

R. B. Smith
BELL SYSTEM PRACTICES **SECTION P35.651**
Teletypewriter and Manual **Issue 5, October, 1946**
Telegraph Station and P.B.X. **AT&T Co Standard**
Installation and Maintenance

TYPING REPERFORATOR UNITS AND BASES

14 TYPE

REQUIREMENTS AND PROCEDURES

I. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of 14 type typing reperforator units and bases. It is reissued to include information from Section P35.610 so this section is now complete for typing reperforator units and to make other minor changes and corrections. Changes or additions of consequence are indicated with an asterisk (*).

1.02 The following shall be observed in applying requirements and procedures.

- (a) Use appropriate gauges for dimensional measurements.
- (b) Use the following Teletype scales for tension measurements as the tension values specified are not absolute values but readings to be obtained on these scales when used in the positions called for.

<u>Teletype Scale</u>	<u>Tension Range</u>
138-55M	8 ozs. or less
138-58M	8 ozs. to 32 ozs.
82711M	32 ozs. to 64 ozs.
4841M	4 lbs. to 12 lbs.
2727M	12 lbs. to 25 lbs.

(c) Before readjusting a part, loosen locking device (clamping screw, lock nut, etc.). Reset locking device after adjustment is completed.

(d) After readjusting a part, check adjustment of related parts which have been disturbed.

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(e) Parts dismantled to facilitate checking or readjustment shall be reassembled after operation is completed, reassembling any dismantled locating shims in original position.

(f) Springs which are outside tension limits shown and for which no adjustment is provided shall be replaced.

(g) Refer to ordering information for part names and numbers since designations used herein are in some cases abbreviated to save space.

(h) Contact points shall fall wholly within the circumference of the opposing contact except in case of contacts having the same diameter. In those cases contact centers shall not be out of alignment by more than 25% of their diameter.

1.03 To remove cover, raise lid, shift platen to rear ("letters") position and grasp lid at each side close to hinge using both hands. Lift vertically upward taking care to avoid snagging the platen push rod. In replacing cover, make sure that the platen is in the "letters" position and then lower the cover vertically and carefully into place grasping it as aforementioned.

1.04 To remove reperforator unit, remove the two thumb screws, grasp the rear motor gear guard handle and the left side handle, lift rear of base plate to clear left rear positioning stud and rotate the unit counterclockwise about its right front stud until the handle on the right side becomes accessible. Then move the right hand to this handle and raise the unit straight upward. To replace the unit reverse this procedure.

1.05 To determine condition of contacts "open" or "close" use a test lamp, buzzer or the volt-ohm-milliammeter.

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2. CLEANING

2.01 If necessary, typing units shall be cleaned in accordance with Section P30.010, covering Cleaning Teletypewriter Apparatus.

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3. LUBRICATION

3.01 Typing units shall be lubricated in accordance with Section P35.604 covering lubrication of typing reperforators.

4. REQUIREMENTS AND PROCEDURES FOR TYPING REPERFORATOR UNITS

4.01 Selector cams shall line up with their respective selector levers. Gauge by eye while selector cam sleeve is rotated through at least one complete revolution.

(a) To adjust, loosen main shaft bearing brackets and raise or lower shaft.

4.02 Main Shaft Clutch Throw-Out Lever:

(a) Main shaft clutch teeth shall clear each other by min. .010", max. .020" as in Fig. 1 when clutch is fully cammed out of engagement.

(b) Clutch throw-out lever shall be free in its bearings without perceptible end play.

(1) To adjust, reposition clutch throw-out lever pivot screws.

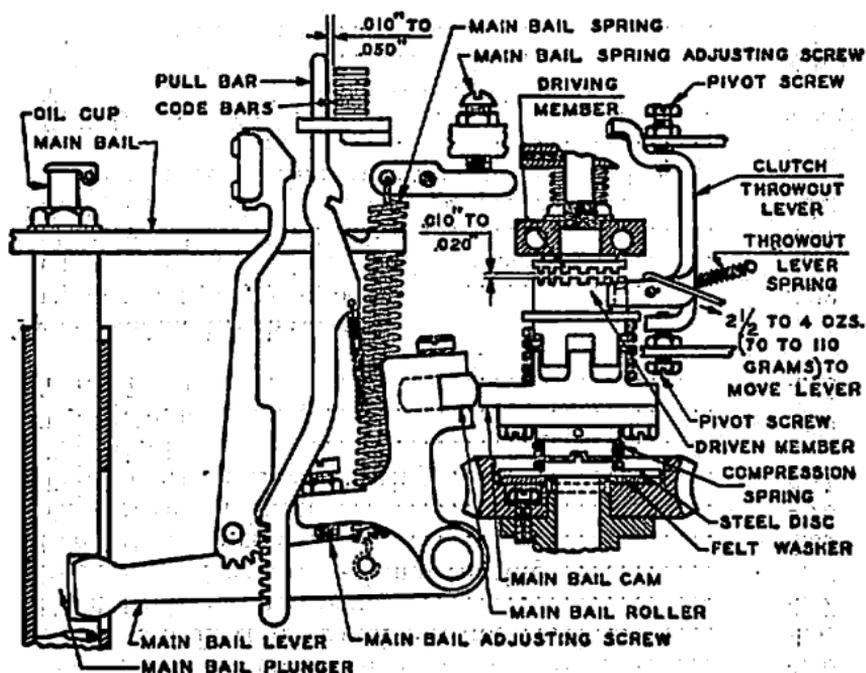


Fig. 1

4.03 **Clutch Throw-Out Lever Spring** shall have a tension of min. 2-1/2 ozs., max. 4 ozs. measured at right angles to the throw-out lever as in Fig. 1 with clutch teeth fully engaged.

4.04 **Main shaft clutch spring:** A pull of 30 ozs. applied to driven jaw of clutch as in Fig. 2 shall separate clutch teeth when tips of teeth are resting against each other. A pull of 24 ozs. similarly applied shall not separate clutch teeth.

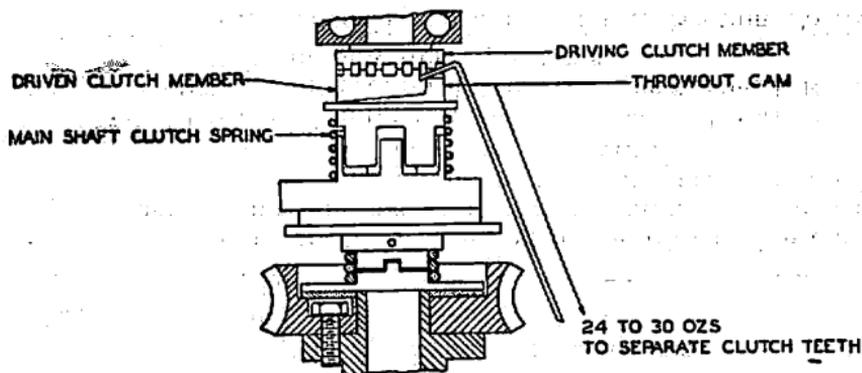


Fig. 2

4.05 **Main shaft clutch driven member,** after being pulled manually to position of extreme disengagement, shall start and slide until it engages with or touches the driving member teeth when the clutch spring is opposed by a force of not less than 10 ozs.

- (a) To gauge, pull driven member to operated position with 30 oz. tension as in 4.04, gradually reduce tension and permit driven member to slide until it touches driving member. The gauge reading should not go below 10 ozs.
- (b) To adjust, clean and lubricate clutch. If sliding surfaces of driven member and bushing on which it slides are not smooth and polished, replace these parts or return typing unit to shop for replacement.

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

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4.06 **Motors and governors** shall meet the requirements of Section P36.640 covering 15 type teletypewriter motor units and Section P31.190 covering governors except those with regard to position of the motor and its speed which shall be as follows:

(a) Motor pinion and main shaft gear shall engage with minimum backlash and without bind throughout a complete revolution of the main shaft. Gauge by eye and feel.

(1) To adjust, reposition motor on mounting plate.

(b) **Ribbon feed lever** shall clear the motor when the main bail is in its uppermost position and motor and motor plate are in their normal operating position. Gauge by eye.

* (c) **Speed:** The free speed of receiving shaft in revolutions per minute, corresponding to operations per minute with the shaft running free is:

<u>Operations per Minute</u>	<u>Words per Minute</u>	<u>Code No. of Target</u>	<u>Black Spots on Target</u>	<u>Free Speed of Receiving Shaft in R.P.M.</u>
AC or DC Governed Motors				
368.0	61.3	1G	10	420.6
460.0	76.7	1G	10	525.7
60 Cycle AC Synchronous Motors				
367.5	61.2	—	—	420.0
459.4	76.6	—	—	525.0

Note: Word speed is based on 6 operations (five characters and one space) per word. Nominal speeds of 368 and 460 operations per minute are commonly known as 60 and 75 speed respectively.

(1) Check and adjust speed of governed motors as outlined in Section P30.020 covering Speed Regulation of Teletypewriter Apparatus.

Note: If speed is variable, refer to Section P31.190 covering adjustment of governor contacts.

*4.07 **Selector lever springs** shall have a tension of min. 6 ozs., max. 10 ozs. measured as in Fig. 3 when letters combination has been set up, main shaft has been rotated until main bail is in its highest position, and the swords have been moved manually to their "spacing" position.

(a) To adjust replace selector lever springs unless difficulty can be traced to impaired movement of associated selector lever or sword and impairment corrected.

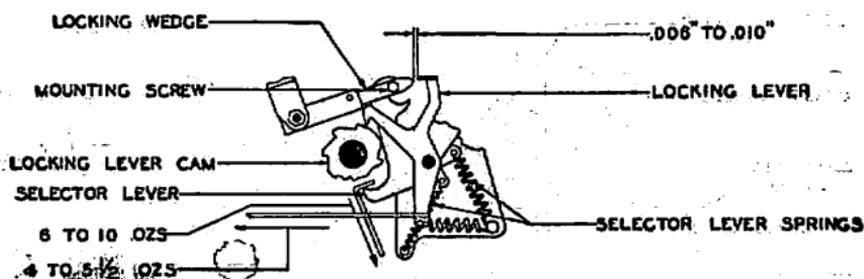


Fig. 3

4.08 Code bars and "T" levers shall move freely without bind.

(a) To check, rotate the main shaft until the main bail is in its lowest position, rest the unit on its left side, hold the swords away from their "T" levers, then raise the code bars to their marking position and observe their movement when released.

(b) If any impairment of motion is noted, check for binds at the "T" lever and code bar bearings, between code bars and code bar bell crank separator plates (see 4.59), and between adjacent code bars, then take steps necessary to eliminate difficulty.

Note: Old units may have separator washers of nickel silver (will not be attracted by a magnet) into which the separator collars may be imbedded if retaining nuts are drawn up too tightly. In these cases a retaining nut should be placed directly over the top separator washer and drawn up as tightly as possible with fingers. The lockwasher then should be placed over the first nut and followed by the lock nut which should be drawn up with one wrench while the bottom nut is prevented from turning with another wrench. Where only the new steel separator washers are used in the assembly, the lockwasher may be placed directly over the top separator washer and the assembly held in place with only one nut which may be drawn up by means of a wrench. In no case should the separator washers and collars rotate when the code bars are in operation.

Note: Remove range finder assembly for adjustments 4.09 to 4.24, inclusive.

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4.09 **Sword separator plate leaf springs**, except those of top and bottom plates, shall press lightly against their respective swords.

*Note: If necessary to check, remove separator plates and check to see that leaf spring end is min. .050", max. .060" away from plane of plate as gauged by eye. See Fig. 4.

(a) To adjust, bend leaf spring at narrow portion.

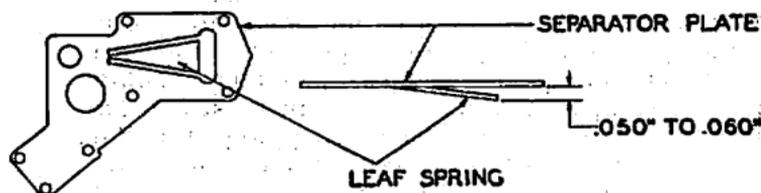


Fig. 4

4.10 **Armature lever** shall have a minimum amount of end play without bind as gauged by eye and feel when armature lever and selector arm springs are unhooked. See Fig. 5.

(a) To adjust, reposition top armature lever pivot screw.

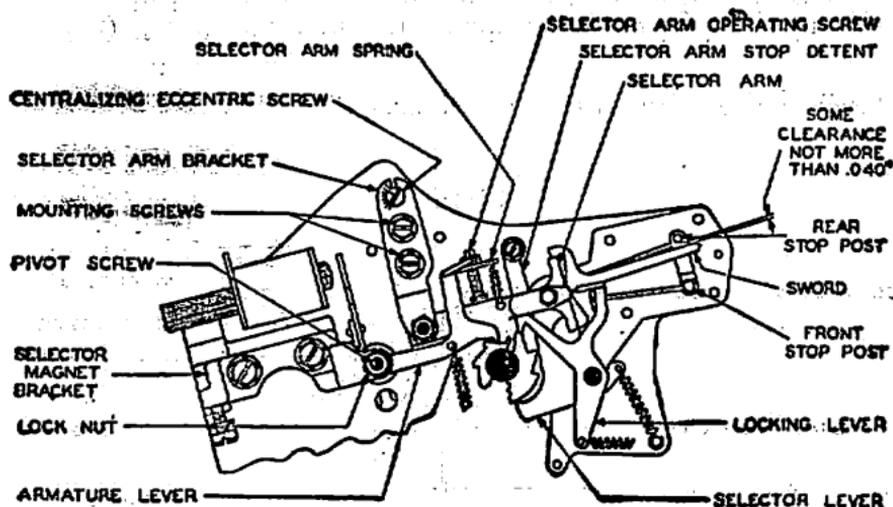


Fig. 5

*4.11 **Selector armature** when in its operated position shall touch both magnet cores at approximately the centers of their pole faces and the cores shall be centrally located with respect to the armature as gauged by eye.

