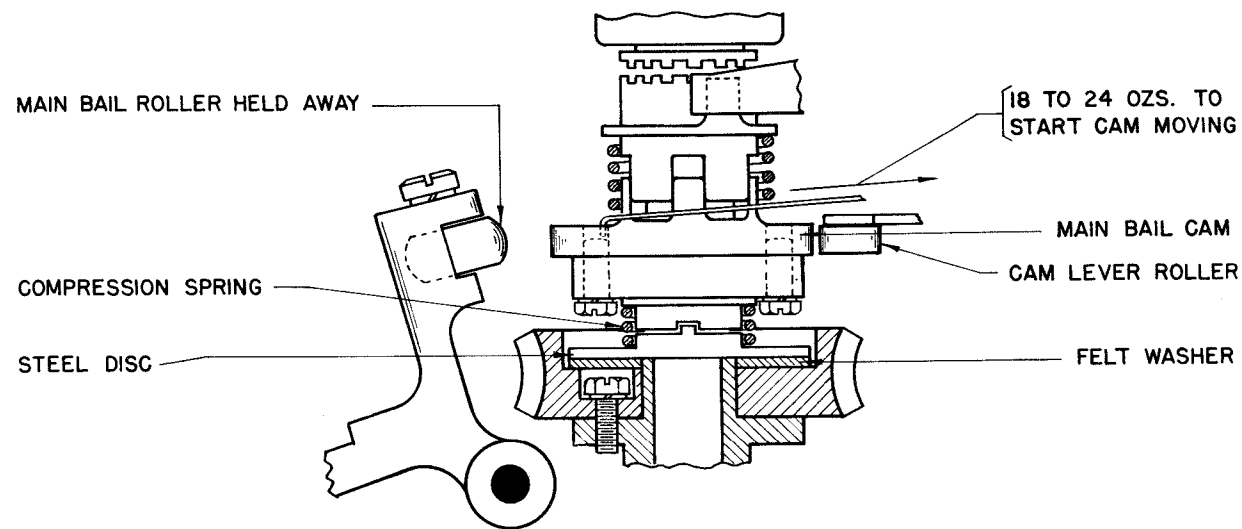


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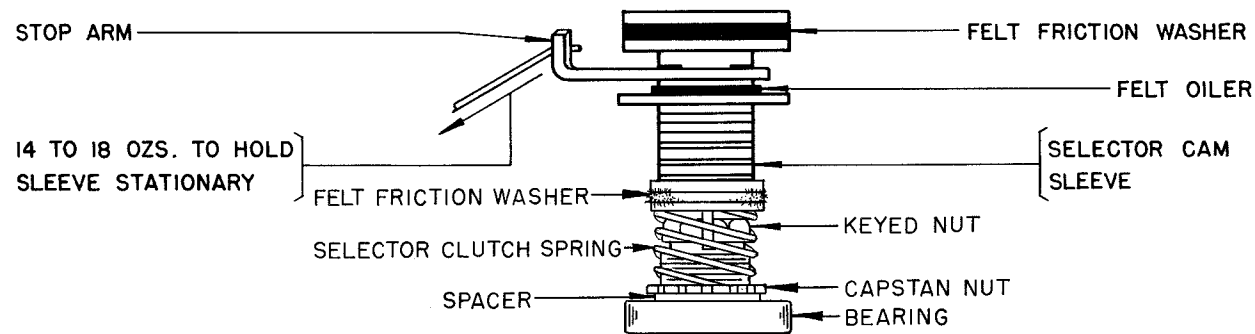


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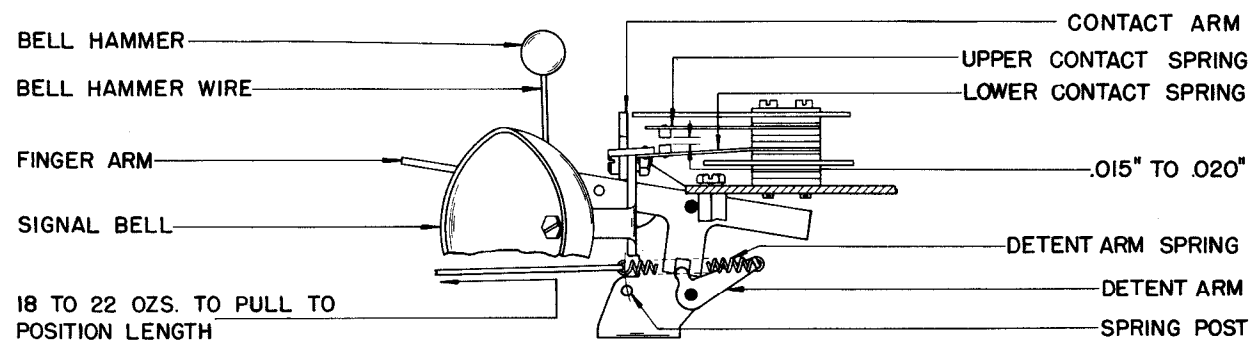


FIGURE 49

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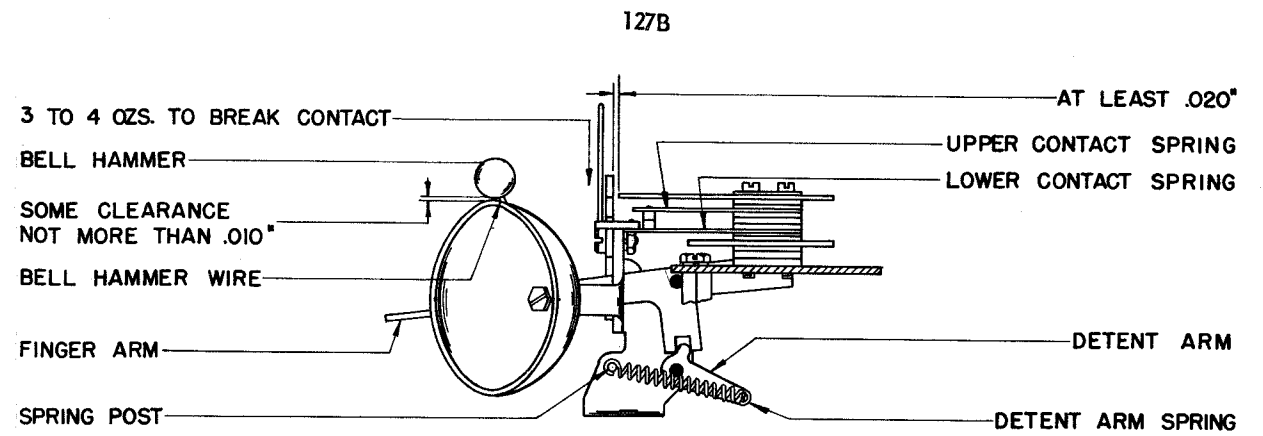


FIGURE 50

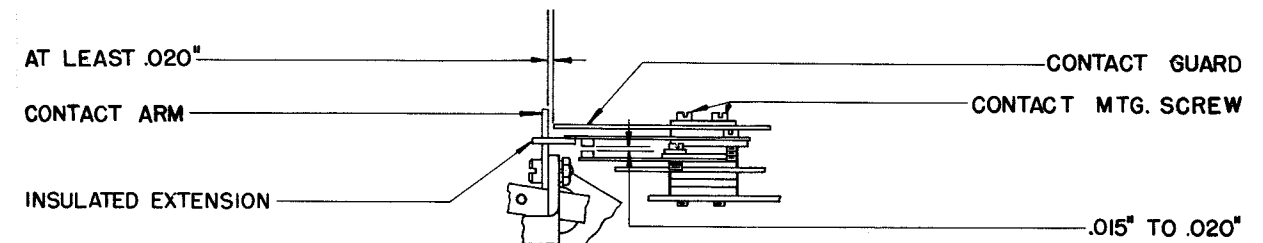


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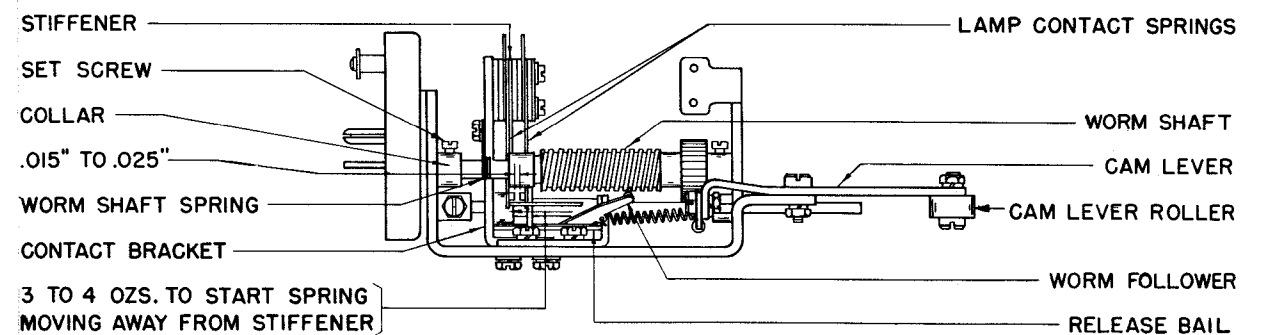


