KS-13834 L1 PERFORATOR

(TROUBLE RECORDER)

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the KS-13834 L1 perforator (Fig. 1 and 2) used for recording troubles in

- 4A and 4M toll central offices
- No. 5 crossbar central offices equipped with master test frame (MTF) and not arranged for wideband
- Crossbar tandem, step-by-step, and No. 1 crossbar central offices when arranged for automatic message accounting (AMA).

1.02 This section is reissued for the following reasons:

(a) To delete reference to (6) from 3.02 under ECCENTRIC SHAFTS in Table A

(b) To update the List of Tools, Gauges, Materials, and Test Apparatus

(c) To make minor changes as required.

This reissue does not affect the Equipment Test List.

1.03 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein.

Definitions

1.04 ***Asterisk (*):*** Requirements are marked with an asterisk when to check for them would necessitate dismantling or dismounting of apparatus or affect the adjustment involved or other adjustments. Except where otherwise instructed, no check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

1.05 ***Home position of the perforator*** is the position at completion of an operating cycle. In the home position, the backward stop pawl fully engages the notch in the brake cam and the index lines of the card feed mechanism are aligned within 1/32 inch.

Caution: When manually advancing the perforator to the home position using the manual control handle, make certain that the position defined above is reached and that the forward stop cam does not prevent the latch armature from operating. Check and make sure that the LCH armature is free to operate the forward stop roller.

1.06 ***Neutral position*** of the clutch drive control shaft is the shaft position under control of the centering plungers when neither the INT or CONT solenoids are energized.

1.07 ***A pair of contacts*** as referred to in this section consists of a single contact on one contact spring and the corresponding contact on the opposing contact spring.

1.08 The term ***make contact*** or ***break contact*** applies to the electrical circuit between two springs. Contact make, associated with bifurcated contacts (parallel contacts), may involve the closure of only one pair of the two parallel pairs of contacts. Contact break, associated with bifurcated contacts, involves the opening of both parallel pairs of contacts.

1.09 ***Use of 510C Test Lamp:*** The 510C test lamp equipped with a 561A straight tip or