Note: If this requirement is not met, excessive negative internal bias will probably be encountered in operating test.

(a) If necessary to check, remove selector magnet bracket assembly from unit and hold it in a position where its armature rests against the pole-pieces by its own weight, then sight around pole-pieces against a light background.

Caution: Make sure armature and pole faces are free of oil and dirt.

(b) To adjust, reposition magnet core assembly.

Note: With proper adjustment, at least 3-1/2 lbs., applied at right angles to armature edge midway between cores, should be required to pull armature away from cores when .020 ampere is flowing to the magnet coils. (Coils in series shunted by 5000-ohm resistance.) This electrical check need not be made for .060 ampere operation (coils in parallel).

*4.12 **Selector Arm:** See Fig. 6.

(a) Selector arm shall clear the armature lever by min. .008" and its stop detent by min. .010".

(b) Selector arm shall have barely perceptible end play without bind as gauged by eye and feel with the armature lever, selector arm and stop detent springs unhooked.

(1) To adjust, reposition lower selector arm pivot screw for clearance, then upper screw for end play.

Note: It may be necessary to remove the selector arm and magnet brackets to readjust the lower pivot screw.

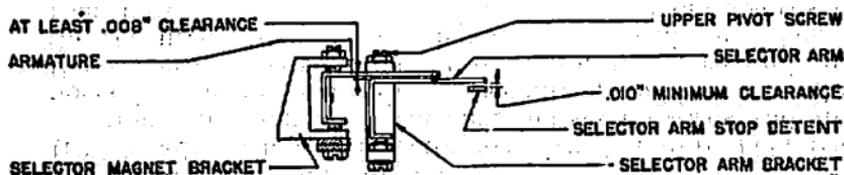


Fig. 6

4.13 **Selector swords** shall clear both stop posts by approximately equal amounts, not more than .040", measured as in Fig. 5 after removing locking lever and selector arm springs, placing associated selector lever on peak of its cam,

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placing the sword arm against the armature extension end, and moving the armature slowly from its unoperated or operated position to a point where the extension arm just clears the sword arm. When checking clearance to front stop post unhook armature lever spring from spring arm.

Note: Use No. 1 sword in gauging and adjusting, then check remaining swords.

(a) To adjust, loosen selector arm bracket until held friction tight; equalize clearance between swords and stop posts by turning centralizing eccentric, making sure that the selector arm stop detent does not interfere and that the eccentric indicating line is adjacent to scale on bracket; then move bracket closer or further away from swords by inserting the 90783M wrench into one of the two holes provided and turning wrench.

4.14 **Locking wedge** shall clear locking lever by min. .006", max. .010" as in Fig. 3 when lever is resting on the long high part of its cam and end of wedge is held in line with lever.

(a) To adjust, reposition locking wedge.

4.15 **Locking lever spring** shall have a tension of min. 4 ozs., max. 5-1/2 ozs. measured as in Fig. 3 when lever starts to move from high part of its cam.

4.16 **Selector arm stop detent:** Locking lever shall clear sides of locking wedge by equal amounts within .003" as gauged by eye when armature lever is in its operated and unoperated positions. See Fig. 7.

Note: Make sure that selector arm operating screw does not interfere with selector arm.

(a) To adjust, reposition detent by means of its eccentric post.

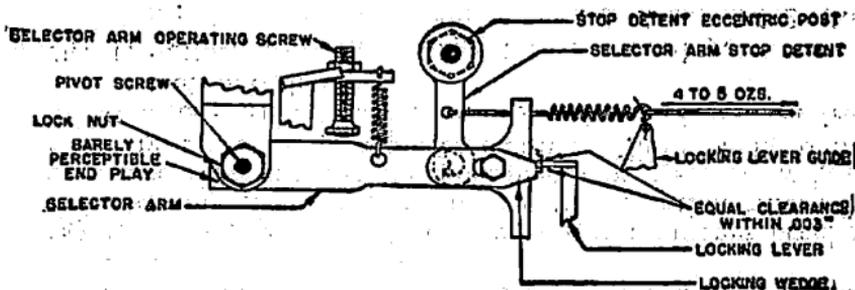


Fig. 7

4.17 **Selector arm stop detent spring** shall have a tension of min. 4 ozs., max. 5 ozs. measured as in Fig. 7 when stretched to position length.

4.18 **Selector magnet bracket adjusting arm:** Armature lever shall clear its cam by min. .060", max. .065" as in Fig. 8 when locking lever has just dropped off the long high part of its cam, the cam is held back against the locking lever, and the selector arm is held in its operated position by the locking lever.

Note: On units operated at 75 speed the clearance shall be min. .058", max. .062".

(a) To adjust, loosen selector magnet bracket and selector magnet bracket adjusting arm until held friction tight, then reposition selector magnet bracket by inserting and turning 90783M wrench in hole above adjusting arm end.

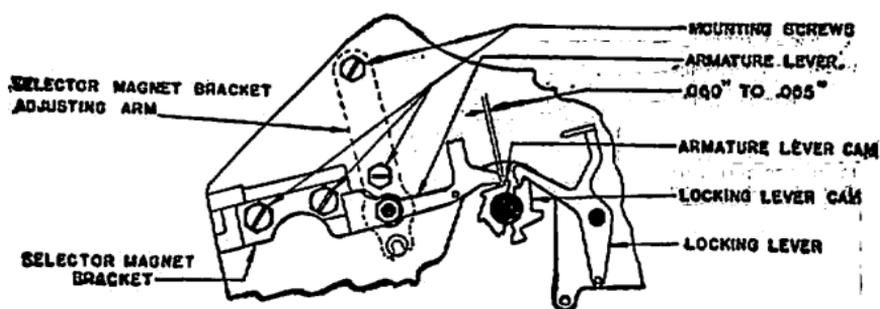


Fig. 8

4.19 **Selector magnet bracket:** With the selector magnet energized and the main shaft in a position to give the greatest throw to the armature lever, the clearance between selector arm and its operating screw shall be .004" to .006" greater when armature lever is on a peak of its cam as in Fig. 9A than when opposite an indent as in Fig. 9B.

* (a) To adjust, deenergize the magnets, hold cam sleeve with the armature lever resting on a peak of its cam, turn main shaft to the position where it gives the greatest throw to the selector arm operating screw, loosen selector magnet bracket mounting screws and reposition bracket by means of its adjusting screw until the armature just touches its pole face, then give the screw an additional 1/10 turn

counterclockwise. Energize the magnets and if the selector arm does not clear its operating screw, back off the operating screw to provide at least .006" clearance, then recheck requirements; if difference in clearances exceeds .006" turn magnet bracket adjusting screw clockwise, if less than .004" turn screw counterclockwise.

Note: Avoid lost motion due to loose fitting screw threads.

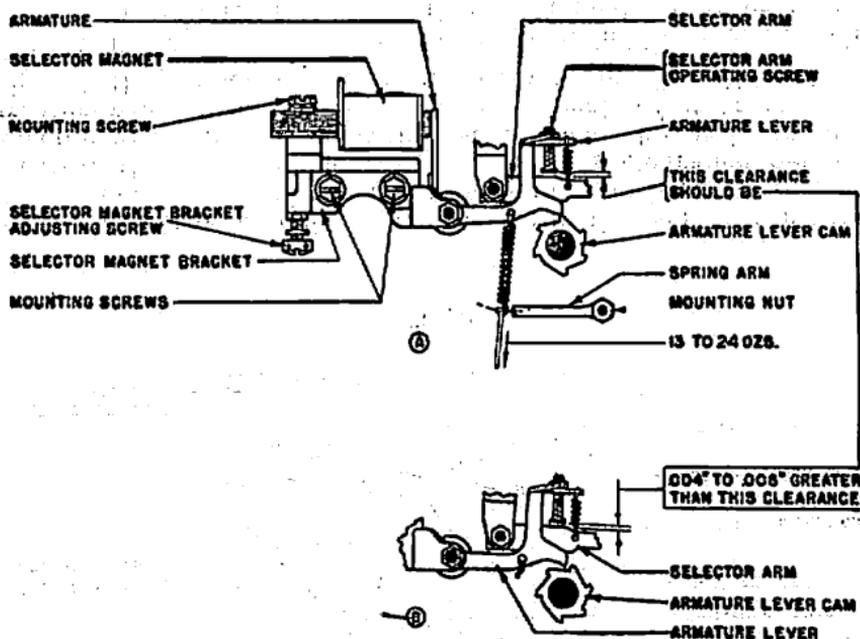


Fig. 9

4.20 **Selector arm operating screw:** Selector arm shall clear its operating screw by min. .003", max. .006" as in Fig. 10 when magnet is energized, selector arm is in its operated (marking) position and armature lever is between peaks of its cam.

(a) To adjust, reposition operating screw.

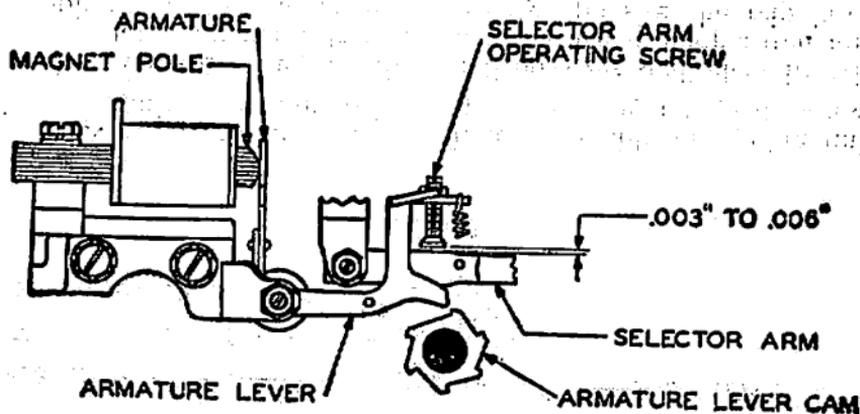


Fig. 10

4.21 **Selector arm spring** shall have a tension of min. 1-1/4 ozs., max. 1-3/4 ozs. measured as in Fig. 11 when armature lever is on a high part of its cam and selector arm stop detent spring is unhooked.

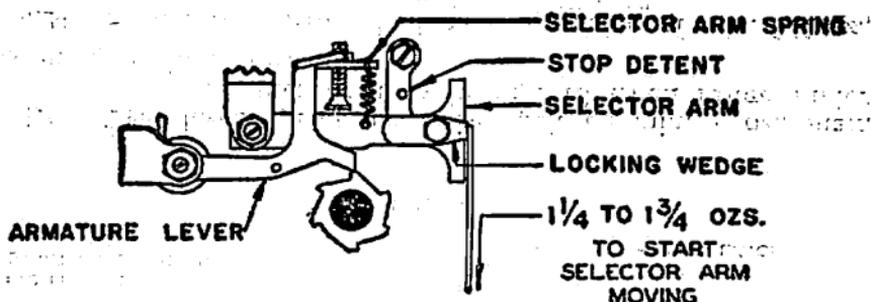


Fig. 11

4.22 **Stop lever** shall overtravel trip latch min. .004", max. .006" as in Fig. 12.

(a) To adjust, reposition stop lever eccentric screw.

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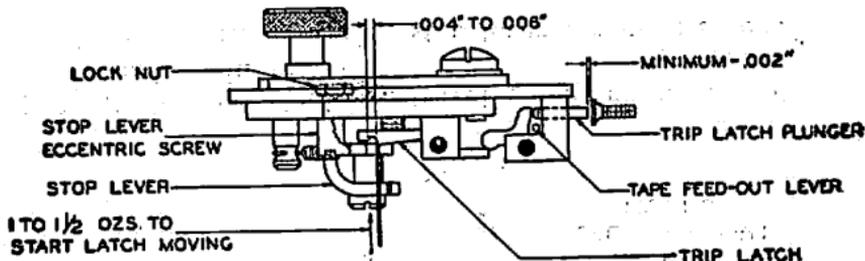


Fig. 12

4.23 Trip latch spring pressure shall be min. 1 oz., max. 1-1/2 ozs. measured as in Fig. 12 when range finder assembly is held horizontal.

4.24 Stop lever spring shall have a tension of min. 3/4 oz., max. 1-1/4 ozs. measured as in Fig. 13.

Note: Check 4.22 before measuring this tension.

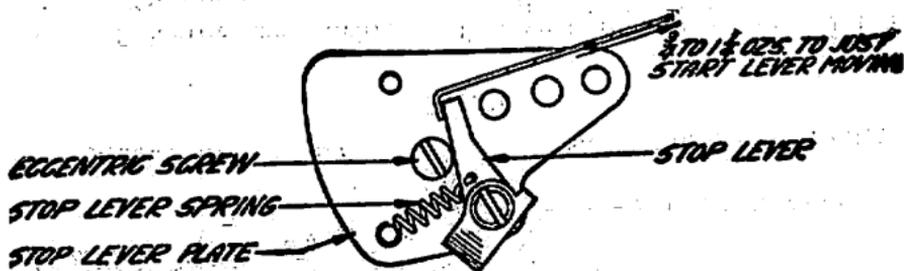


Fig. 13

Note: Reassemble range finder assembly on typing unit taking care not to jam trip latch plunger trip-off screw.

4.25 Armature Trip-off Screw: Stop lever shall clear its trip latch by max. .002" when armature is unoperated and stopping edge of the lever is directly opposite the trip latch latching surface (Fig. 14); and the trip latch plunger shall have min. .002" end play as in Fig. 12 when the armature is operated and the stop lever is clear of the trip latch latching surface.

(a) To adjust, reposition armature trip-off screw.

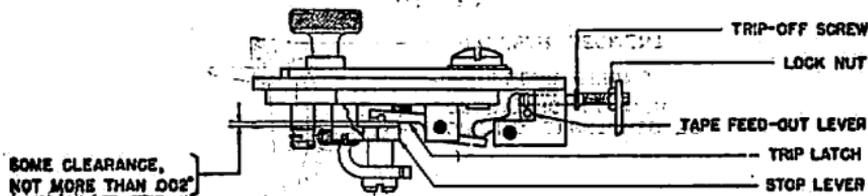


Fig. 14

*4.26 **Tape feed-out lever** shall be free to rotate with a minimum amount of end play:

(a) To adjust, reposition the tape feed-out lever adjusting collar.