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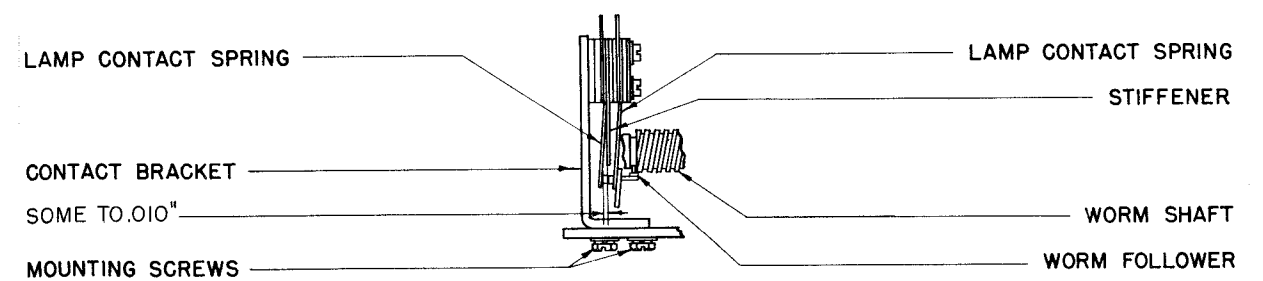


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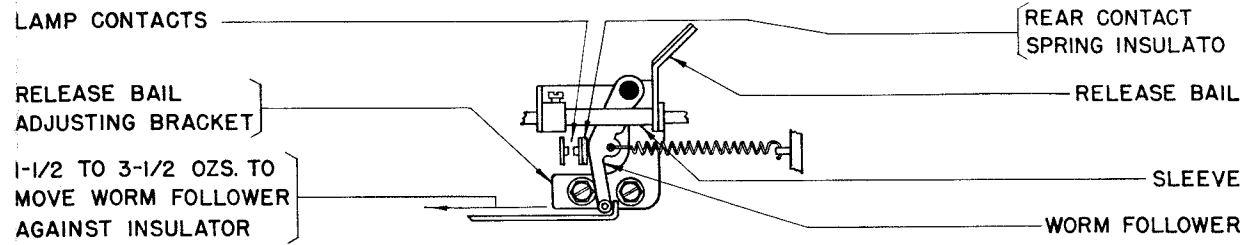


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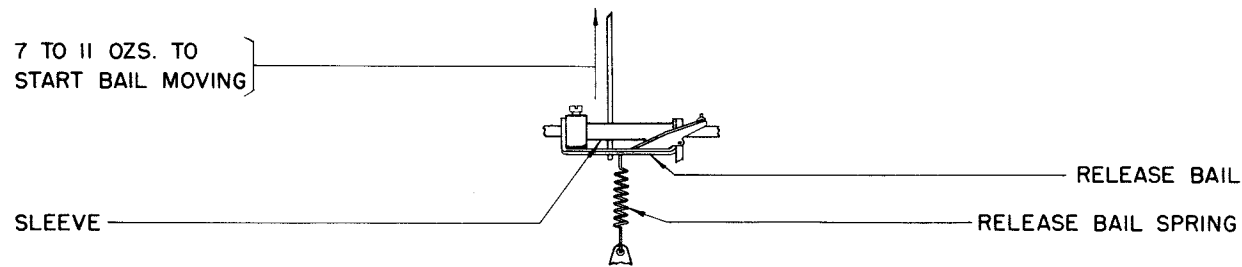


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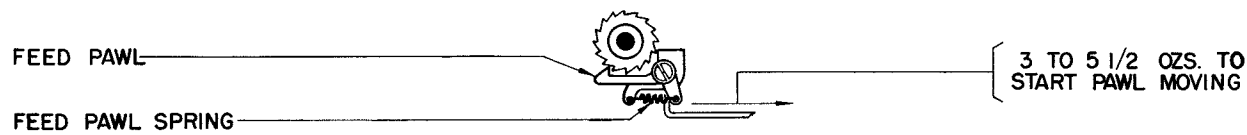


FIGURE 55

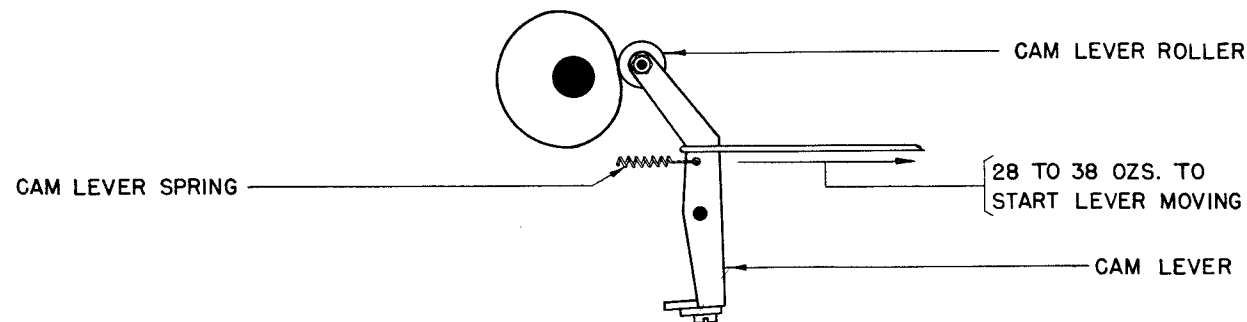


FIGURE 56

ORIGINAL

127B

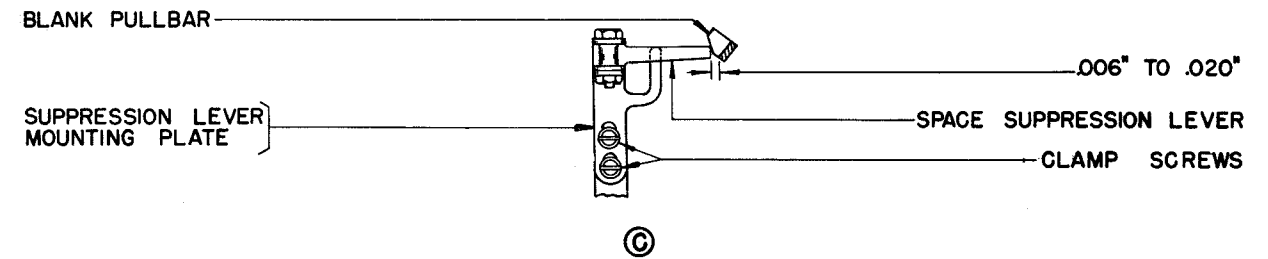
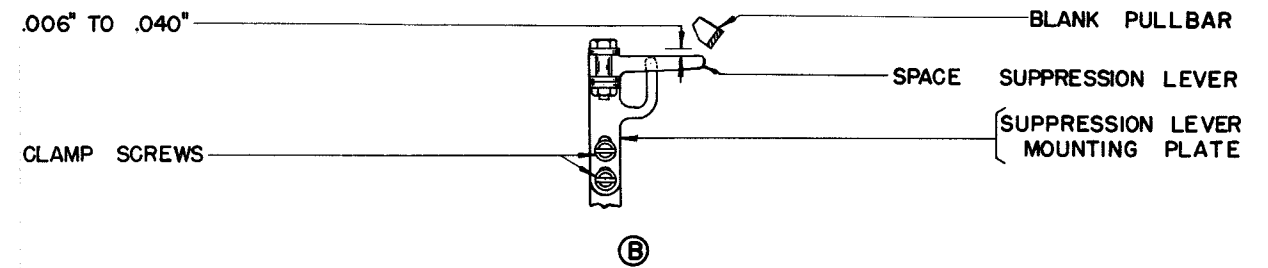
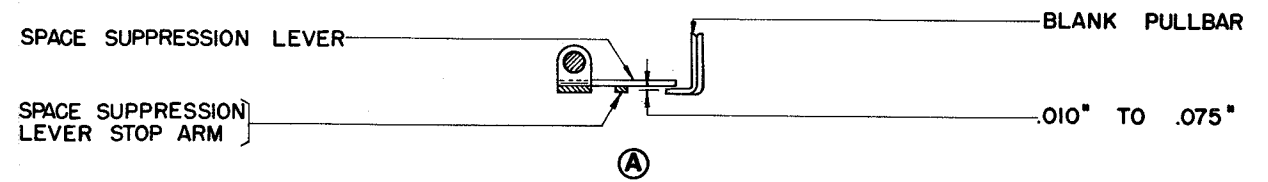