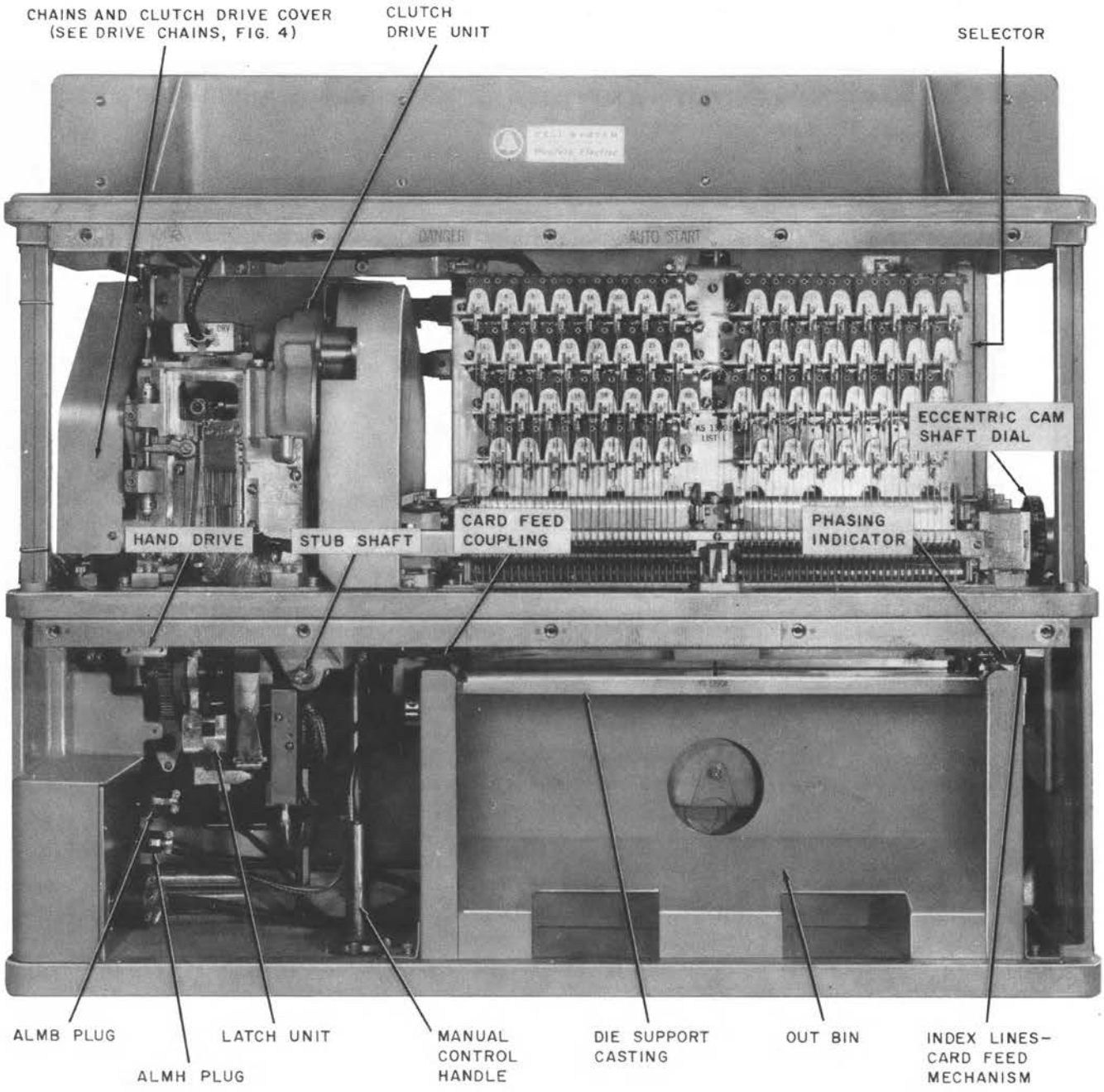


Fig. 1—KS-13834 L1 Perforator—Front View

562B curved tip may be used to facilitate adjustment and gauging operations.

1.10 ***The P-220366 dental mirror*** and ***R-2965 adjustable mirror*** may be used to facilitate viewing the perforator parts in connection with visual inspections.

1.11 ***Make-Busy Information:*** Before making any check or adjustment, make busy the