*4.27 **Armature lever spring** shall have a tension of min. 13 ozs., max. 24 ozs. measured as in Fig. 9A when the armature lever is on a high part of its cam.

(a) To adjust, reposition spring arm.

Notes:

1. As a preliminary setting for 60 speed operation the spring tension should be adjusted to between 14 and 16 ozs. For 75 speed operation the tension should be adjusted to between 16 and 18 ozs.
2. The spring tension should then be further adjusted (within 13 to 24 ozs.) to minimize the internal bias of the selector. To do this it is necessary to determine distortion tolerances while receiving biased test signals as described in Section P30.002 or P30.003.
3. If biased test signals are not available the spring tension should be refined (within 13 to 24 ozs.) to give the maximum orientation range while receiving miscellaneous signals, preferably in the circuit in which it is to be used.
4. If a holding magnet is changed from a .020 ampere circuit (coils in series) to a .060 ampere circuit (coils in parallel) or vice versa, it will usually be necessary to readjust the armature spring tension to obtain maximum bias and distortion tolerances.

*Note: For adjustments 4.28 and 4.29 the type basket should be removed to make the parts accessible. To do this proceed as follows: Unhook springs associated with code bar locking lever, letters pullbar, space

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pullbar, and bell hammer. Remove the three type basket assembly mounting screws. Remove the front mounting screw of the right ribbon spool bracket; loosen rear mounting screw, and swing the bracket so that ribbon spool cup will not interfere with the type basket assembly. Remove the vertical lever bracket mounting screws and remove the vertical lever assembly. Then, using a piece of string or wire tie the pullbars out of engagement with their guide and slide the type basket assembly upward and out of the unit.

4.28 **Function Bar Bracket Plates:** Two end pullbars supported by function bar bracket plates shall clear the plates as in Fig. 15. Gauge by eye.

Note: This need be checked only when plates are moved.

(a) To adjust, reposition function bar bracket plates.

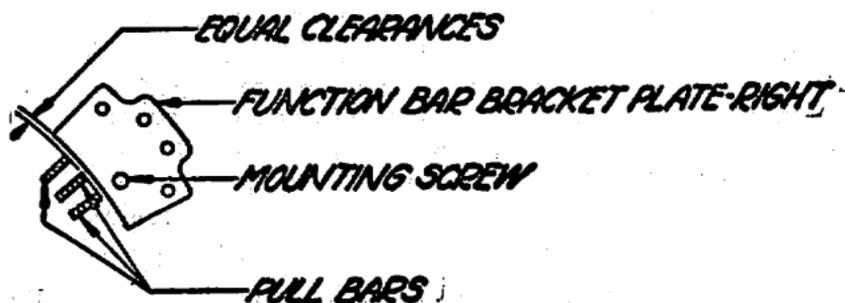


Fig. 15

4.29 **Character pullbar spring tension** shall be min. 3 ozs., max. 4 ozs. and "Figs." pullbar spring tension shall be min. 5-1/2 ozs., max. 6-3/4 ozs. See Fig. 16.

3 TO 4 OZS. FOR CHARACTER PULLBARS
5 1/2 TO 6 3/4 OZS. FOR "FIGS" PULLBAR

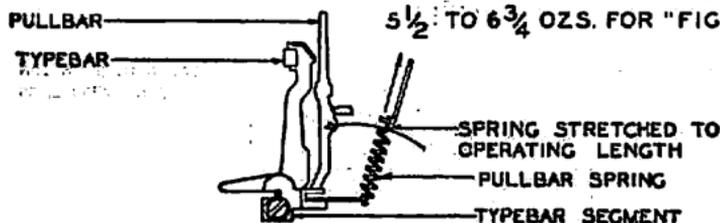


Fig. 16

Note: See 4.51 and 4.52 for function pullbar operating requirements.

Note: To replace type basket reverse procedure described for its removal.

4.30 Main bail of units equipped with roller guides shall not bind throughout its entire travel.

(a) To check, rotate main shaft until the main bail is in its highest position. Swing motor out of the way and remove ribbon-feed lever spring and main bail spring allowing bail to drop. Block all pullbars out of the path of the main bail. (A convenient way to do this is to place a length of rosin core wire solder between the pullbars and code bars.) Then with a finger under the main bail lever raise the main bail slowly to its highest position and release. There should be no evidence of bind on the upward travel and the bail should fall freely of its own weight to its lowest position when released.

(b) To adjust, restore spring and so position the pullbar guide that its mounting screws are in the middle of the elongated slots, then loosen the mounting screw of both main bail roller guides. (1) With the blank combination set up and the main bail opposite the unselected pullbar humps as in Fig. 17, shift the right roller guide to obtain the same clearance between the main bail and the "letters" and "figures" pullbar humps. Tighten the right roller guide top mounting screw friction tight. (2) With the main bail

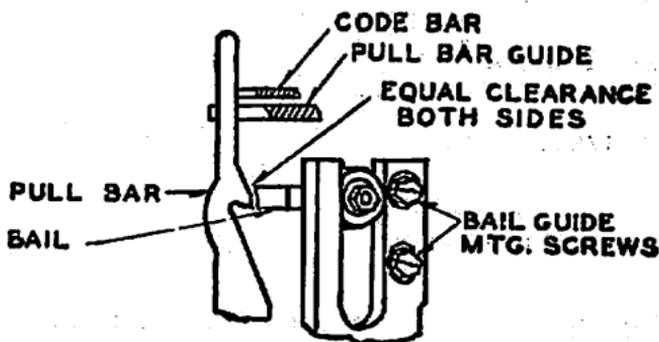


Fig. 17

in its lowest position as in Fig. 18 adjust the main bail adjusting screw to give some clearance between pullbars and code bars. Shift the right roller guide around its friction

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tight top mounting screw to obtain approximately the same clearance between the code bars and "letters" and "figures" pullbars. Tighten the right roller guide bottom mounting screw friction tight and recheck (1). Then fully tighten both right roller guide mounting screws after making any necessary readjustments. Position left roller guide so that check conditions outlined in (a) are met and then tighten both of its mounting screws.

Note: If this adjustment is made check 4.31, 4.32 and 4.60.

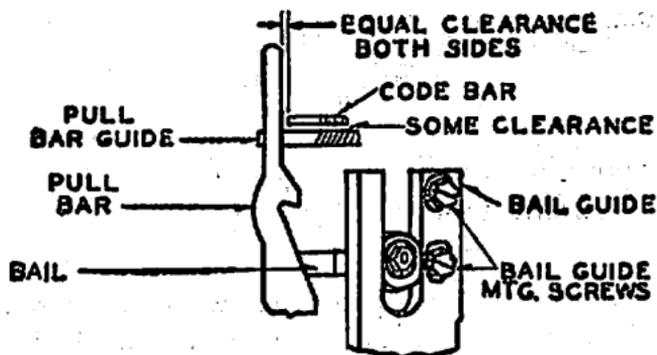


Fig. 18

4.31 Pullbar guide: See Fig. 19.

- (a) Oil cup on the top of the main bail plunger shall clear the pullbar guide.
- (b) Main bail shall clear the projections on unselected pullbars by min. .008", max. .020" when "blank" and "letters" combinations are set up in turn and main bail play is taken up to make this clearance a minimum.
- (c) No. 1 (top) "T" lever shall clear the bottom of the notch in the No. 1 code bar by min. .004", max. .080" at the point of minimum clearance. All other "T" levers shall have some clearance at the bottom of the notches in their associated code bars at the point of minimum clearance.

(1) To adjust, reposition pullbar guide.

Notes:

- 1. If requirements cannot be met it may be necessary to readjust main bail roller guides per 4.30 (b).
- 2. If adjustment is made check 4.32, 4.59 and 4.60.

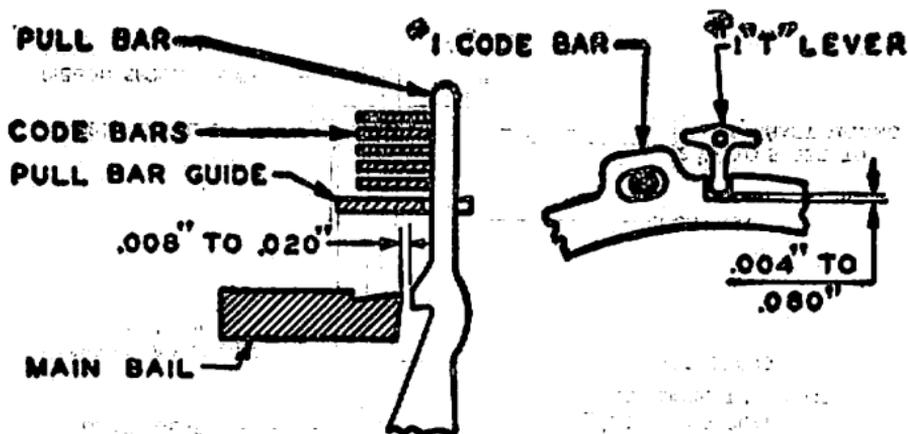


Fig. 19

4.32 Pullbar lockout lever: See Figs. 20 and 21.

(a) "Bell" pullbar shall clear the lockout lever roller of the "S" pullbar by min. .010", max. .040" and "S" pullbar shall clear the code bars by min. .004", max. .020" when platen is in "figures" position, "S" combination setup and main shaft rotated until the main bail is approximately .010" below its notch in the "bell" pullbar.

(b) "Bell" pullbar shall clear the code bars by min. .004", max. .020" when the platen is in "letters" position, "S" combination is set up and main shaft rotated until the main bail is approximately .010" below its notch in the "S" pullbar.

(1) To adjust, reposition pullbar lockout lever adjusting lever.

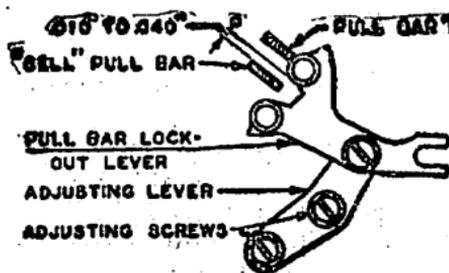


Fig. 20

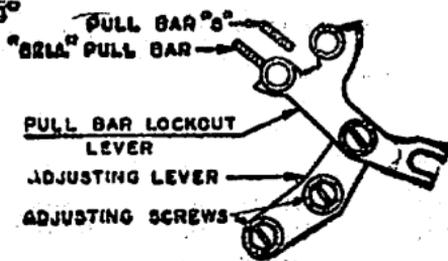


Fig. 21

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***4.33 Ribbon spool cups:** See Fig. 22.

- (a) Center of left ribbon spool cup roller shall be min. $4-11/16"$, max. $4-13/16"$, from the base plate.
- (b) Center of right ribbon spool cup roller shall be min. $2-3/16"$, max. $2-5/16"$ from the top surface of the tape guide.

(1) To adjust, reposition ribbon spool cups.

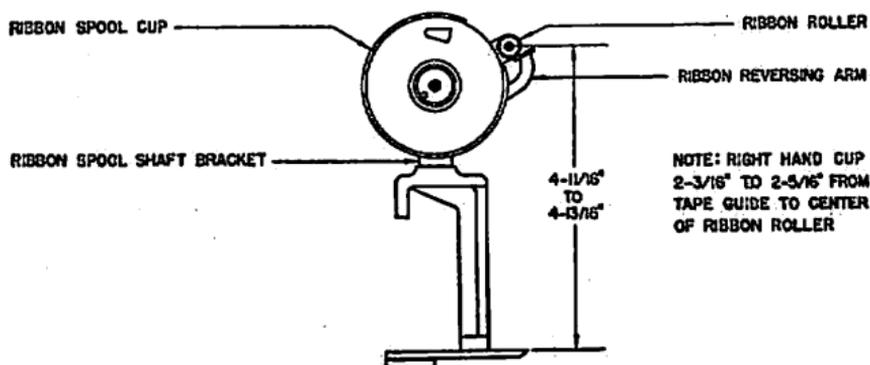


Fig. 22

4.34 Ribbon spool shafts shall have perceptible end play, but not more than $.004"$. See Fig. 23.

- (a) To adjust, reposition ribbon spool shaft gears.

*Note: If the unit is equipped with an end-of-line indicator mechanism the required end play in the right-hand ribbon spool shaft should be obtained by positioning the rear collar on the right-hand ribbon spool shaft.

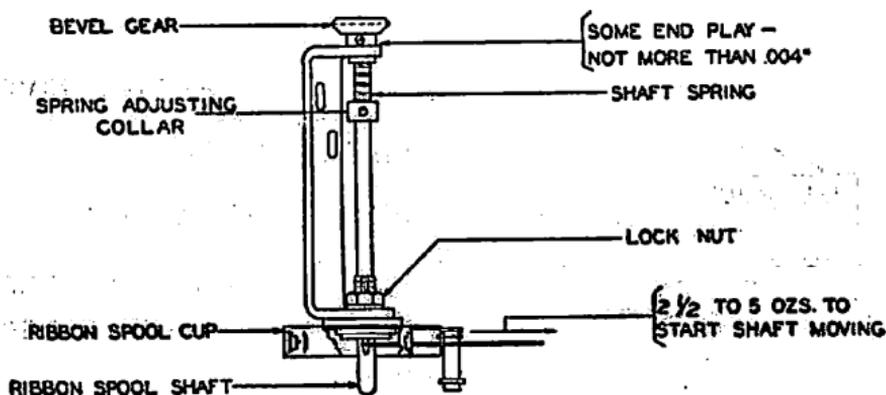


Fig. 23

*4.35 **Ribbon spool brackets** shall be parallel with the edges of the base plate and there shall be a minimum amount of backlash between 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 and right positions, respectively.

(a) To adjust, position the ribbon spool brackets.