FIGURE 57

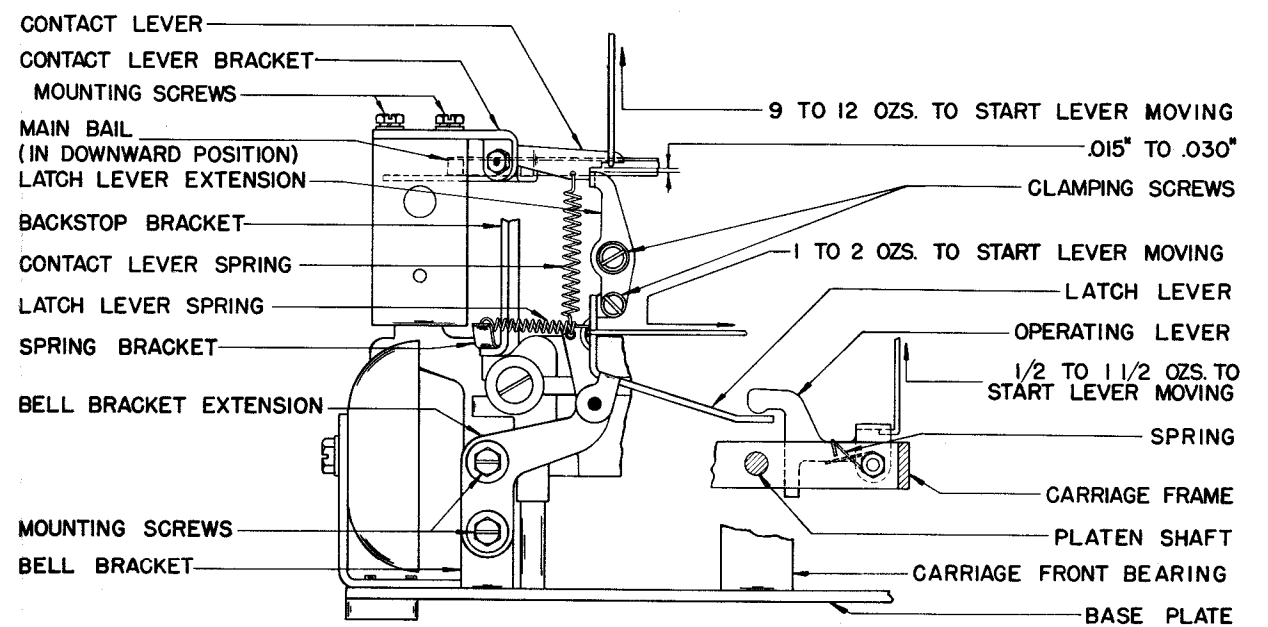


FIGURE 58

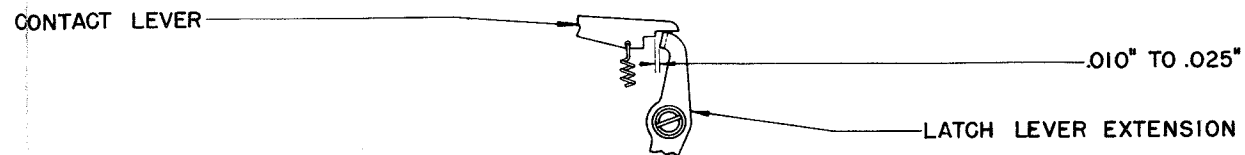


FIGURE 59

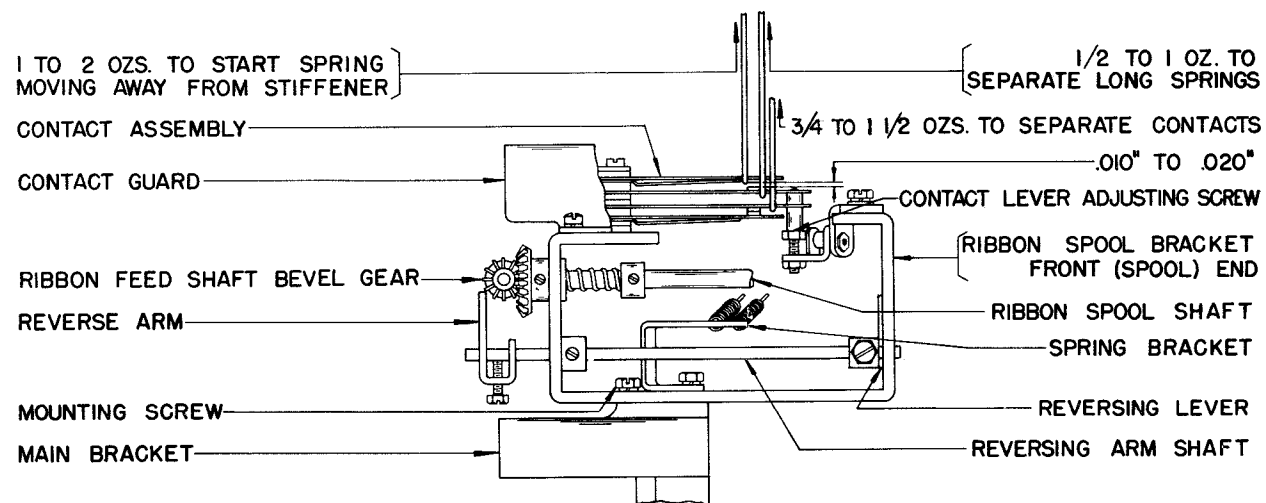


FIGURE 60

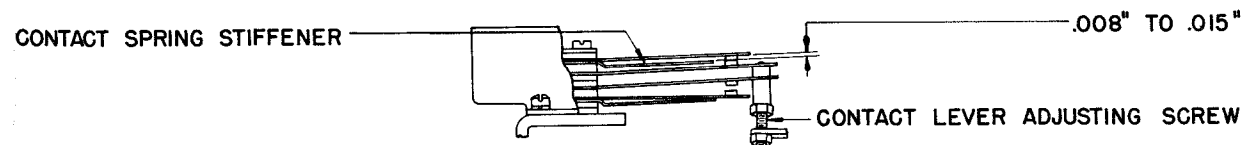


FIGURE 61

ORIGINAL

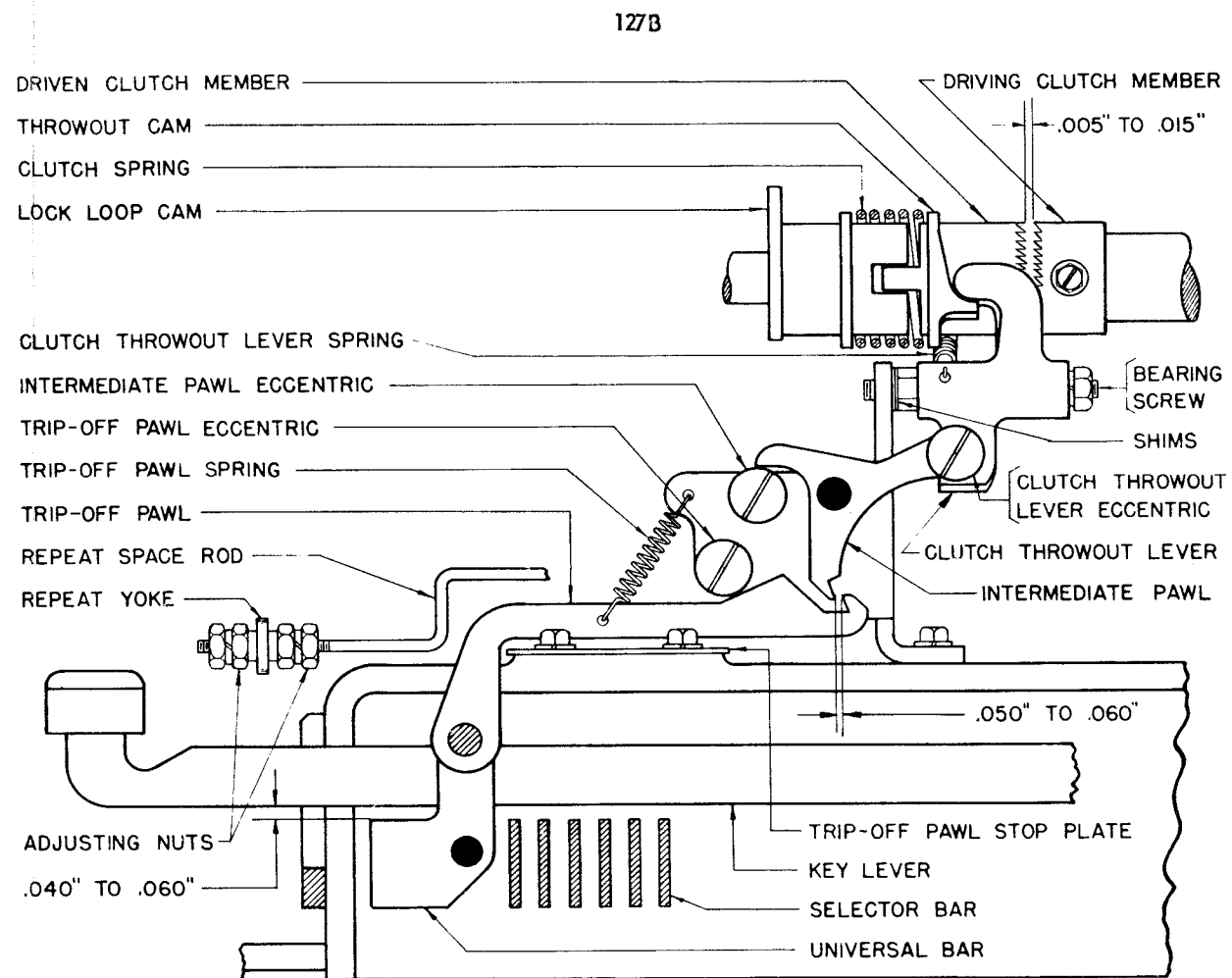


FIGURE 62

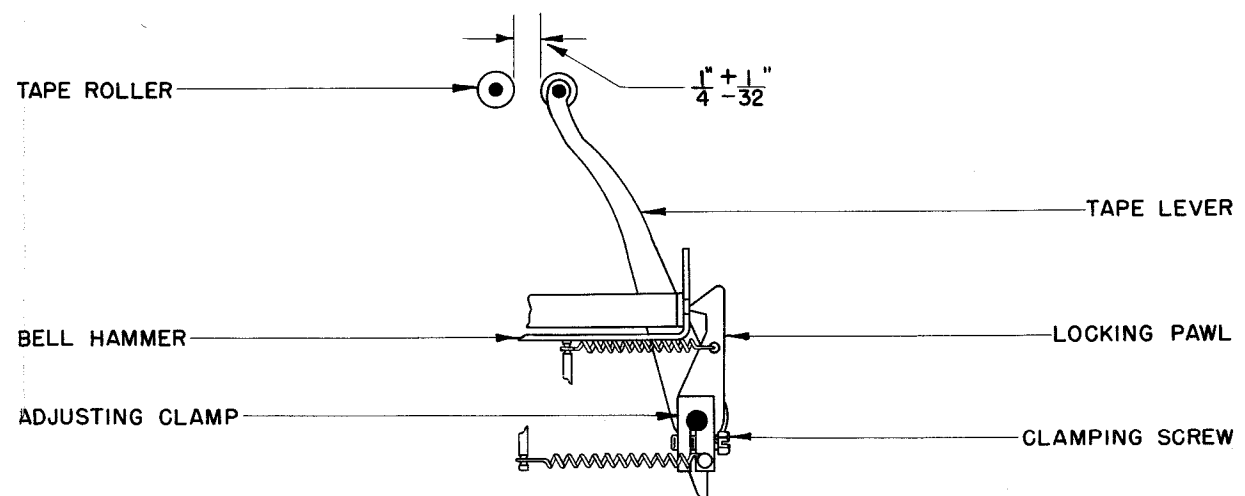


FIGURE 63

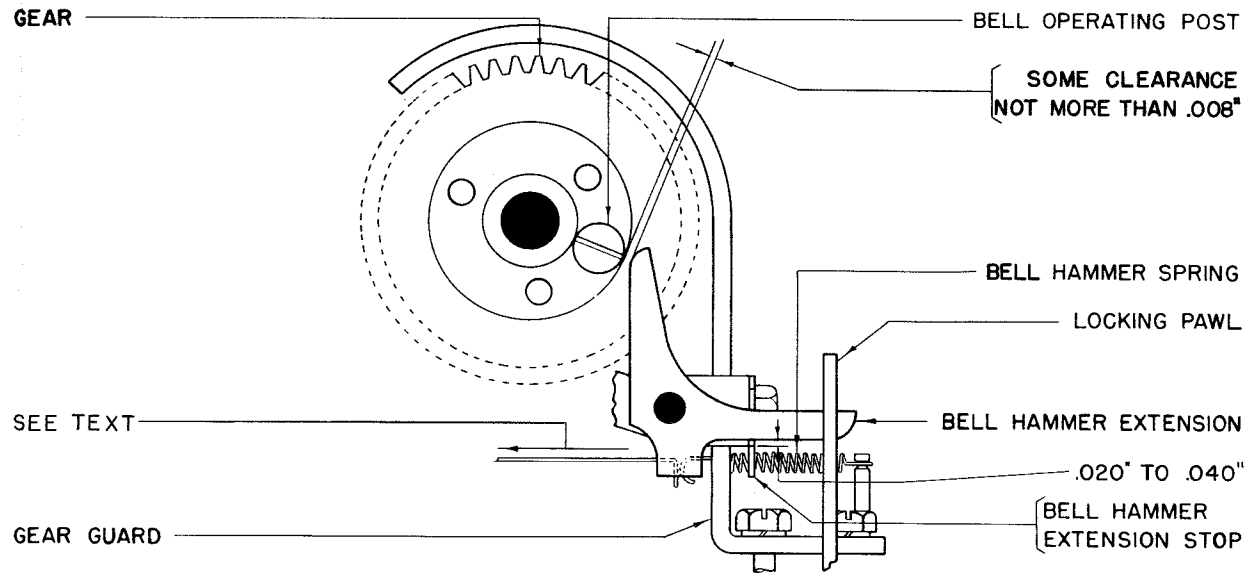


FIGURE 64

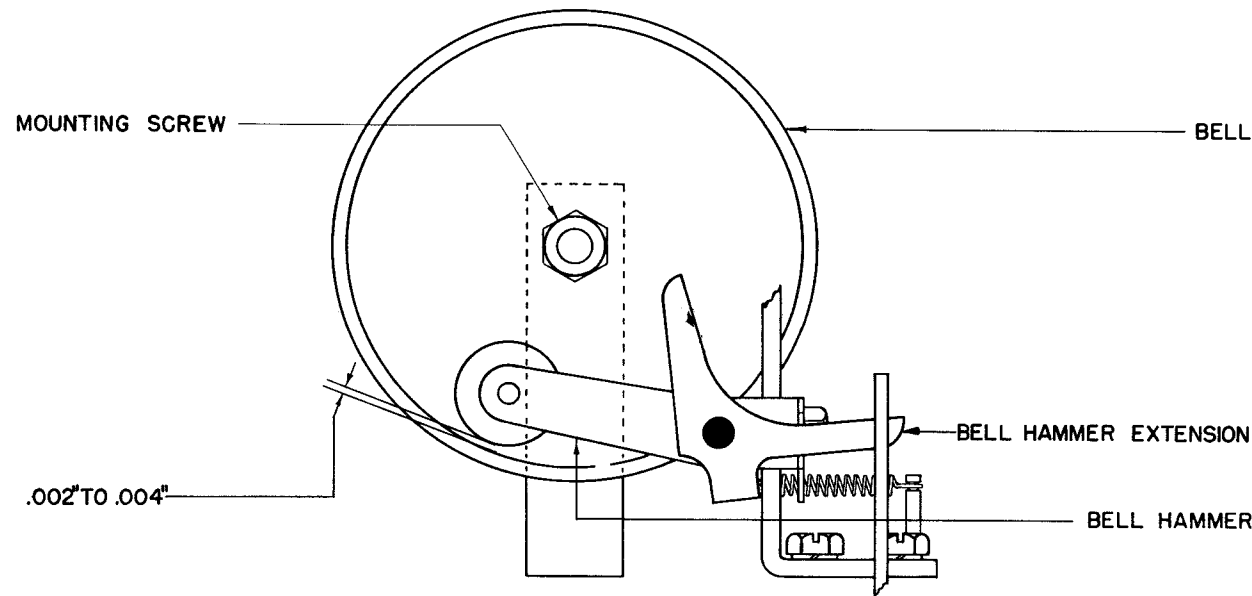


FIGURE 65

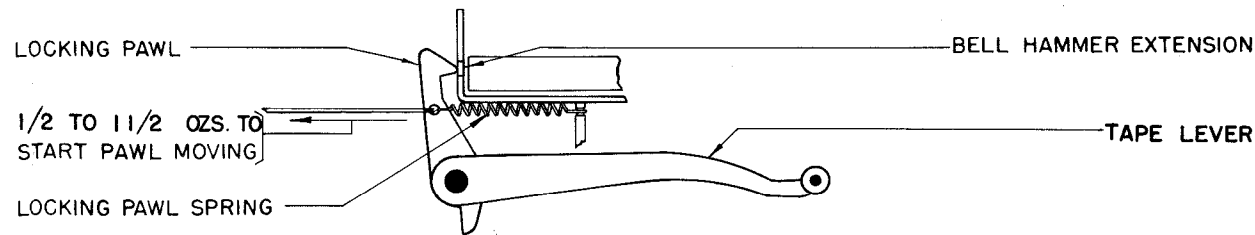


FIGURE 66

ORIGINAL

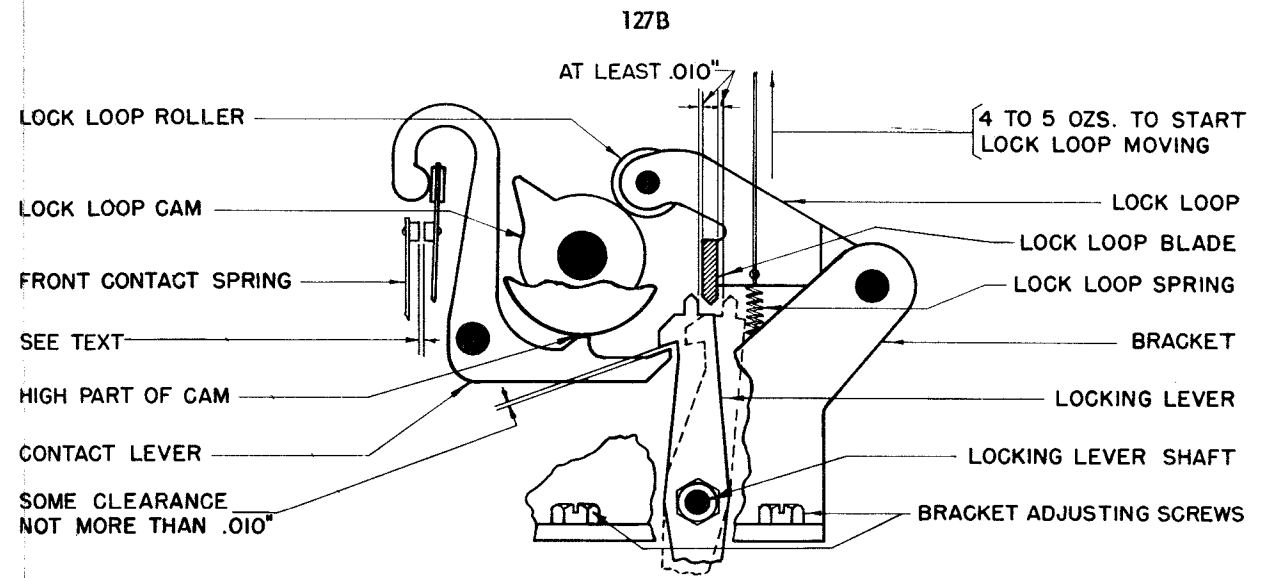


FIGURE 67