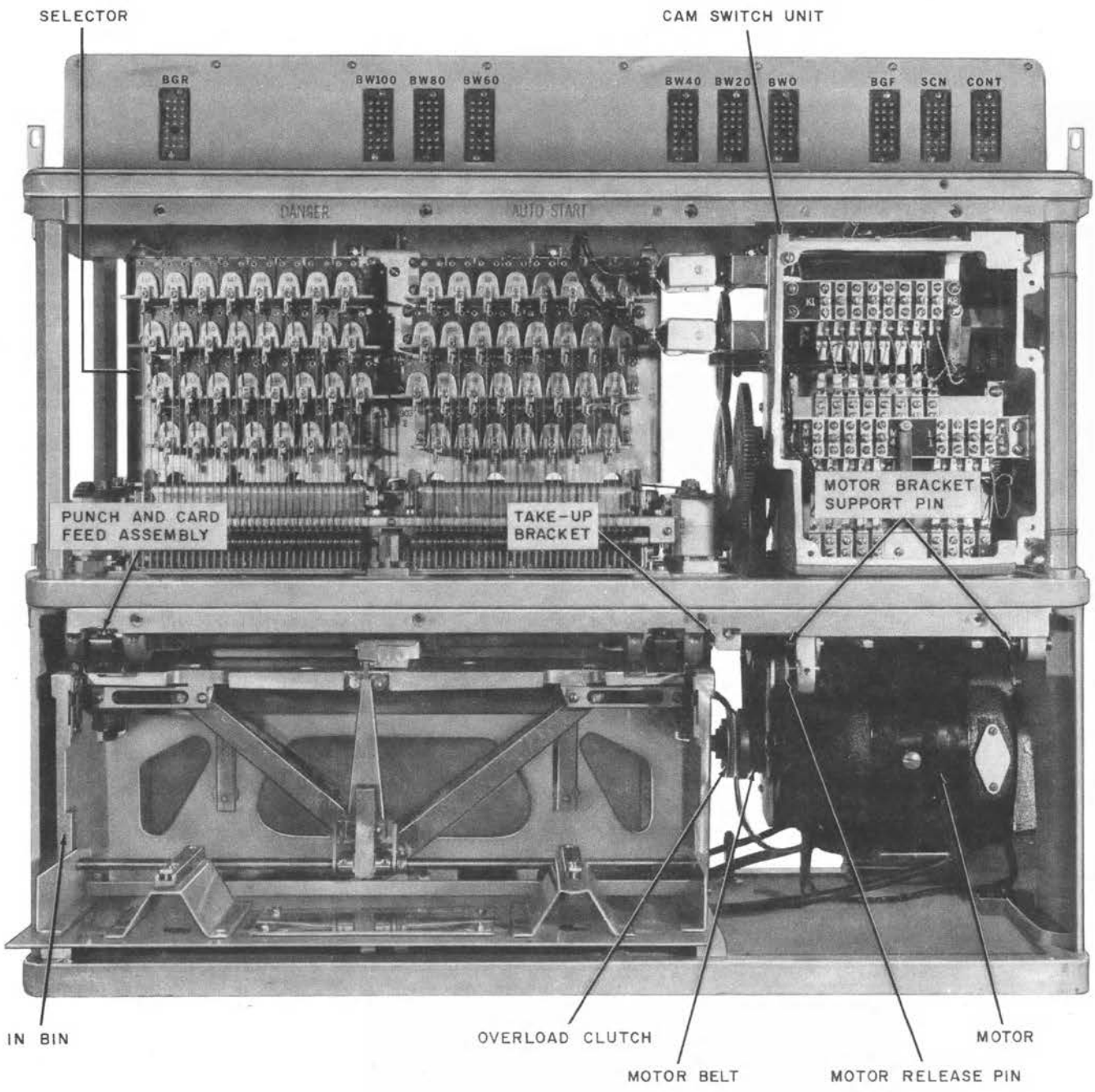


Fig. 2—KS-13834 L1 Perforator—Rear View

associated trouble recorder circuit by inserting a 322A (make-busy) plug into the TRMB jack on the trouble recorder panel of the associated test facility. Also, restore to normal all keys associated with the trouble recorder control and the trouble recorder test circuits on the associated test facility. When checking or adjusting for any requirement except requirements 2.08 and 2.69, remove the MP and CONT connectors in the order named.

1.12 ***One drop of KS-7470 oil*** for the purpose of this section is the amount of oil discharged from the nozzle of the 486A oilcan when the sides

of the can are depressed once and held depressed until the drop is released from the nozzle.

1.13 ***A film of KS-7470 oil*** for the purpose of this section is the amount of oil deposited on the surface of a part after being brushed with a clean KS-14164 brush which has been dipped into the oil to a depth of 3/8 inch and scraped lightly against the side of the container as the brush is removed.

Precautions

1.14 To avoid damaging the throats and other parts of the in-bin mechanism, do not release the in-bin platform from the depressed position unless there is at least one-half pack of cards on the platform and restrain the latching mechanism by using the hands to prevent sudden upward release of the platform except when checking requirement 2.62 in accordance with the specified method of check.

1.15 Because of the high gear reduction employed in the perforator, exercise care when using the motor belt to operate the perforator by hand. No attempt should be made to overcome any bind that may develop because serious damage may result. The cause of the bind should be investigated and corrected before proceeding further.

1.16 Remove the MP and CONT plugs before checking the mechanical and electrical requirements, and reconnect before checking eccentric shaft speed or making operation tests.

1.17 The cards used in the perforator should be stored and handled in accordance with Section 034-305-811.

1.18 ***Index:*** The following index lists the requirements covered in Part 2 of this section. Part 3 is not covered in the index as these items are the adjusting procedures corresponding to the individual requirements of Part 2.

INDEX

GENERAL INFORMATION

2. REQUIREMENTS

General

2.01 ***Cleaning***

(a) ***Spring assembly contacts and contacts of the cam switch unit*** shall be cleaned when necessary in accordance with the appropriate section in Division 069. After cleaning any bifurcated contacts, a check shall be made to see that both contacts close as specified in 2.30(b) and 2.43(b).