Note: If unit is equipped with an end-of-line indicator mechanism the right bracket shall be so positioned that the front edge of its ribbon spool cup is approximately in line with the front edge of the left ribbon spool cup and the gear backlash obtained by positioning the gear on right ribbon spool shaft.

*4.36 **Ribbon spool shaft springs:** The resistance to turning caused by the ribbon spool shaft springs shall be min. 2-1/2 ozs., max. 5 ozs. measured as in Fig. 23 by pulling on the pin with ribbon feed shaft disengaged from ribbon spool shaft.

(a) To adjust, move spring collar longitudinally on shaft.

4.37 **Left ribbon reverse arm:**

* (a) Left ribbon reverse arm shaft shall clear the ribbon spool cup by min. .005", max. .025" (Fig. 24) when the reverse arm is held against the ribbon spool bracket to make this clearance a minimum.

(b) Left ribbon reverse pawl shall clear the ribbon reverse bail by min. .015", max. .025" (Fig. 25) when the reverse arm is against the spool cup and the bail is opposite the pawl.

(1) To adjust, reposition reverse arm.

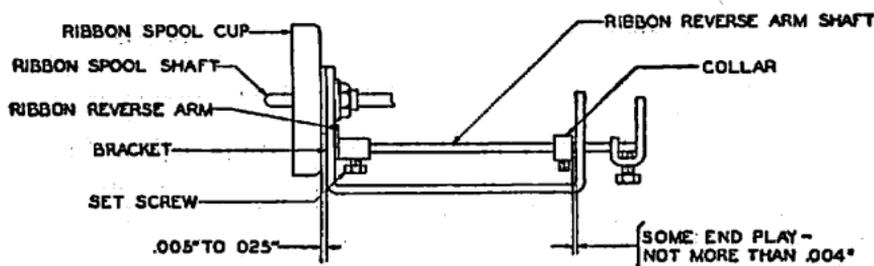


Fig. 24

4.38 **Left ribbon reverse arm shaft** shall have perceptible end play not to exceed .004". See Fig. 24.

(a) To adjust, reposition shaft collar.

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4.39 **Right ribbon reverse arm shaft** shall clear the ribbon spool cup by not more than .004" when its collar is held against the ribbon spool bracket to make the clearance a maximum.

(a) To adjust, reposition shaft collar.

4.40 **Right ribbon reverse arm:**

(a) The rear of the right ribbon reverse arm ribbon slot shall be in line with or slightly behind the rear flange of the roller on the spool cup.

(b) **Right ribbon reverse pawl** shall clear the ribbon reverse bail by min. .015", max. .025" when the reverse arm is against the spool cup and the bail is opposite the pawl.

(1) To adjust, reposition reverse arm.

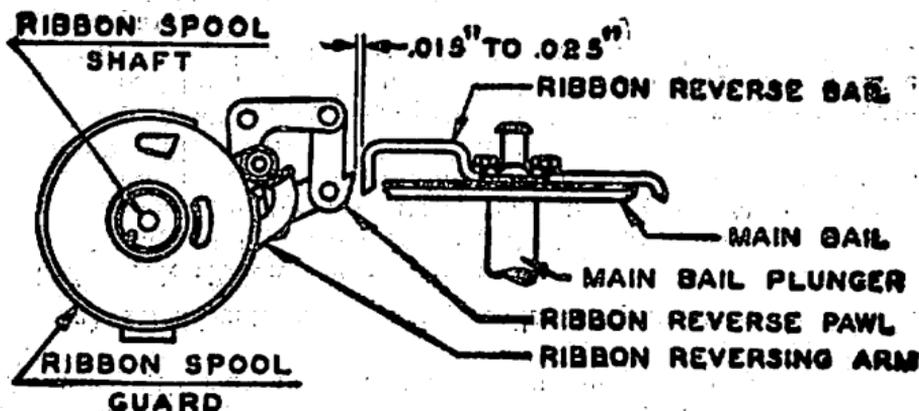


Fig. 25

4.41 **Ribbon reverse pawl links** shall not bind on their shoulder screws.

(a) To adjust, reposition levers on rear ends of shafts and recheck 4.37 and 4.40.

4.42 **Ribbon spools** shall be sufficiently tight on their shafts to insure that they will not slide off in service.

(a) To adjust, spread slot in end of shaft.

4.43 **Ribbon feed shaft tension springs** shall exert a pressure of min. 3 lbs., max. 5 lbs. measured on the ribbon reverse pawls as in Fig. 26 when the feed shaft is held in

engagement with the opposite spool shaft gear and the main bail is in its uppermost position.

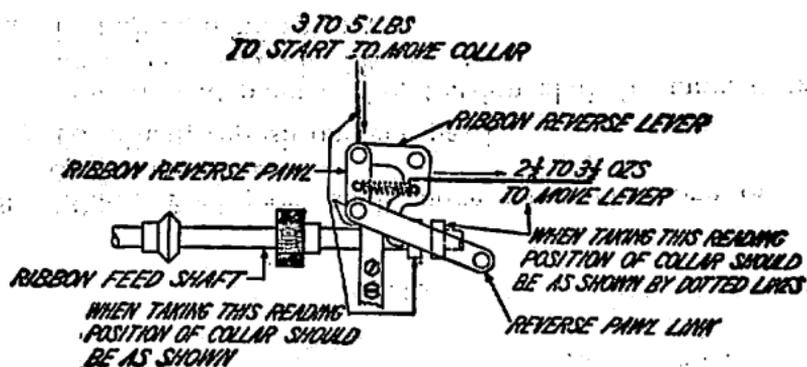


Fig. 26

4.44 Ribbon feed shaft detent plunger spring shall so press the plunger against the detent that it requires a force of min. 1-1/2 lbs., max. 3-1/2 lbs. to push the detent over the plunger as in Fig. 27 when the ribbon feed and check pawls are held clear of the bracket.

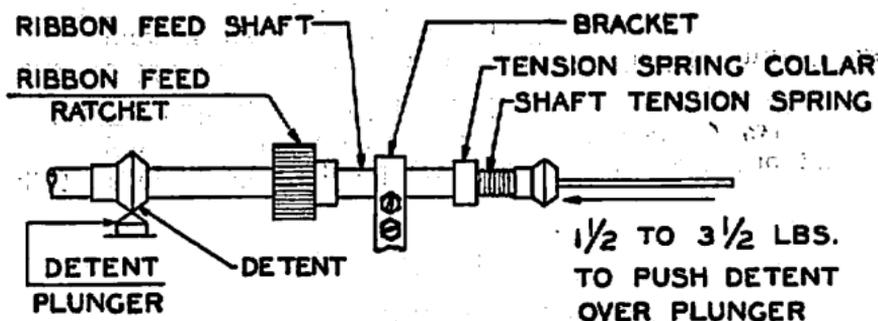


Fig. 27

4.45 Ribbon feed lever spring tension shall be min. 12 ozs., max. 18 ozs. measured as in Fig. 28 after removing ribbon feed pawl spring and placing feed lever roller in plunger indent.

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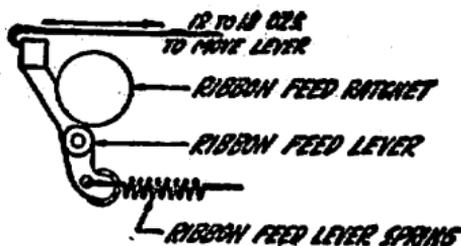


Fig. 28

4.46 Ribbon check pawl (top end) shall clear the pullbar guide by min. $3/64$ " , max. $5/64$ " gauged by eye.

(a) To adjust, reposition check pawl.

4.47 Ribbon check pawl spring tension shall be min. 6 ozs., max. 8 ozs. measured as in Fig. 29.

(a) To adjust, bend spring.

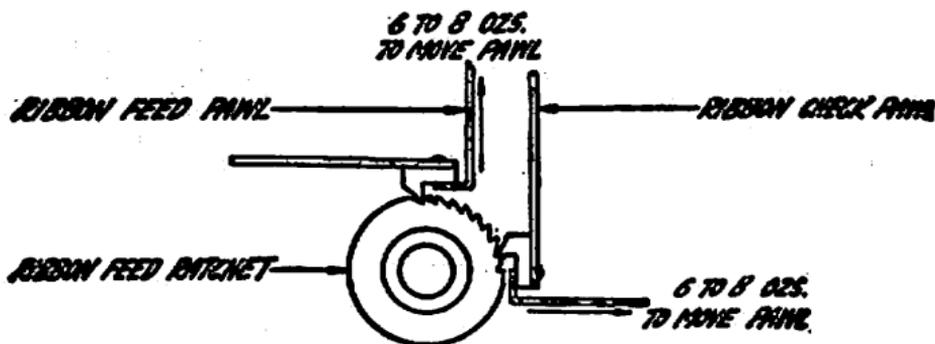


Fig. 29

4.48 Ribbon feed pawl shall move its ratchet one or two teeth at a time.

(a) To adjust, reposition feed pawl.

4.49 Ribbon feed pawl spring tension shall be max. 8 ozs., measured as in Fig. 29.

(a) To adjust, bend spring.

4.50 Ribbon reverse pawl spring tension shall be min. $2-1/2$ ozs., max. $3-1/2$ ozs. measured as in Fig. 26 with ribbon feed shaft collar moved away from ribbon reverse lever as shown dotted.

4.51 "Letters" pullbar spring tension shall be min. 1 oz., max. 1-1/2 ozs. when measured as in Fig. 30 with the main bail in its lowest position.

(a) To adjust, reposition left function pullbar spring bracket.

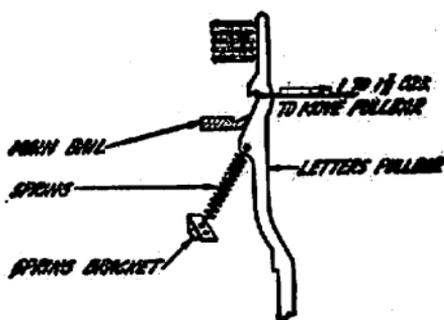


Fig. 30

*4.52 Code bar lock lever spring tension shall be min. 3-1/2 ozs., max. 5 ozs. when measured as in Fig. 31 with the main bail in its highest position and the code bar bell cranks held away from the code bar locking lever.

(a) To adjust, reposition right function pullbar spring bracket.

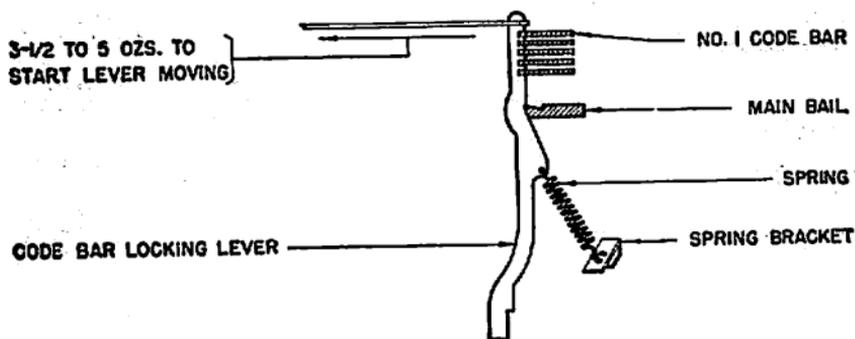


Fig. 31

4.53 Punch arm shall be centrally located in its bracket and have end play not to exceed .005". See Fig. 32.

(a) To adjust end play, reposition front pivot screw; to adjust location, reposition rear pivot screw.

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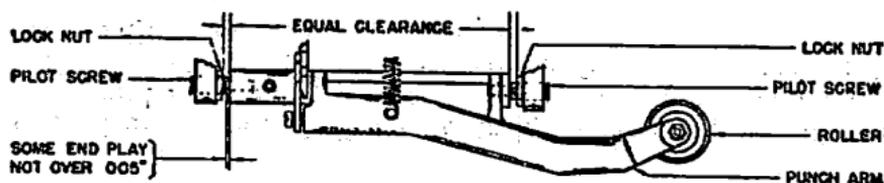


Fig. 32

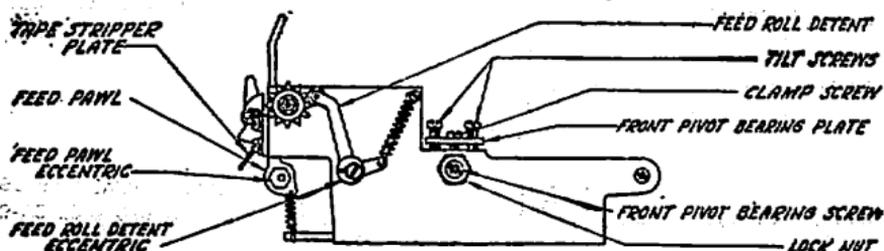


Fig. 33

Notes:

1. Punch arm is located when assembled and it is seldom necessary to relocate it.
2. New units have a hole in the main shaft bracket for access to the rear pivot screw; however, older units may not have this hole and in these cases it will be necessary to remove the main bracket from the base plate to adjust rear pivot screw.

4.54 **Punch Bail:** See Figs. 33 and 34.

- (a) The rear edge of the No. 1 (rear) selector finger and the front edge of the No. 5 (front) selector finger shall be within the outer edges of their respective punch pins when "letters" combination is set up and the main shaft is rotated until the selector fingers just touch the pins.

(b) All selector fingers shall clear their respective punch pins by approximately the same amount when "letters" combination is set up and the main shaft is rotated until the selector fingers are about to contact the pins.

(c) Punch bail shall have some end play not to exceed .005" as gauged by eye.

- (1) To adjust, loosen front pivot bearing screw lock-nut and proceed as follows. To meet requirement (a), keep clamp screw fixed and rotate front pivot bearing plate by means of the tilt screws. To meet requirement (b), loosen clamp screw and raise or lower front bearing plate as required by turning each tilt screw an equal amount in the direction required. To meet requirement (c) reposition front pivot bearing screw.