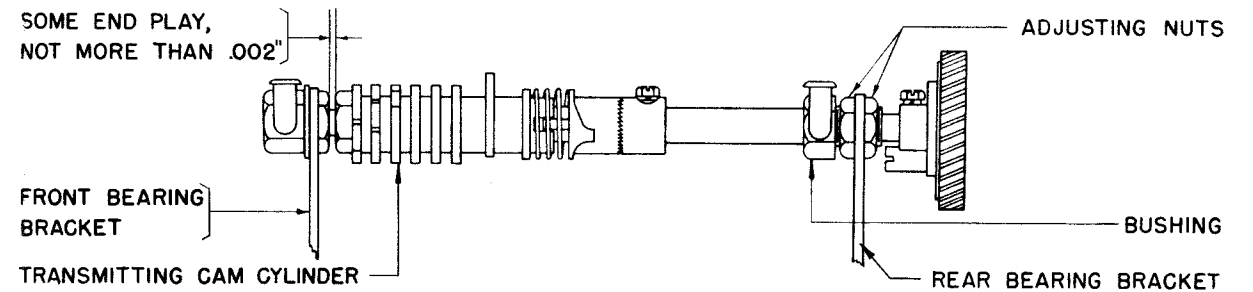


FIGURE 68

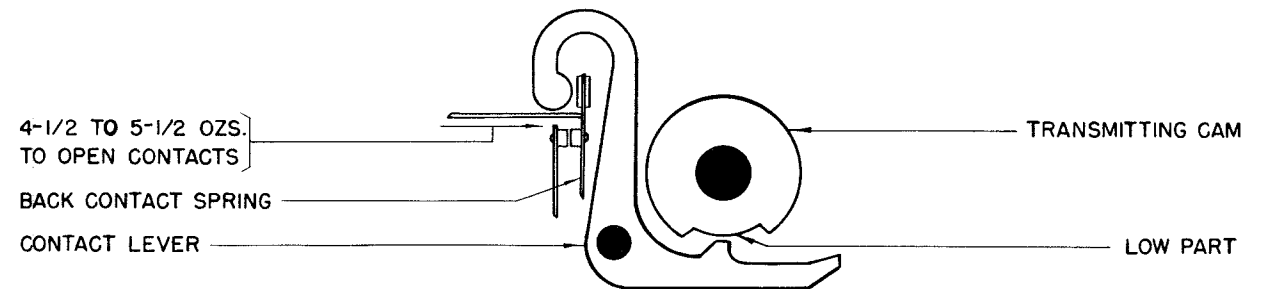


FIGURE 69

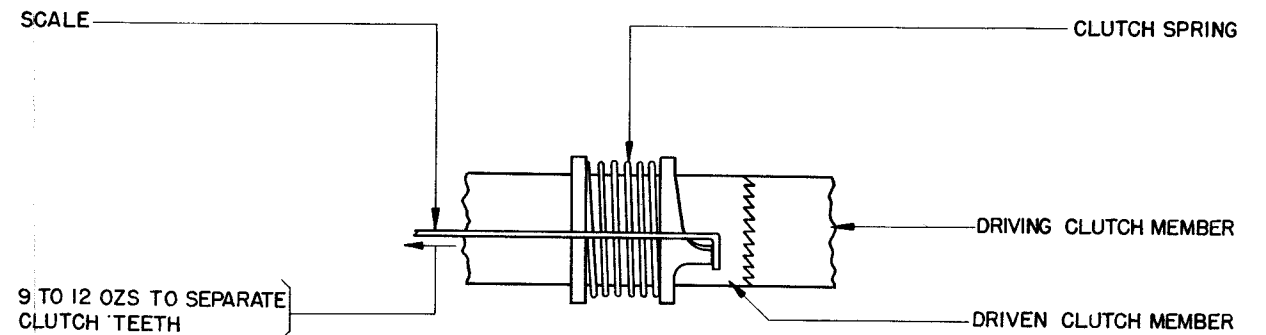


FIGURE 70

2-3/4 TO 3-3/4 OZS.  
WHEN PULLED TO ITS  
POSITION LENGTH

TRIP-OFF PAWL SPRING

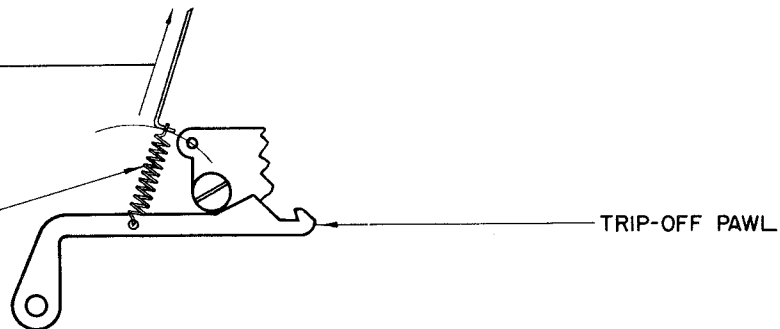
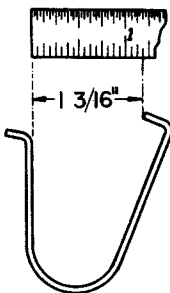
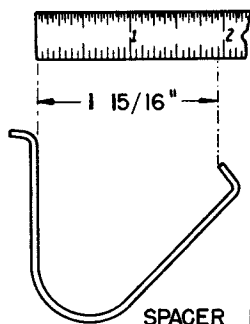


FIGURE 71



KEYLEVER SPRING



SPACER LEVER SPRING

FIGURE 72

3/4 TO 1 3/4 OZS. TO START  
THE ROD MOVING

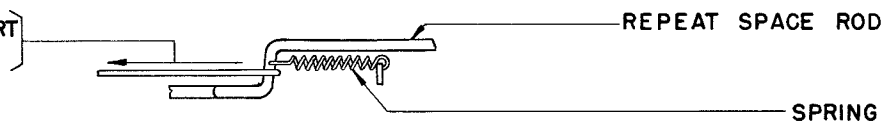


FIGURE 73

SELECTOR BAR

REPEAT YOKE

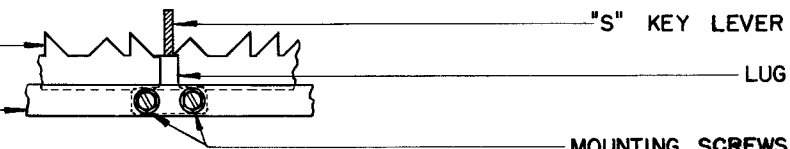


FIGURE 74

ORIGINAL

127B

BACKSTOP

MAGNET

INSIDE CONTACT

MIDDLE CONTACT

OUTSIDE CONTACT

5 TO 6 OZS. TO  
OPEN CONTACTS

.025" TO .030"

.005" TO .015"

BACKSTOP

MAGNET

INSIDE CONTACT

MIDDLE CONTACT

OUTSIDE CONTACT

12 TO 16 OZS TO  
OPEN CONTACTS

1-1/2 TO 2 OZS. TO  
OPEN CONTACTS

.030" TO .040"

FIGURE 75

FIGURE 76

YOKE

SHIMS

.070" TO .080"

STOP MAGNET ARMATURE

INNER CONTACT ASSEMBLY

NOT LESS THAN 7 OZS. TO SEPARATE CONTACTS

1 1/2 TO 2 1/2 OZS. TO START LATCH MOVING

LATCH

START MAGNET BRACKET

MOUNTING SCREWS

START MAGNET CORES

SHIMS

YOKE

.004" TO .008"