(b) The armature and core of selector magnets shall be cleaned when necessary.

(c) ***The card hook shoes and the openings of the card channel*** shall be free of excessive lint accumulations and shall be cleaned when necessary.

(d) ***The chaff bin*** shall be emptied whenever half full.

Note: The level of the chaff bin may be observed through the center hole in the empty out bin.

(e) ***Other parts*** shall be cleaned when necessary in accordance with approved procedures.

2.02 ***Lubrication:*** Trouble recorder parts shall be lubricated in accordance with Table A and Fig. 3 through 8. Recommended lubrication intervals are as follows.

(a) ***Before Turnover:*** Lubricate before perforator is placed in service and at 3-month intervals up to time of turnover except for parts marked with an asterisk(*).

(b) ***After Turnover:*** Lubricate parts not marked with an asterisk(*) every 3 months, and parts marked with an asterisk(*) annually. These intervals may be extended if periodic inspections have indicated local conditions are such as to ensure that requirements will be met during the extended interval.

Caution: Exercise care when lubricating the perforator, and do not allow lubricant on the cork surface of the cone clutch of the clutch drive assembly, selector armatures, throats, or throat mounting plates.

2.03 ***Record of Lubrication:*** During perforator installation, a lubrication record shall be maintained. The records showing the dates of lubrication or lubrication status shall be turned over to the operating company at the time the perforator is turned over.

Overall

2.04 ***Engagement of Card Feed Coupling***

(a) The backlash between the members of the card feed coupling shall be

Max 1/64 inch

measured at the periphery of the members. Gauge by eye.

(b) With the endplay of the shafts which are connected by the coupling taken up toward the coupling, the endplay remaining in the coupling shall be

Max 1/32 inch

Gauge by eye and feel.

2.05 ***Chain Tension***

(a) ***Clutch Drive to Cam Switch Chain:*** The tension of the idler sprocket spring of the clutch drive (Fig. 1) to cam switch chain shall be

Min 1450 grams
Max 2150 grams

Use the 79F gauge. To check the requirement, proceed as follows.

(1) Insert the KS-14322 torque rod into the socket provided on the idler sprocket.

(2) Grasp the extended end of the torque rod, and apply a slight downward pressure to take up any play in the idler sprocket.

(3) Mark a line on the corner post of the perforator 5 inches from the socket and

TABLE A

LUBRICATION

LUBRICATION POINTS	INSTRUCTIONS	FIG. REFERENCE	NOTE(S)
SWITCH			
GEARS (inside housing)	A film of KS-7470 oil distributed evenly over the teeth of each gear. (3 gears)	A, Fig. 3	1
CAM	A film of KS-7470 oil distributed evenly over each cam surface. (17 cams)	B, Fig. 3	1
GEARS AND SPROCKET (outside housing — refer to Fig. 10)	A film of ARAPEN lubrication No. 295 over the gear teeth.	C, Fig. 3	
MOTOR BELT IDLER PULLEY	One drop of KS-7470 oil on each side of the pulley.	D, Fig. 3	
MOTOR TENSION SPRING (large helical spring not shown)	A film of KS-7471 grease on the loop of each spring end.	E, Fig. 3	2
MOTOR RELEASE PIN	A film of KS-7471 grease on the accessible surface of the pin.	F, Fig. 3	2 and 3
MOTOR BRACKET SUPPORT PIN	One drop of KS-7470 oil on both ends of each pin. (2 pins)	G, Fig. 3	
OVERLOAD CLUTCH			
	A film of KS-7470 oil on the inner flange surfaces.	H, Fig. 3	
COIL SPRING	A film of KS-7470 oil on the coil spring.	I, Fig. 3	
FLAT SPRING	Six drops of KS-7470 oil evenly spaced around each side of the flat spring between the flat spring and inner flange surfaces.	J, Fig. 3	
CLUTCH ROLLER (not shown)	A film of KS-19139 lubricant on surface of rollers.	K, Fig. 3	
HAND DRIVE			
HAND DRIVE GEARS	A film of ARAPEN lubricant No. 295 distributed evenly over the surface of each gear. (3 gears)	A, Fig. 4	
KEY PLATE	One drop of KS-7470 oil on each side.	B, Fig. 4	