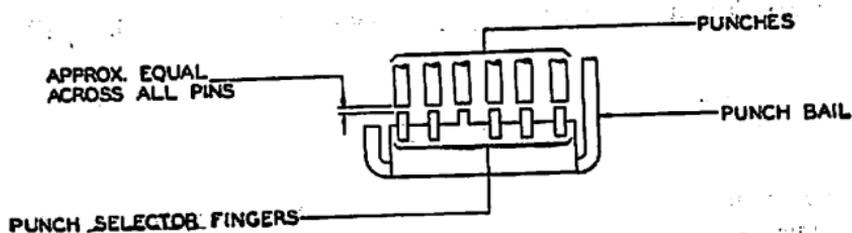


Fig. 34

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4.55 Feed roll shall rotate freely and have end play not to exceed .004", when its detent, feed pawl and tape tension lever are held clear of the roll. See Fig. 35.

- (a) To eliminate bind, reposition rear bearing bracket; to adjust end play, reposition bearing bushing.

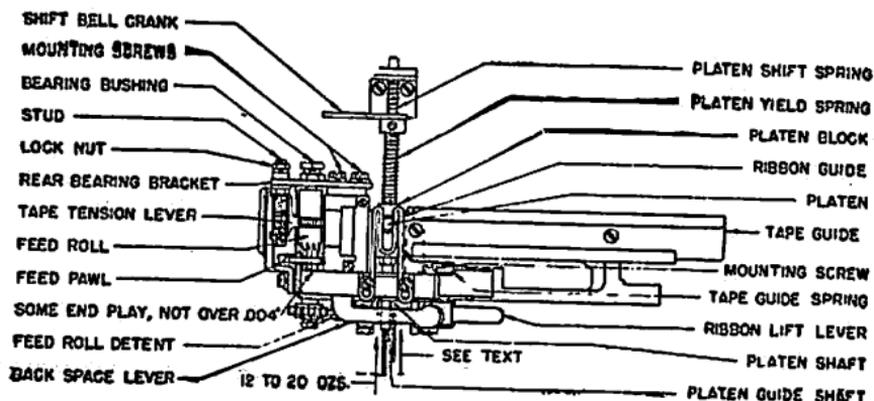


Fig. 35

4.56 Tape tension lever shall be located centrally over the feed roll pins and not touch them when the play in the feed roll and the tension lever is taken up in opposite directions. See Fig. 36.

- (a) To adjust, reposition lever stud by adding or removing shims.

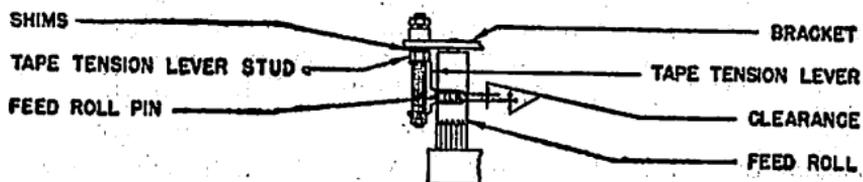


Fig. 36.

4.57 **Feed roll detent—preliminary setting.** (See 4.66)
Centers of feed punch and feed roll pin shall be approximately .600" apart when the punch bail is in its operated position. See Fig. 37.

(a) To adjust to position feed roll by means of its detent eccentric that the feed pin centers in the middle hole of the 73517M feed wheel position gauge when the latter is inserted in the punch block with its projection against the feed punch.

Note: Center of eccentric head should be to the left of the screw body.

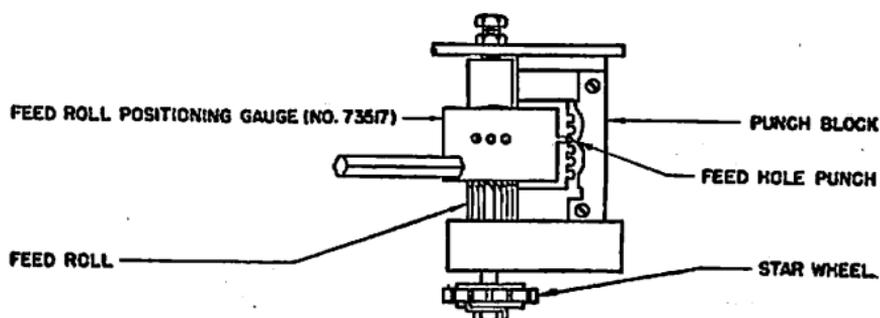


Fig. 37

4.58 **Feed pawl eccentric—preliminary setting.** (See 4.68)
Feed pawl shall bottom in the feed roll tooth which is just below the horizontal center line of the roll when the punch rocker arm roller is on the low part of its cam.

(a) To adjust, reposition feed pawl eccentric keeping center of eccentric head to left of screw body.

*4.59 **Code bar bell cranks:**

(a) Bell cranks and their separator plates shall be in horizontal planes.

- (b) Bell cranks and associated code bars shall line up and move freely between separator plates.
- (c) Bell cranks shall engage the top ends of their vertical levers fully and not interfere with the vertical levers associated with bell cranks above and below.
- (d) Bell cranks shall clear the adjacent right ends of associated code bars by min. $.010''$, max. $.030''$, when blank combination is set up and main shaft is rotated until new style two-step bell cranks are in a position where this clearance is a minimum as in Fig. 38 (approximately $1/32''$ clearance between bell crank step and code bar). In the case of the older one-step bell cranks, this requirement shall be met when main shaft is rotated until the locking lever rests on the code bars as in Fig. 39.

(1) To adjust, reposition vertical lever bracket to obtain horizontal plane for bell crank movement, add or remove shims on bell crank pivot beneath bottom separator plate to raise or lower bell cranks, and reposition bell crank pivot post in its slot to position bell cranks horizontally. Before making these adjustments check 4.31 and if any of these adjustments are made check 4.08, 4.61 and 4.62.

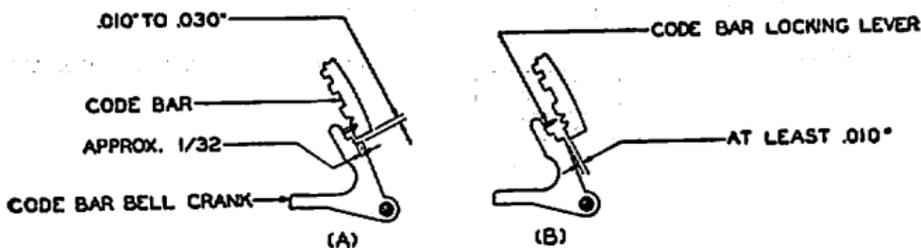


Fig. 38.

4.60 Main bail adjusting screw:

- (a) Unselected pullbars shall clear inner edges of code bars by min. $.010''$, max. $.050''$, as in Fig. 1 when "blank" and "letters" combinations are set up in turn, main bail roller is on the high part of its cam, and play in main bail and pullbars is taken up to make this clearance a minimum.

(b) Front edges of code bars shall clear the adjacent edges of associated **code bar bell cranks** by at least $.010''$ as in Figs. 38 and 39 when "letters" combination is set up and main bail roller is on the high part of its cam.

Note: Before making any adjustment to meet these requirements check 4.31 and 4.59.

(1) To adjust, reposition main bail adjusting screw.

Note: If requirements cannot be met it may be necessary to readjust main bail roller guides per 4.30 (b).

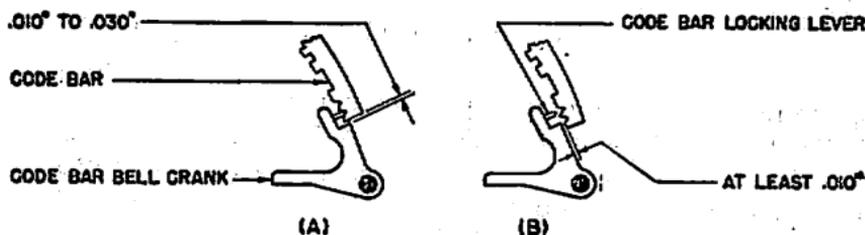


Fig. 39

*4.61 Right edges of the punch engaging projections on the punch selector fingers shall be in approximate alignment with the right edges of the punch pins when "letters" combination is set up, main shaft is rotated until the code bar bell cranks are resting on the code bars, and all play in associated parts is taken up by pressing lightly toward the left on the right ends of the selector fingers. See Fig. 40.

(a) To adjust, reposition vertical lever pivot screw in its slot in the vertical lever bracket. If this adjustment is made check 4.62.

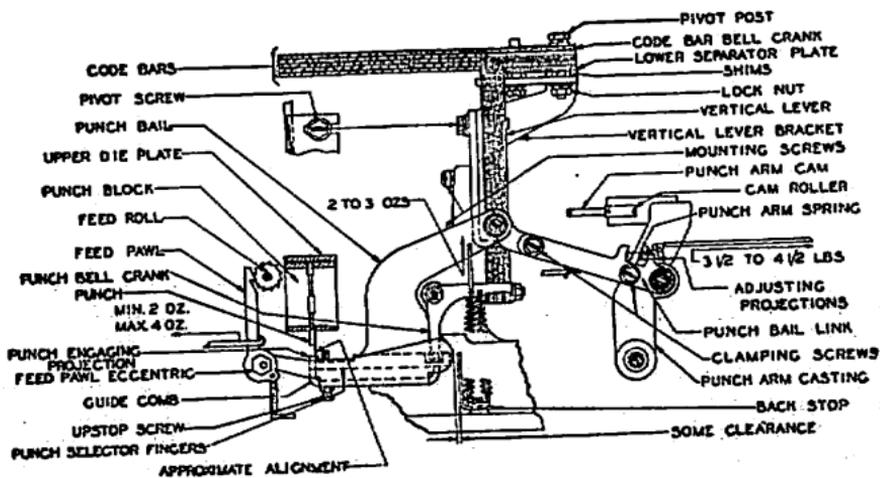


Fig. 40

4.62 Punch selector finger backstop:

(a) Left ends of punch selector fingers shall engage their guide comb at the left end of the punch bail by not less than one-half the thickness of the comb when held to the right against the backstop.

(b) Right ends of punch selector fingers shall clear the backstop when main bail is in its lowest position. See Fig. 40.

Fig. 40.

(1) To adjust, reposition backstop.

4.63 Punch bell crank springs shall have a tension of min. 2 ozs., max. 3 ozs., measured when the unit is in the stop position by pulling vertically upward on the bell crank at the spring and noting when the bell crank starts to move. See Fig. 40.

See Fig. 40.

4.64 **Punch arm spring** shall have a tension of min. 3-1/2 lbs., max. 4-1/2 lbs., measured at the spring post in line with the spring as the roller starts moving away from the low part of its cam. See Fig. 40.

4.65 **Punch Travel:** Punches shall punch holes in tape cleanly when "letters" combination is set up and the typing reperforator is operated under power.

Note: By cleanly is meant a well-defined hinged lid, with no fibrous edges, and no appreciable tear at the hinged portion of the feed hole. A slight tear at the hinged portion of the code perforations is permissible.

(a) **To adjust:** Remove tape from under tension lever and carry it over the top of the lever so it can be fed by hand, back off main bail spring adjusting screw until the spring lever touches the casting, back off punch bail upstop screw, adjust punch bail link (see Fig. 40) by means of its projections so the feed hole is just punched through the tape cleanly when "letters" selection is set up and the unit is operated under power.

***Note:** Feed punch pin is approximately .010" shorter than punch pins.

Caution: Avoid excessive punch pin travel, otherwise the operating bail might jam excessively when the upstop screw is adjusted.

Restore main bail spring adjusting screw to its former setting and advance punch bail upstop screw (see Fig. 40) in small steps (tighten lock nut each time) until feed punch fails to perforate tape when operated under power. Turn back upstop screw in 1/12 turn steps (tighten lock nut each time) until feed punch clearly embosses but does not fully punch the tape, then back off upstop screw an additional 1/6 turn and lock it in this position. Check that feed holes are punched cleanly.

Caution: Do not take defective punch blocks apart. If satisfactory punching cannot be obtained replace block assembly.

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4.66 Feed Roll Detent—Final Setting (See 4.57). Perforations in tape shall be evenly spaced, 10 to the inch, with an allowable variation of $\pm .007$ " in a 4" length.

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

(b) To adjust, reposition feed roll detent eccentric and check 4.68.

4.67 Feed roll detent spring shall have a tension of min. 10 ozs., max. 15 ozs., measured at right angles to the detent lever at the roller as the roller starts moving from the star wheel. See Fig. 41.

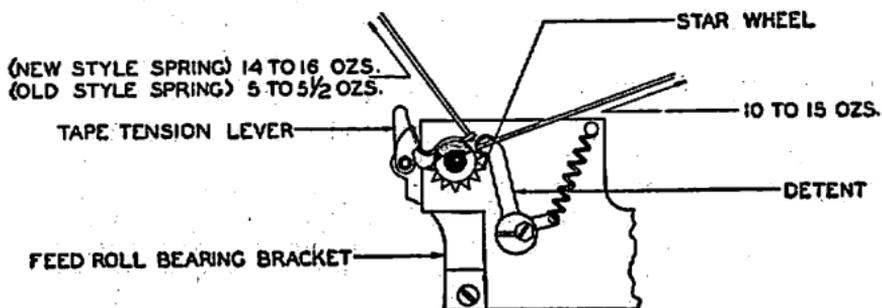


Fig. 41

4.68 Feed Pawl Eccentric—Final Setting (See 4.58). Feed pawl shall advance the feed roll one full step for each downward stroke of the pawl with the tape removed and the motor rotated by hand. See Fig. 40.

*(a) To check, hold detent clear of star wheel during a complete down stroke of feed pawl. If when the detent is allowed to reengage, the tips of the star wheel teeth are

not rotated in either direction by more than .010" as gauged by eye the adjustment is correct. Check in at least three places on star wheel.

(b) To adjust, reposition feed pawl eccentric.

4.69 **Feed pawl spring** shall have a tension of min. 2 ozs., max. 4 ozs., measured as the pawl starts to move when pulling horizontally to the left at a point just above the pawl hub. See Fig. 40.

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

(a) To adjust, reposition stripper plate.