ARMATURE STOP

MOUNTING SCREWS

START MAGNET ARMATURE

LATCH SPRING

FIGURE 77



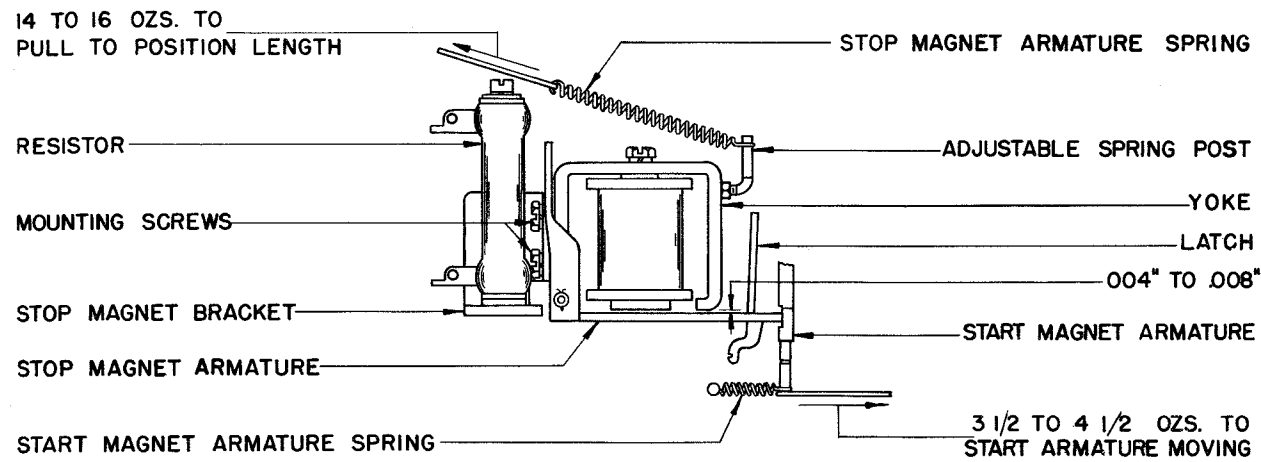


FIGURE 78

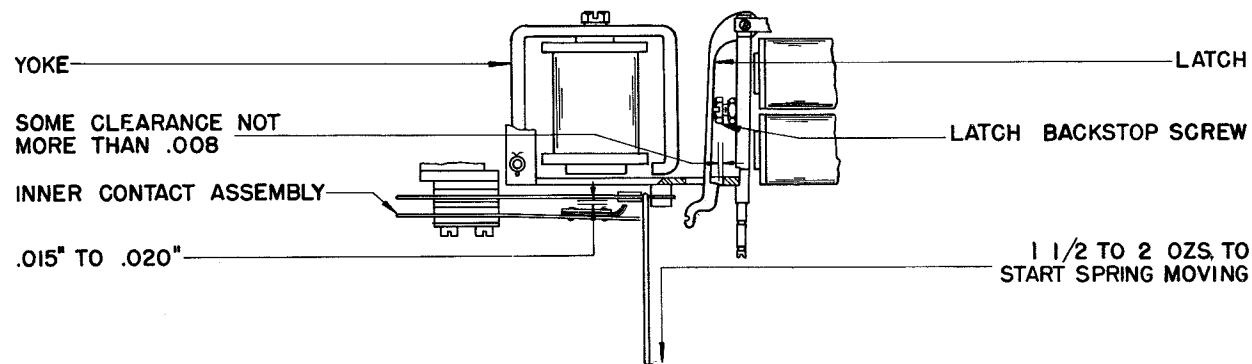


FIGURE 79

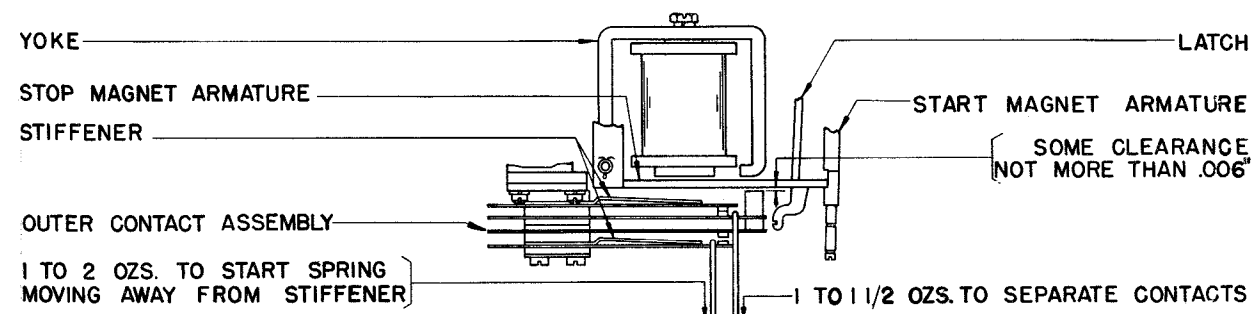


FIGURE 80

ORIGINAL

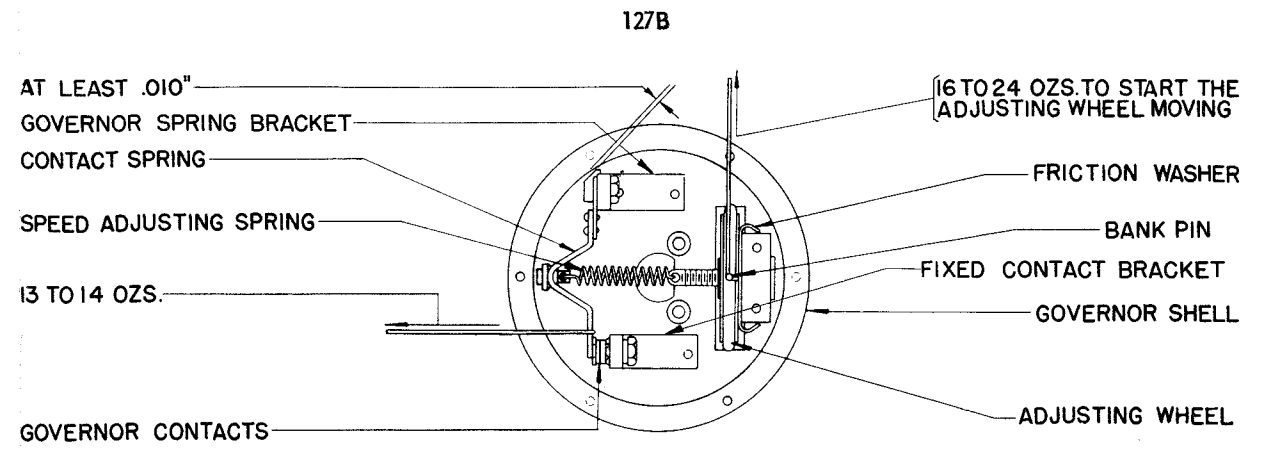


FIGURE 81

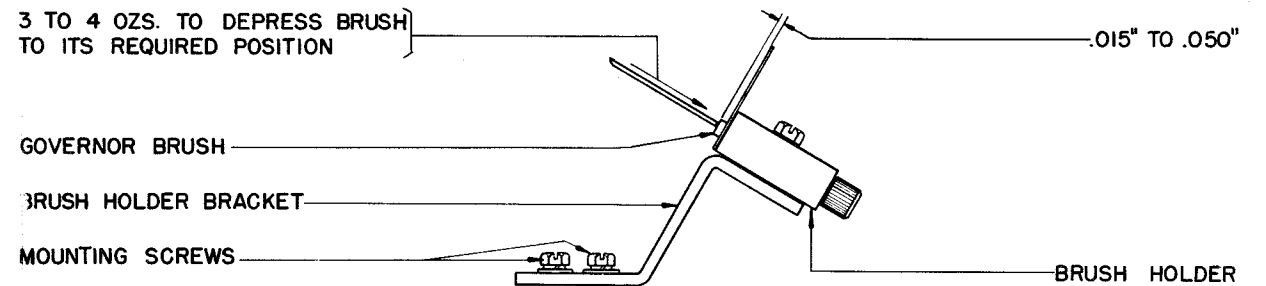


FIGURE 82

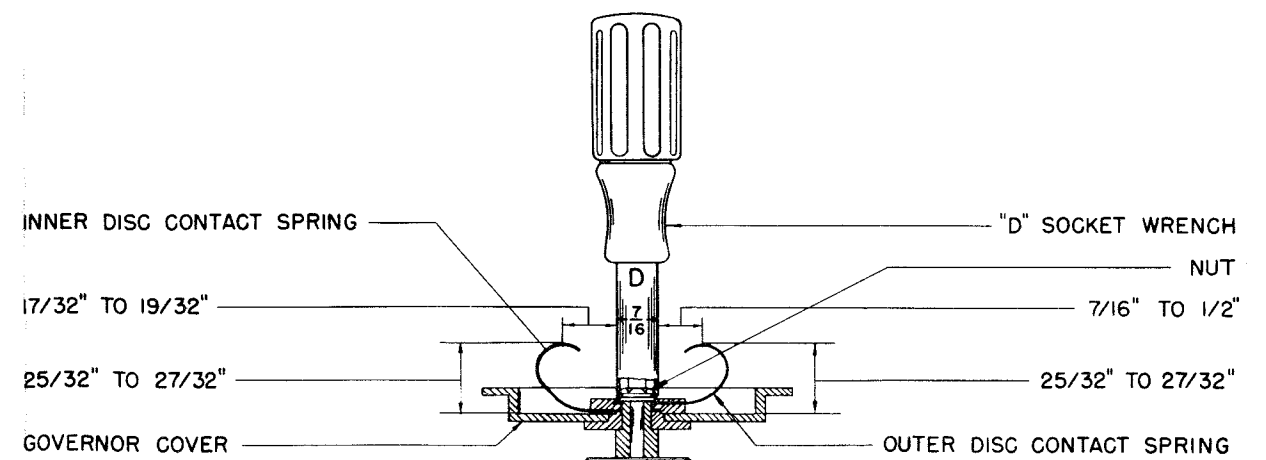


FIGURE 83

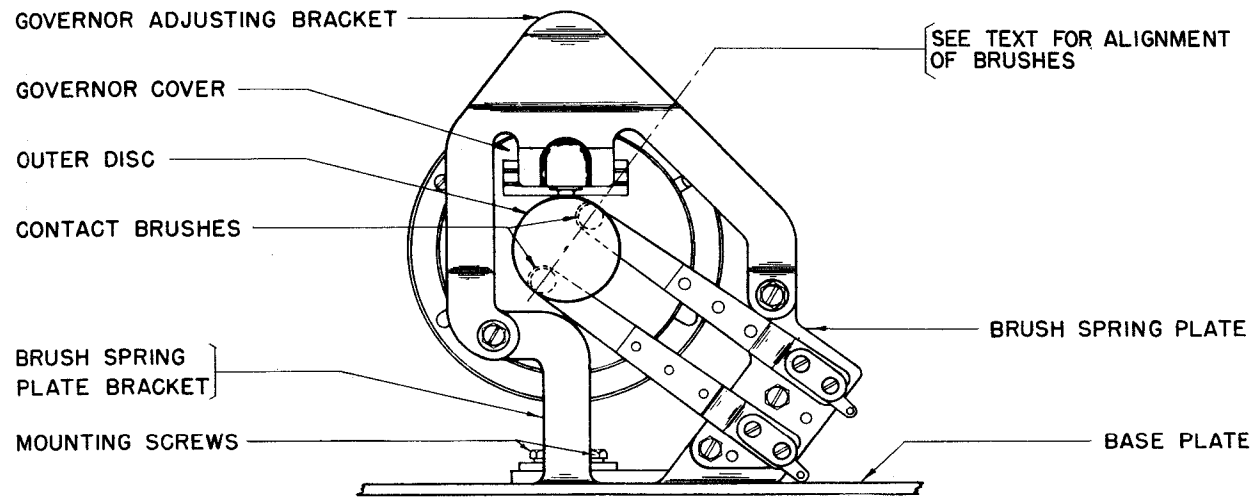


FIGURE 84

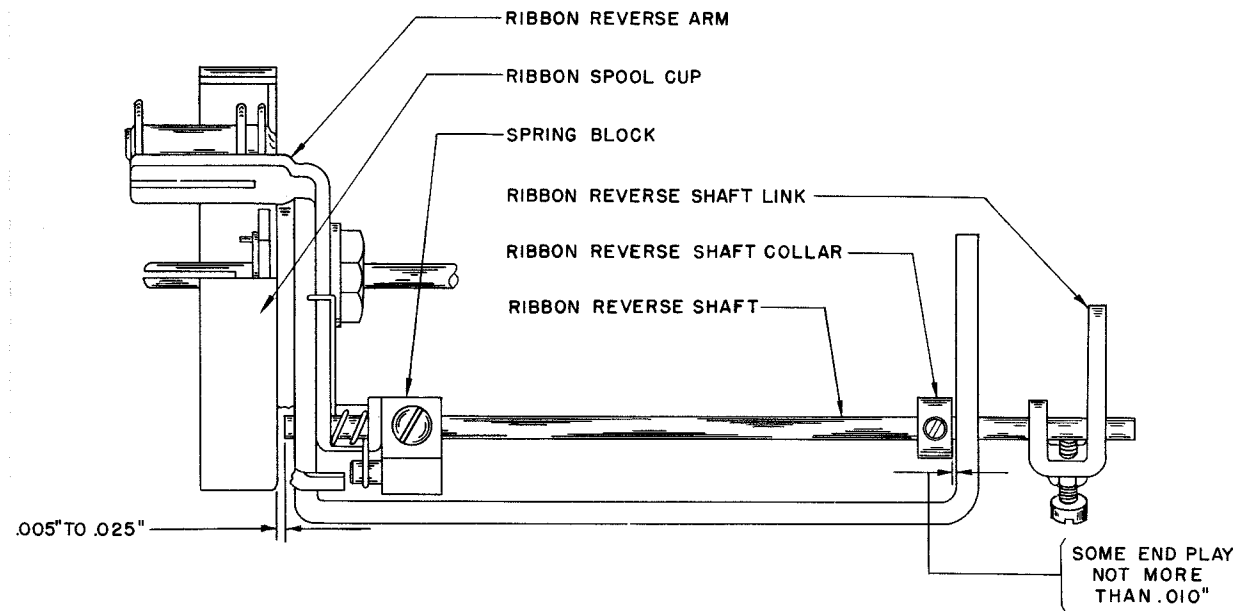


FIGURE 87

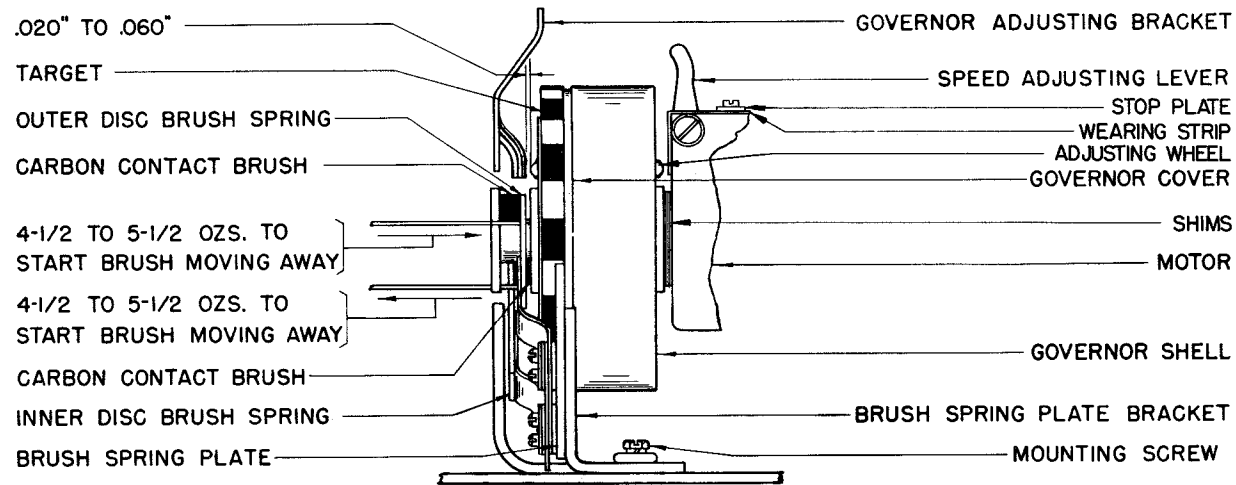


FIGURE 85

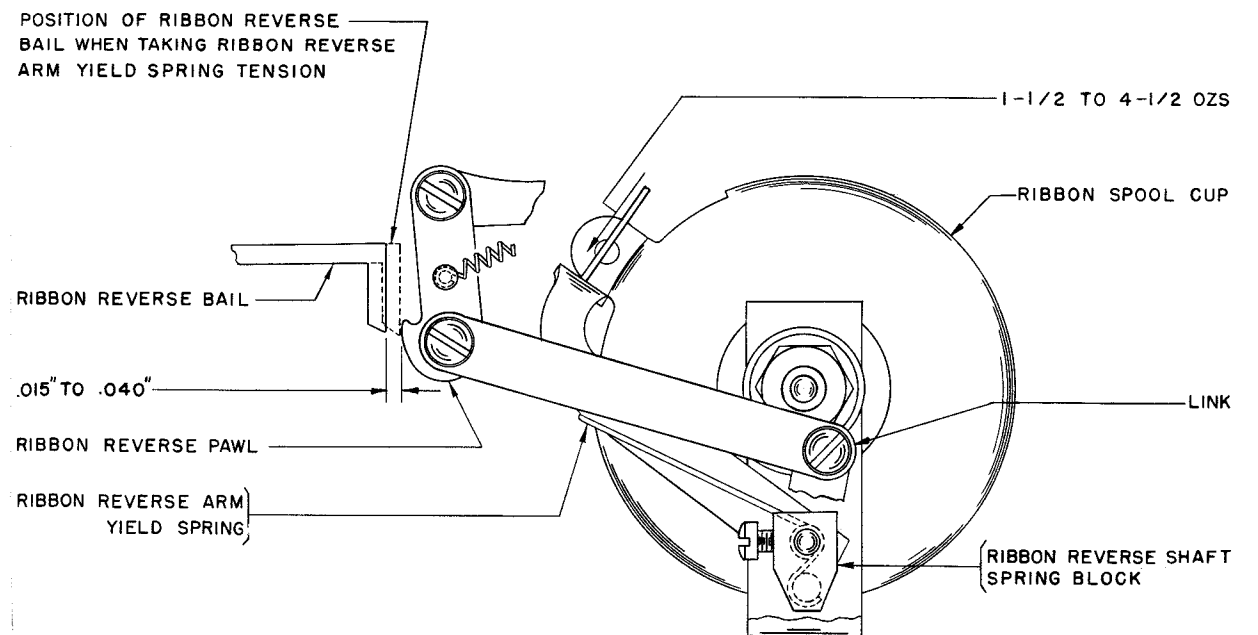


FIGURE 88

UPPER CASE	WEATHER SYMBOLS	↑ ⊕ ○ ↗ 3 ↘ ↓ 8 ↙ ↘ ↙ ↘ . ① 9 ∅ 1 4 Δ 5 7 ⊙ 2 / 6 + - < >	COMMUNICATIONS																																
	COMMUNICATIONS	- ? : \$ ! B X 8 ' ( ) . , 9 ∅ 1 4 Δ 5 7 ; 2 / 6 " ∞	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	BLANK	C.R.	L.F.	SPACE	LTR. SHIFT	FIG. SHIFT	
	1		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	2		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	FEED HOLES		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	3		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	4		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	5		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