*4.71 **Tape tension lever spring** shall hold the lever against the feed roll with a pressure of min. 14 ozs., max. 16 ozs. when the new style 110974M spring is used (or min. 5 ozs., max. 5-1/2 ozs., when the old style 84023M spring is used) measured at the end of the lever, perpendicular to a plane passing through the center of the tension lever stud and end of the lever. See Fig. 41.

(a) To adjust, reposition stud clockwise to increase and counterclockwise to decrease the tension.

4.72 **Shift rocker post** sides shall be parallel to the platen shaft as gauged by eye. See Fig. 42A.

(a) To adjust, reposition post.

4.73 **Shift rocker lever post** front surface shall be approximately parallel to the front edge of the base plate.

(a) To adjust, reposition post.

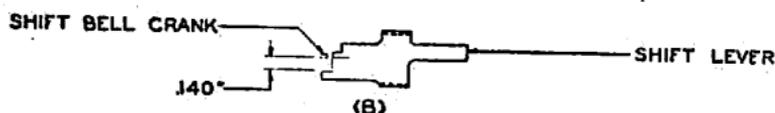
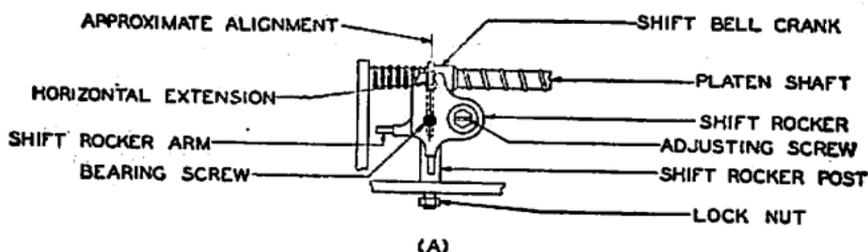


Fig. 42

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*4.74 **Shift bell crank horizontal extension** shall be in approximate alignment with vertical center line through the shift rocker bearing screw as in Fig. 42A when the platen shaft is so held that the front face of the downward extension of the shift bell crank is opposite the mark on the top surface of the shift lever as in Fig. 42B.

Note: Older shift levers that are not marked can be marked by scribbling a .140" line to the rear of the forward shoulder as indicated in Fig. 42B.

(a) To adjust, bend horizontal extension of shift bell crank.

4.75 Shift bell crank guide:

(a) Platen assembly shall shift freely.

(b) Printing face of the platen shall be approximately horizontal.

(1) To adjust, reposition shift bell crank guide. See Fig. 43.

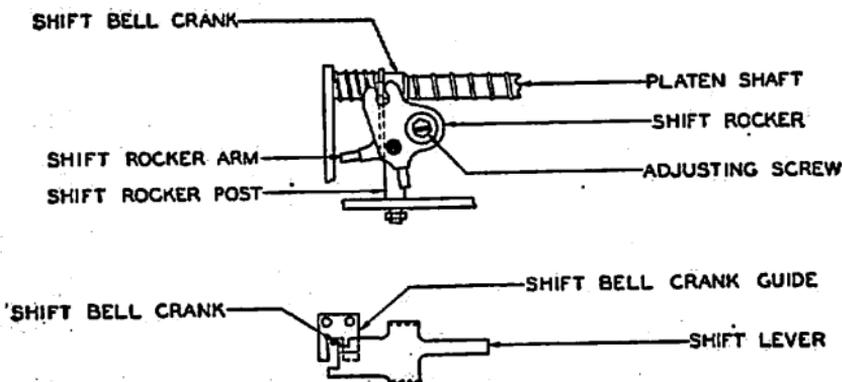


Fig. 43

4.76 Platen travel and latching: Shift lever rear shoulder shall just engage the vertical extension of the shift bell crank when, starting with the platen in the forward ("figures") position, "letters" selection is set up, the main shaft is rotated until the main bail roller is on the low part of its cam, and the main bail is lifted by hand to its highest position. See Fig. 43.

(a) To adjust, loosen shift rocker adjusting screw and reposition shift rocker with respect to the shift rocker arm.

4.77 Platen and Type Character Alignment: When in both "figures" and "letters" the platen shall be approximately centrally located with respect to the type pallet characters.

(a) To adjust, add or remove shims on platen shaft between the front collar and the platen block.

4.78 Platen shift spring shall exert a pressure of min. 5 ozs., max. 7-1/2 ozs., measured with the platen in the "letters" position by pressing toward the rear on the front end of the platen shaft until the platen assembly extension starts to move away from the rear shoulder of the shift latch. See Fig. 35.

4.79 Platen yield spring shall exert a pressure of min. 12 ozs., max. 20 ozs., measured on the front end of the platen guide shaft by pressing toward the rear until the platen block starts to move on the platen shaft when the platen shaft is held in the extreme rear position. See Fig. 35.

4.80 Shift lever spring shall have a tension of min 1/2 oz., max. 1 oz., measured as the shift lever starts to move when a downward pressure is applied on the lever in line with the right edge of the platen shaft and the shift bell crank extension is held clear of the shift lever shoulder (to the rear).

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

4.82 Tape guide spring edge shall be parallel to the upper edge of the punch unit casting and its curved pressure tip shall engage the tape opposite the guide cutout. The spring shall press the tape firmly against the rear side of the guide without buckling the tape.

(a) To adjust, reposition and bend spring.

4.83 Ribbon guide: Ribbon shall (a) be centrally located with respect to all type pallets, (b) be held approximately 1/32" above the tape, and (c) show no tendency to curl at its rear edge.

(1) To adjust, reposition ribbon guide from front to rear to obtain (a) bend guide adjacent to casting to obtain

(b), and bend forward end of lower part of guide to obtain (c).

***4.84 Main bail spring tension:**

(a) Platen shall move from "figures" position to "letters" position without failure.

(b) Characters and punctuation marks shall be typed clearly without embossing tape.

(c) Main bail spring tension shall not exceed 15-1/2 lbs. measured as spring adjusting lever starts to move away from its adjusting screw when pulling upwards, on the spring adjusting lever from a point directly below the spring with the main bail in its lowest or stop position.

(1) To adjust, with motor running send alternate "letters" and "figures" slowly, back off the main bail spring adjusting screw until platen just fails to return to "letters" position, tighten adjusting screw without failure, then tighten adjusting screw an additional 1-1/2 turns and tighten its lock nut, check typing requirement and increase spring tension if necessary but not above specified maximum.

4.85 Left edge of "bell" pullbar shall clear the bell hammer eccentric screw by approximately 1/8" when the main bail is in its lowest position.

(a) To adjust, reposition bell hammer post on base plate.

*4.86 Bell hammer lip shall clear the bell hammer post by min. .020", max. .040" when the "bell" pullbar is selected, the main bail is in its highest position, and the "bell" typebar is held with its type pallet against the platen. See Fig. 44.

(a) To adjust, reposition bell hammer eccentric screw keeping high part of eccentric to the rear.

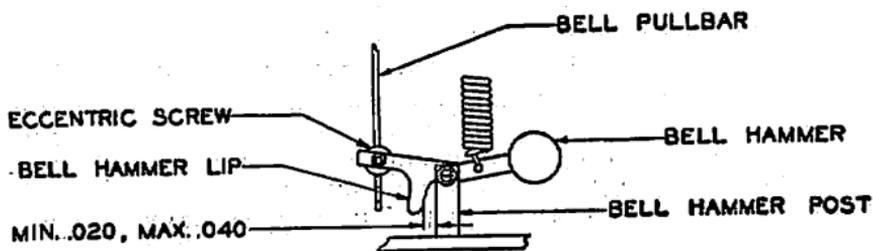


Fig. 44

4.87 Bell shall be so positioned to obtain most satisfactory tone and shall clear the left ribbon spool bracket, the carrying handle on the left side of the unit and the bell bracket mounting screws, by min. .010". Also see 4.88.

(a) To adjust, reposition bell on its mounting bracket.

4.88 **Tape platform** shall clear bell by min. .004" and the front side of its rear vertical lip shall clear and be approximately parallel to the rear edge of the tape.

(a) To adjust, reposition platform.

*4.89 **Back space mechanism:**

(a) Ribbon lift lever spring tension shall require min. 28 ozs., applied as in Fig. 45 to start the lift lever to move.

(b) Back space lever spring tension shall require min. 1 oz., max. 2-1/2 ozs., applied as in Fig. 46 to start the back space lever to move.

(c) Back space feed pawl spring tension shall require min. 1/2 oz., max. 1-1/2 ozs., applied as in Fig. 46 to start the feed pawl to move.

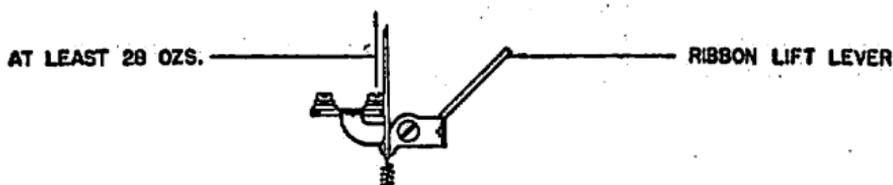


Fig. 45

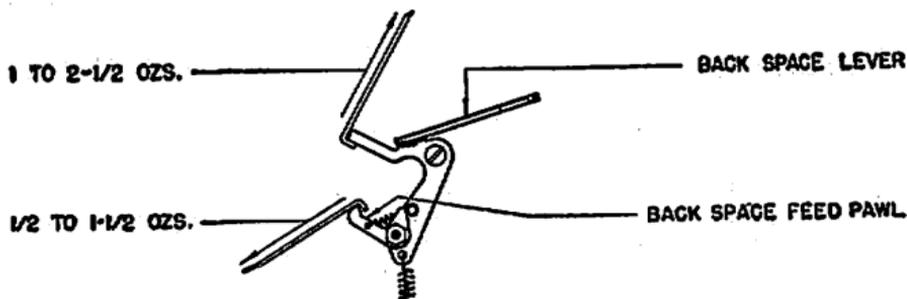


Fig. 46

Note: The following check shall be made on all units equipped with the back space mechanism.

The unit shall be capable of back spacing a length of tape containing 72 characters of regular text matter with one "letters" combination after each nine characters by

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consecutively depressing the back space lever 72 times. The tape should not buckle or be damaged by the back space operation. It may be necessary to refine punch travel adjustment (4.65) and to remove dirt and burrs from parts.

4.90 Mechanical End-of-Line Indicator:

(a) Worm shaft shall not bind but shall have just perceptible end play. Gauge by eye and feel with shaft spring detached from the contact bracket. See Fig. 47.

(1) To adjust, reposition collar.

(b) Front lamp contact spring shall press against its stiffener with a pressure of min. 3 ozs., max. 4 ozs. measured by pushing perpendicular to the spring at the contact point when the contacts are in the unoperated position. See Fig. 47.

(1) To adjust, remove spring from pileup and bend it.

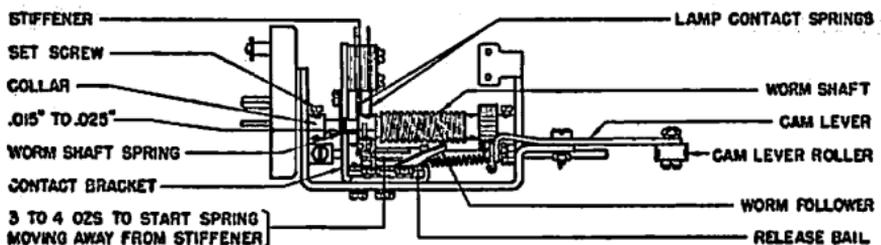


Fig. 47

(c) Rear lamp contact spring shall clear the front spring contact by min. $.015''$, max. $.025''$ when the front spring is resting against its stiffener. See Fig. 47.

(1) To adjust, bend rear spring.

(d) Front lamp contact spring shall clear the lower edge of its stiffener by min. $.010''$, max. $.020''$ when the worm follower rests in the groove at the end of the worm. See Fig. 48.

(1) To adjust, reposition contact bracket.

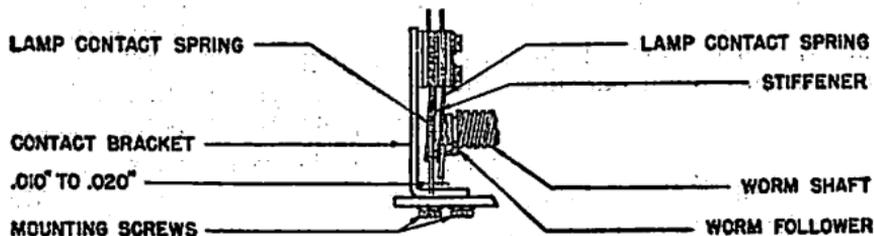


Fig. 48

(e) Worm follower bails shall not bind, shall have just perceptible end play and shall close the lamp contacts when min. 62 characters, max. 66 characters have been received.

(1) To adjust, reposition adjusting bracket (old arrangement) or collar on ribbon reverse shaft and adjusting bracket (new arrangement) and re-check (d).

(f) Worm follower spring tension shall be min. 1-1/2 ozs., max. 3-1/2 ozs. measured by pulling parallel to the spring at the end of the worm follower as the follower comes in contact with the rear contact spring, so holding the bail that the follower pin clears the worm. See Fig. 49.

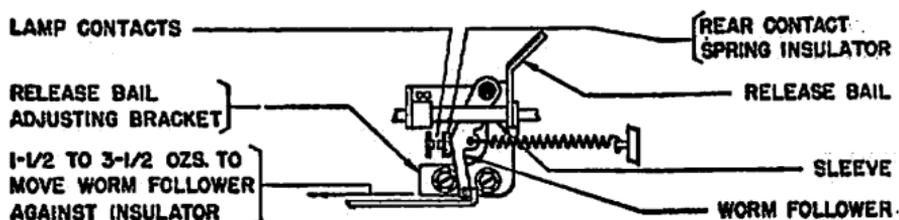


Fig. 49

(g) Release bail spring tension shall be min. 7 ozs., max. 11 ozs. measured by pulling vertically upward at the edge of the release bail near the spring hole as the bail starts to move from its unoperated position. See Fig. 50.