FIGURE 86

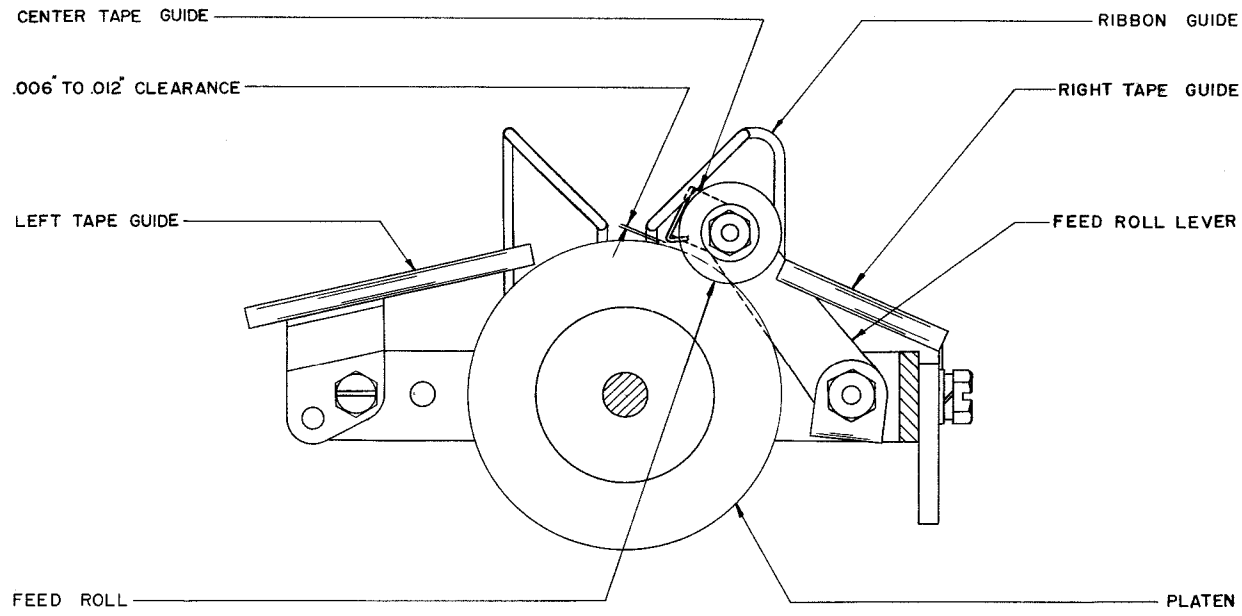


FIGURE 89

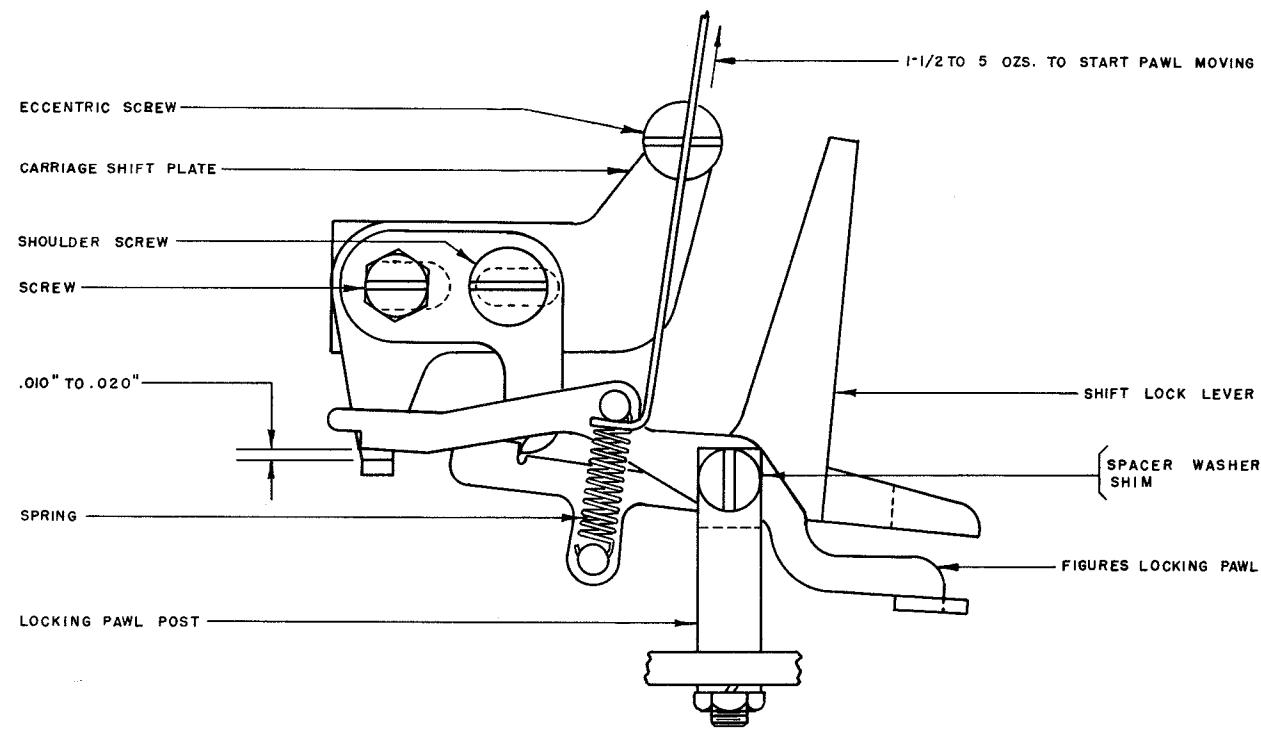


FIGURE 90

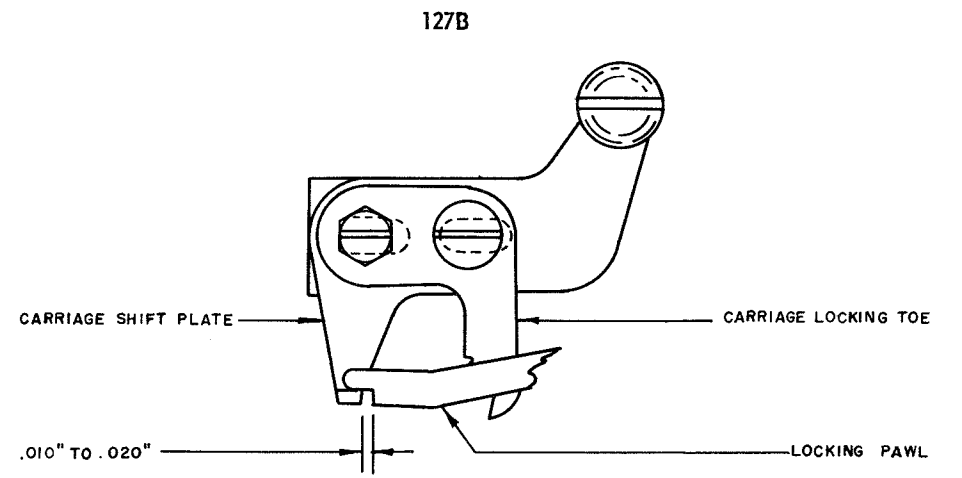


FIGURE 91

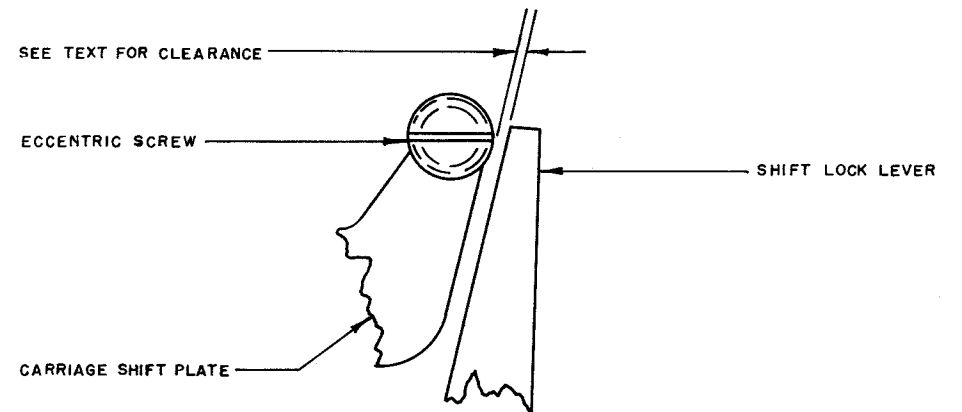


FIGURE 92

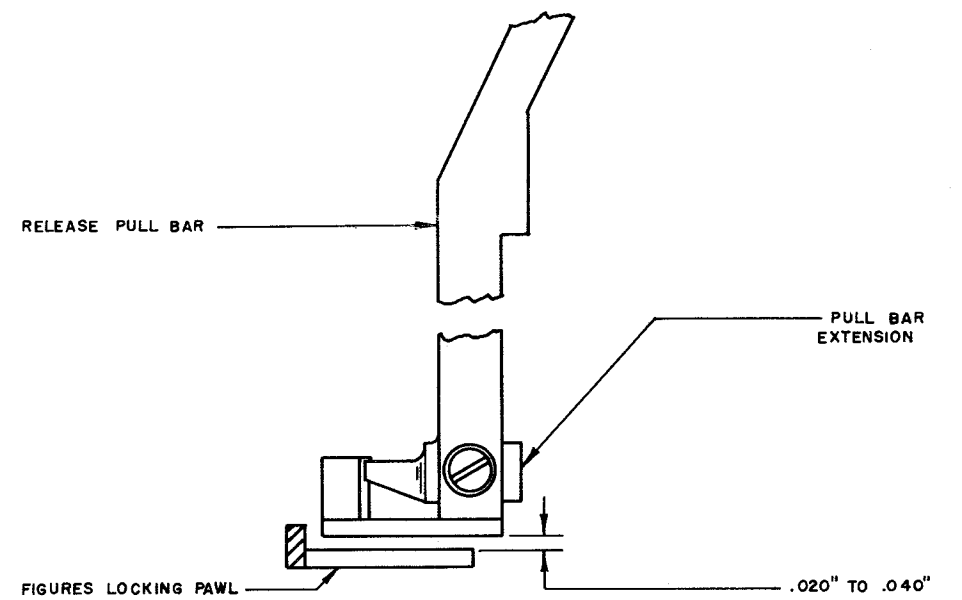


FIGURE 93