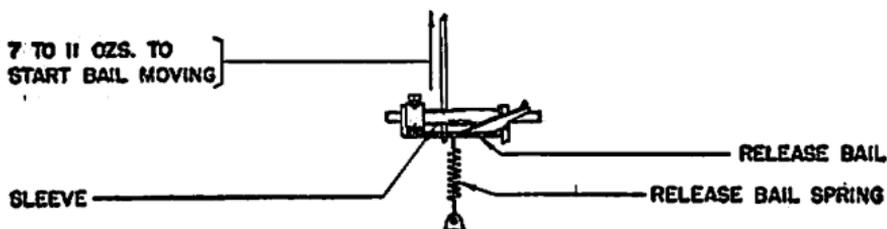


Fig. 50

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(h) Feed pawl spring tension shall be min. 3 ozs., max. 5-1/2 ozs. measured as the pawl starts to move when pulling in line with the spring at the end of the feed pawl with the feed lever roller on the high part of its cam. See Fig. 51.



Fig. 51

(i) Cam lever spring tension shall be min. 28 ozs., max. 38 ozs. measured on the cam lever near the spring hole as the lever starts to move when the cam lever roller is on the low part of its cam. See Fig. 52.

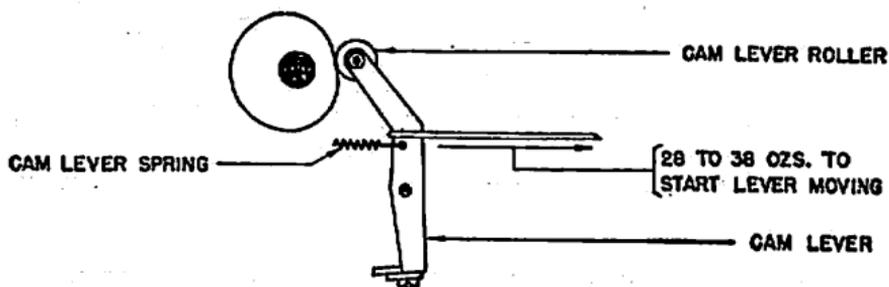


Fig. 52

4.91 Tape Feed-Out Magnet:

(a) Tape feed-out magnet yoke shall be in line with the magnet bracket and the clearance between the magnet coil terminals and the magnet yoke shall be equal on both sides.

(1) Align by means of the magnet mounting screw. Recheck after tightening the screw.

(b) Armature face shall be flush against magnet core and yoke and in line with them when the tape feed-out lever is fully operated.

(1) Adjust by means of the armature mounting screws.

(c) Spring bracket base shall be parallel to the axis of the magnet coil.

(1) Align by means of the mounting screws.

(d) Armature spring shall require min. 3/4 oz., max. 1-1/4 ozs. to stretch the spring to position length as measured with the scale held horizontally.

4.92 Remote Signal Bell Contacts:

(a) Contact lever shall fully engage the heel of the "bell" pullbar and clear its side by min. .010" when the "bell" pullbar is selected and the main bail is in its highest position. Gauge by eye.

(1) To adjust, reposition contact bracket.

(b) Contact lever shall clear the insulator on the upper contact spring by max. .006" when the contact lever is held against the bell pullbar and the main bail is in its lowest position.

(1) To adjust, bend upper contact spring.

(c) Contact gap shall be min. .025", max. .030" when the contact lever is held clear of the upper contact spring.

(1) To adjust, bend stiffeners.

(d) Lower contact spring pressure against its stiffener shall be min. 1-1/2 ozs., max. 2 ozs. measured at the end of the lower contact spring.

(1) To adjust, bend contact spring.

Note: If contact gap or spring tension requirements are in question remove contact assembly from unit to check and readjust.

***4.93 Clutch Throwout Lever Contact Mechanism:**

(a) Short contact springs shall have min. 1/2 oz., max. 2 ozs., pressure against their stiffeners measured as in Fig. 53.

(1) To adjust, bend short contact springs.

Note: It may be more convenient to remove bracket and spring assembly from unit to make this and the following adjustment.

(b) Contact gap shall be min. .015", max. .020", measured as in Fig. 53.

(1) To adjust, bend long contact springs.

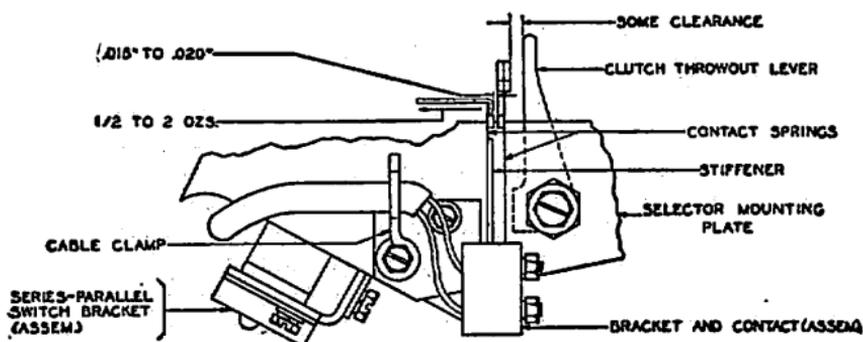


Fig. 53

(c) Contact pressure of min. 1/2 oz. measured at the end of the short contact springs shall be obtained with clutch throwout lever on the high part of its cam; and the clutch throwout lever shall clear the insulator on the long contact spring as shown in Fig. 53, when the main shaft is in the stop position.

(1) To adjust, reposition contact bracket but if latter requirement cannot be met it may be necessary to readjust contact springs and stiffeners.

*4.94 Platen Shift Contacts:

(a) Contact operating arm shall engage the bakelite tip on the long spring approximately in its center.

(1) To adjust, reposition contact bracket.

Note: Following contact adjustments can be checked and corrected only by removing the contact and bracket assembly. This should be done only when contacts are obviously out of adjustment.

(b) "Letters Make" type platen contact upper (long) spring shall be straight, approximately parallel to the insulator cover and the spun projections of its contact points shall clear the cover by max. .010".

(1) To adjust, bend spring.

(c) "Letters Make" type platen contact lower (short) springs shall be straight, rest against their stiffeners throughout the length of the stiffeners.

(1) To adjust, bend spring.

(d) "Letters Make" type platen contact gap shall be min. .015", max. .020".

(1) To adjust, bend lower spring stiffeners and check to see that both contact make and break approximately simultaneously when upper contact spring is operated and released.

(e) "Letters Make" type platen contact pressure shall be min. 1 oz., max. 2 ozs.

(1) To measure, insert a .040" wire gauge between dust shield and press it toward the mounting screws until the lower contacts clear their stiffeners by min. .004", max. .010", then pull downward with scale hooked on lower contact springs at contact points.

(2) To adjust, bend lower springs.

(f) "Figures Make" type platen contact upper (short) springs shall be straight and rest against their stiffeners throughout the length of the stiffeners when lower contact spring is held off.

(1) To adjust, bend springs.

(g) "Figures Make" type platen contact upper (short) springs shall clear the insulator cover by min. .010", max. .020" when lower contact spring is held off.

(1) To adjust, bend stiffeners and check to see that both pairs of contacts break and make approximately simultaneously when lower contact spring is operated and released.

(h) "Figures Make" type platen contacts shall open when a downward pull of min. 1 oz., max. 3 ozs. is applied on the lower contact spring at the contacts.

(1) To adjust, bend lower spring.

4.95 Pullbar Contacts

(a) Toes of all pullbar hooks shall be as close as possible to .442" above and .620" in front of the mounting plate when the pullbars are resting against the code bars.

(1) Check two end and one middle pullbar using 99391M gauge as in Figs. 54 and 55.

(2) To adjust, add or remove shims between switching contact plate and mounting posts for first requirement and utilize clearance in mounting holes in plate and brackets to meet second requirement.

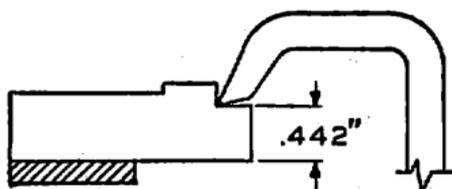


Fig. 54

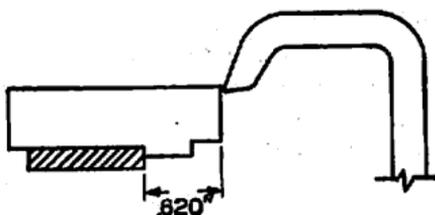


Fig. 55

(b) Pullbar guard shall clear all pullbars by min. .015" when associated typebars are held against the platen with the main bail in its lowest position; and it shall prevent the manual disengagement of all pullbars from their guide slots when typebars are resting against the backstop.

(1) Check end pullbars first and, if necessary, add or remove washers from between guard and backstop.

(If washers which are .028" thick do not give close enough results replace one washer with required num-

ber of 8896M shims, .004" thick.) After requirements are met on end pullbars, position guard by means of its mounting slots to obtain requirements on center pullbars.

(c) Pullbar contact assemblies shall be centrally located with respect to the pullbars; and the toes of contact hooks of all selected pullbars, except those which are not opposite the pullbar stripper, shall clear the sloping surfaces of the contact spring insulators by min. .004", max. .015", as in Fig. 56 when play is taken up by pressing lightly on the pullbars to make this clearance a minimum. Under the same conditions the clearance in the case of the pullbars which are out of range of the stripper shall be min. .035", max. .050".

(1) To adjust, shift contact assemblies. If requirements cannot be met in this manner recheck switching contact plate adjustments covered in (a).

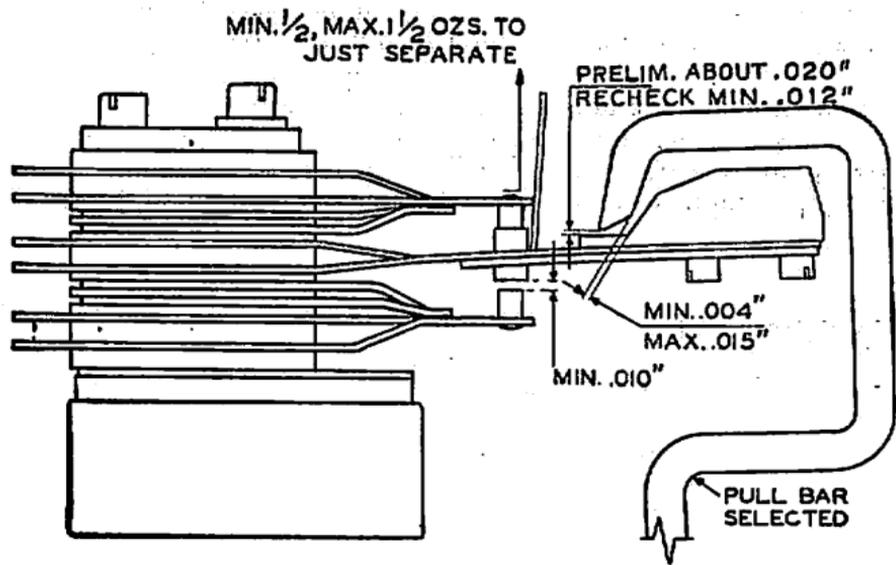


Fig. 56

(d) Upper contact gap shall be min. .015", max. .025" as in Fig. 57 when associated pullbar is not selected and resting on the No. 1 code bar.

(1) To set up condition select pullbar in question and rotate main shaft until pullbar falls into code bar slots, then hold pullbar and code bar locking lever out of the way and shift No. 1 code bar. Make sure upper contact spring has some pressure against its stiffener.

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- (2) To adjust, bend the upper contact stiffener with a 98055M tool.

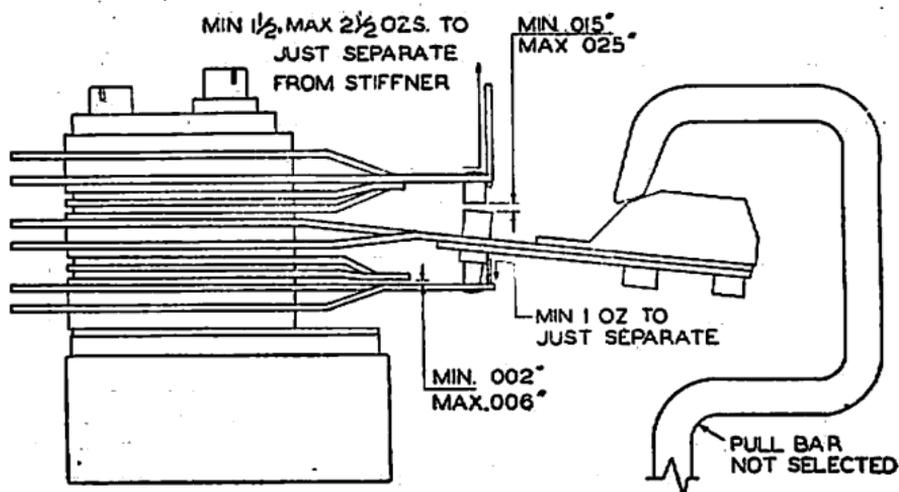


Fig. 57

(e) Upper contact spring shall require min. 1-1/2 ozs., max. 2-1/2 ozs. to start it moving away from its stiffener measured as in Fig. 57 with upper contact open.

(1) To adjust, bend upper contact spring with a 98055M tool.

(f) Middle contact spring contact shall bear on upper contact spring contact by min. 1/2 oz., max. 1-1/2 ozs., and the flat surface of its insulator shall clear the pullbar hook tip, preliminary adjustment—about .020", recheck adjustment—min. .012", when the associated pullbar is fully selected. See Fig. 56.

(1) To adjust, bend middle contact spring with 98055M tool, bend near pileup insulators to increase or decrease contact pressure and bend near contact to meet latter requirement. Then recheck 4.95 (d) and (e).

(g) Lower contact spring shall clear the stiffener by min. .002", max. .006" when associated pullbar is not selected and rests on the No. 1 code bar as shown in Fig. 57 and described in 4.95 (d) (1) and lower contact gap shall be min. .010" when pullbar is fully selected as in Fig. 56.

(1) To adjust, bend lower contact stiffener with 98055M tool.

(h) Lower contact spring contact shall bear on middle contact spring contact by min. 1 oz., measured as in Fig.

57 with associated pullbar not selected and resting on the No. 1 code bar as described in 4.95 (d) (1).

- (1) To adjust, bend lower contact spring with 98055M tool.

Note: Bending the contact spring and stiffeners originates stresses which tend to cause changes in adjustments. To stabilize adjustment, operate each contact at least 20 times. To do this, operate the contacts under power or lift the pullbars manually and allow them to fall to their normal position. Recheck 4.95 (d) to (h) and make refinements where necessary.

4.96 Old Style "Make" Universal Contact Mechanism: (Contact springs are mounted horizontally and have application only on units having old style square bail guide post.)

- (a) Contact operating lever shall clear the fully selected "Q" pullbar by min. .020", max. .060" when the lever is held in contact with the bail by its spring and the play in the lever is taken up in a direction to make this clearance a minimum. The contact operating lever shall also clear the extension on the casting that mounts the old style square bail guide post by min. .020" when the main bail is in its lowest position and play in the lever taken up to make this clearance a minimum.

- (1) To adjust, reposition contact lever bracket.

- (b) Upper contact springs shall be straight and make contact with their stiffeners throughout their entire length.

- (1) To adjust; bend springs and, if necessary, their stiffeners, then check to see both pairs of contacts close and open approximately simultaneously when lever contact spring is operated and released.

- (c) Contact gap shall be min. .015", max. .020" when main bail is in its lowest position.

- (1) To adjust, bend lower contact spring.

- (d) Contact operating lever shall allow the contacts to just make when lever is in contact with the bail and main shaft rotated until the bail rises to within min. .020", max. .080", of the notches of all the pullbars.

- (1) To adjust, reposition contact operating lever pivot screw.

- (e) Contact pressure shall be min. 1-1/2 ozs., max. 2-1/2 ozs., measured with the push end of a scale that is held as nearly vertical as possible and applied on the

bakelite end of the lower contact spring when main bail is in its highest position.

***4.97 New Style "Make" Universal Contact Mechanism:**
(Contact springs are mounted vertically.)

(a) Contact operating lever extension shall be approximately midway between the No. 1 and No. 2 pullbars when bail is at its highest and lowest positions.

(1) To adjust, reposition contact assembly bracket.

(b) Short contact springs shall be straight and make contact with their stiffeners throughout their entire length.

(1) To adjust; bend springs and, if necessary, their stiffeners, then check to see that both pairs of contacts close and open approximately simultaneously when long contact spring is operated and released.

(c) Contact gap shall be min. .015", max. .020", when main bail is in its lowest position.

(1) To adjust, bend long contact spring.

(d) Contact operating lever shall clear the top of the insulator on the end of the long contact spring by min. .025", max. .035", when a pullbar having pullbar contact is selected and main shaft is rotated until the associated top pullbar contacts just close. If unit has no pullbar contacts the operating lever shall clear the insulator by approximately 1/8" when main bail is in its lowest position.

(1) To adjust, reposition operating lever mounting block keeping its top surface horizontal.

(e) Contact operating lever spring shall require min. 4 ozs., max. 6 ozs., to pull it to position length when unhooked from the lever and the lever held against the long contact spring insulator.

***4.98 "Transfer" Universal Contact Mechanism:**

(a) Contact operating lever extension shall be approximately midway between the No. 1 and No. 2 pullbars when bail is at its highest and lowest positions.

(1) To adjust, reposition contact assembly bracket.

(b) Outer contact spring stiffeners shall be parallel to side of the mounting bracket. ("Outer" means farthest from mounting bracket.)

(1) To adjust, bend outer spring stiffeners and check to see that both pairs of contacts break and make approximately simultaneously when middle contact spring is operated and released.

(c) Outer contact springs shall require min. 1/2 oz., max. 1 oz. applied at their ends to move them away from

their stiffeners when middle contact spring is held off.

(1) To adjust, bend outer springs.

(d) Middle contact springs shall be so tensioned that outer contact springs clear their stiffeners by max. .006" when operating lever is held away from middle contact spring.

(1) To adjust, bend middle contact spring.

(e) Contact gap between middle and inner spring contacts shall be min. .015", max. .020", when middle contacts are making with outer contacts.

(1) To adjust, bend inner spring stiffeners and check to see that both pairs of contacts make and break approximately simultaneously when middle contact spring is operated and released.

(f) Inner contact springs shall require min. 1/2 oz., max. 1 oz., applied at their ends to move them away from their stiffeners.

(1) To adjust, bend inner springs.

(g) Contact operating lever shall clear the top of the insulator on the end of the middle contact spring by min. .025", max. .035" when a pullbar having pullbar contacts is selected and main shaft is rotated until the associated top pullbar contacts just close. If unit has no pullbar contacts the operating lever shall clear the insulator by approximately 1/8" when main bail is in its lowest position.

(1) To adjust, reposition operating lever mounting block keeping its top surface horizontal.

(h) Contact operating lever spring shall require min. 4 ozs., max. 6 ozs., to pull it to position length when unhooked from the lever and the lever held against the middle contact spring insulator.

4.99 Main Bail Cam Friction Clutch Torque: After motor has been run for at least 10 minutes a pull of 24 ozs. applied to main bail cam as in Fig. 58 shall move cam in a direction opposite normal rotation when motor is running, selector magnet is operated and main bail roller is held away from its cam. A pull of 18 ozs. applied under the same conditions shall not move cam.

Note: This measurement requires considerable care, and need be checked only when it is thought that cam is not being brought up to speed as the clutch engages.

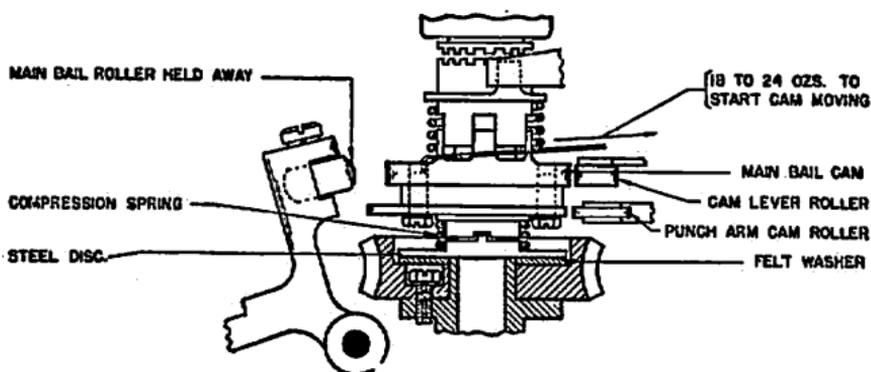


Fig. 58

(a) To check, remove tape reel and gear guard, hold main bail roller away from cam by pressing upon lid of oil cup at top of the main bail plunger, block magnet armature in its operated position so that main clutch will not engage, hook scale into screw hole as in Fig. 57 and pull in the direction reverse to normal rotation until cam just starts to move.

Notes:

- *1. On older units 82440M screws may fill hole in main bail cam; in these cases replace screws with 74986M screws.
2. Pulling too far will tend to make main clutch engage and give a greater reading, therefore only a slight backward motion of cam should be given.

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

- (b) To adjust, replace compression spring and/or felt washer of clutch.

Note: If torque is too high, lubricate clutch and recheck before replacing parts.

4.100 Selector Clutch Torque: After motor has been run for at least 10 minutes and clutch has been freshly lubricated a pull of 18 ozs. applied as in Fig. 59 when motor is running shall hold selector cam sleeve from rotating when selector arm is held just clear of its stop. A pull of 14 ozs. similarly applied shall not hold sleeve from rotating.

- (a) To adjust, recondition or replace felt friction washers, add spring adjusting washers, or replace spring as follows:

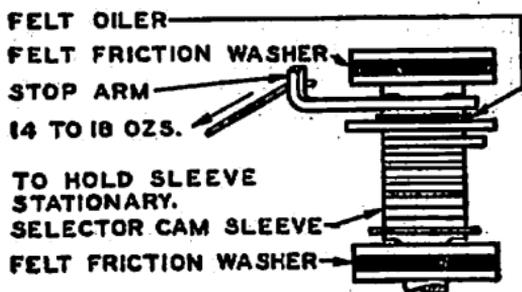


Fig. 59

Note: Reconditioning of washers by removing them and kneading with the fingers to soften them, or their replacement by new washers will usually be satisfactory in most cases since the spring holds its adjustment over long periods. Before replacing spring, consideration should be given to the addition of shims 96763M, 96764M or 96765M around the shoulder of the 72515M nut at the end of the spring nearest the bearing.

(1) To recondition felt washers: remove range finder assembly, detach locking lever spring and remove retaining disc, noting that it has a left-hand thread and unscrews to the right (clockwise); remove outer felt washer, cam sleeve assembly cam sleeve disc, and inner felt washer, holding selector levers away from shaft and rotating cam sleeve disc until notch in its edge registers with points of selector levers; knead felt washers with fingers and saturate with oil as specified in Section P35.604. Avoid getting dirt or metal chips in washer and bearing surfaces.

(2) To remove clutch spring or add adjusting washers, proceed as in (1), then remove top and bottom bearing brackets, main shaft, clutch driving disc and spring.

4.101 Type bars and pullbars shall be free of bind.

(a) To adjust, so bend type bars individually that they do not exert appreciable pressure on sides of slots. Check to see that foreign material is not impeding movement and if bind cannot be relieved in this manner, replace type bar as follows: Remove ribbon and ribbon guide; remove the platen guide shaft from platen block; push the platen block to the rear and rotate it clockwise out of path of type bars; move type bar forward and downward as far as it will go and lift its pivoted end from type bar segment; in case it cannot be readily disengaged or if it is located at extreme left-hand end, back off left type bar bearing rod retaining screw, not to exceed one full turn, to facilitate disengagement; hook replacement bar over bearing rod, lapping it with 87698M carborundum stone if necessary to relieve bind in segment slots; mesh type bar and pullbar teeth so that type bar rests against its back stop and top of pullbar is in line with tops of other pullbars and reassemble.

***4.102 Alignment of Type:** Characters shall be inked evenly and not be noticeably out of line or misspaced with respect to the character "N". Type bars shall lie evenly spaced against the backstop when unit is not printing.

(a) To check, type a series of characters between the letter "N" as "NANBNCN", etc. In case of doubt about any character, type character at least six times between two letter "N"s.

Note: On some early units it may be found that characters do not space reliably on a repeated test. This condition can be corrected completely only by extensive modifications to provide the following features which are standard on later units.

- (1) Main bail roller guides.
- (2) Latest main bail and punch cams, 101435M and 95460M, respectively.
- (3) Resilient backstop brackets, 103341M.

(b) To adjust, proceed as described in the following in cases where only a few type require adjustment. However, if many type appear to require adjustment it is well to first check the possibility of readjusting "N" to minimize the readjustment effort on other type.

(1) To correct spacing bend type bar in its straight shank in the direction required and then straighten character as described in (2). The type bar may be bent using two pliers, one to hold type bar near the type bar segment and the other to apply the bending force; or by using the 78589M three-prong pliers with the single prong on the side toward which the bend is to be made.

(2) To straighten type so that sides of character will be vertical and upper case character will be spaced the same as the lower case character bend top of type bar at its junction with the straight shank. This can be done by holding type bar shank at point of bend with one pliers while applying bending force on top of type bar with another pliers. 78590M parallel pliers are recommended for holding shank and short nose pliers for applying bending force.

(3) To bring type into horizontal alignment shift type pallet. To do this pull type bar forward and place a block behind it to hold it forward from other type bars. Heat type pallet with an electric soldering copper until solder is melted and then reposition pallet as required. After solder is thoroughly reset remove block and recheck alignment.

(4) To correct uneven inking of characters twist type bar, peen type pallet, or unsolder and tip pallet as required. If one side of type prints light or fails to print, twist type bar proceeding as described in (2) except applying a twisting force instead of bending

force. Special pliers may be used to cut or peen type just back of face position that is printing light; these are the 78587M two-side cutting pliers and 78588M one-side cutting pliers. If inking discrepancy is at top or bottom of character, pallet may be unsoldered as described in (3) and tipped into required position.

Note: If type pallets have been unsoldered in the alignment procedure they should be held down on top of a piece of cardboard placed over the ribbon guide and their slots refilled with solder. Brush off any excess solder.

*4.103 **Platens** which are worn should be replaced. In the case of the newer two-piece platen it is probable that only the plastic insert will need replacement and in some cases the insert may be turned over to obtain additional life.

4.104 **Ribbons** which are worn or defective shall be replaced with new ribbons (Bell System #6141 ribbon Black Record Heavy, is recommended).

4.105 **Orientation Range and Distortion Tolerances:** Typing units shall be capable of meeting the teletypewriter station orientation range and distortion tolerance requirements given in P30.002 or P30.003.

5. REQUIREMENTS AND PROCEDURES FOR TYPING REPERFORATOR BASES

5.01 **Base unit** shall conform to Section P35.620 except as regards tape-out lever and its spring which shall conform to the following:

(a) Tape-out lever shall clear the tape reel wooden filler piece by min. $7/32''$, max. $9/32''$, when the locking pawl is touching the front face of the bell hammer extension and the play of the bell hammer is taken up in a direction away from the bell.

(1) To adjust, reposition adjusting clamp making sure that the locking pawl bushing has no appreciable end play between the shoulder on the shaft and the adjusting clamp after clamping screw is tightened.

(b) Tape-out lever spring shall have a tension of min. 3 ozs., max. $4-1/4$ ozs., measured at right angle to the front edge of the locking pawl at the pawl spring hole with the locking pawl spring removed and the bell operating post rotated out of the way when the locking pawl just butts against the bell hammer extension. See Fig. 11 Section P35.620 for location of parts.