TABLE A

LUBRICATION (Cont)

LUBRICATION POINTS	INSTRUCTIONS	FIG. REFERENCE	NOTE(S)
PUNCH AND CARD FEED			
CARD FEED CHAIN	A film of KS-7470 oil on the pins and all rubbing surfaces.	C, Fig. 4	
PUNCH RETRACTOR ROLLER BEARING	One drop of KS-7470 oil on both sides of each roller. (8 rollers)	D*, Fig. 4	
PUNCH RETRACTOR BEARING	One drop of KS-7470 oil on each bearing. (8 springs)	E*, Fig. 4	
PUNCH HEAD	One drop of KS-7470 oil on each punch domed head. (124 punches)	F*, Fig. 4	
PUNCH RETRACTOR LIFT SURFACE	One drop of KS-7470 oil on each lift surface. (124 lifts)	G*, Fig. 4	
PUNCH RETRACTOR SPRING	A film of KS-7470 oil over each visible spring coil. (8 springs)	H*, Fig. 4	
PUNCH SHANK	A film of KS-7470 oil on the visible portion of each punch shank. (124 punches)	I, Fig. 4	
PUNCH RETRACTILE SPRING	A film of KS-7470 oil over each visible spring coil. (124 springs)	J, Fig. 4	
DRIVE CHAINS AND ASSOCIATED PARTS			
CAM SWITCH IDLER SPROCKET BEARING	One drop of KS-7470 oil on each sprocket side.	K, Fig. 4	
IDLER SPROCKET SPRING	A film of KS-7471 grease on each loop where it engages the bracket. (2 loops)	L, Fig. 4	
DRIVE CHAINS AND SPROCKETS	A film of KS-7470 oil distributed evenly over chain and associated sprockets. (2 chains, 6 sprockets)	M, Fig. 4	
CLUTCH DRIVE IDLER SPROCKET BEARING	One drop of KS-7470 oil on each sprocket side. (6 sprockets)	N, Fig. 4	

TABLE A

LUBRICATION (Cont)

LUBRICATION POINTS	INSTRUCTIONS	FIG. REFERENCE	NOTE(S)
IN BIN AND OUT BIN			
CARD RETAINER PIVOT	One drop of KS-7470 oil between the rubbing surfaces.	A, Fig. 5	2
TILT LIMITER PLATE	A film of KS-7470 oil on the sliding surfaces of each plate. (4 plates)	B, Fig. 5	
ELEVATOR ARM ROLLER BEARING	One drop of KS-7470 oil on each side of each roller. (2 rollers)	C, Fig. 5	
DOOR LATCH PINS	One drop of KS-7470 oil on each pin. (4 pins)	D, Fig. 5	
ELEVATOR AND DOOR LATCH	One drop of KS-7470 oil on each rubbing surface.	E, Fig. 5	
ELEVATOR SPRING AND ADJUSTING SCREW	One drop of KS-7470 oil on spring contacting surface and one drop on screw beneath elevator arm.	F, Fig. 5	
SPRING SUPPORT ROLLER BEARING	One drop of KS-7470 oil on each side of each roller. (8 rollers)	G, Fig. 5	
ELEVATOR ARM BEARING	One drop of KS-7470 oil on each side of each arm. (2 arms)	H, Fig. 5	
CARD AND ELEVATOR GUIDE BAR SPRING	One drop of KS-7470 oil on contacting surface of spring and collar.	I, Fig. 5	
MICROSWITCH STUD AND ARM	One drop of KS-7470 oil on contacting surface.	J, Fig. 5	
CARD AND ELEVATOR GUIDE BAR BEARING	One drop of KS-7470 oil on each bearing. (2 bearings)	K, Fig. 5	
BALL AND CHECK ASSEMBLY	One drop of KS-7470 oil on each ball. (2 balls)	L, Fig. 5	
DOOR HINGE	A film of KS-7470 oil on the rubbing surface of each hinge. (2 hinges)	M, Fig. 5	
DOOR ROLLER	One drop of KS-7470 oil on each side of each roller. (2 rollers)	N, Fig. 5	

TABLE A

LUBRICATION (Cont)

LUBRICATION POINTS	INSTRUCTIONS	FIG. REFERENCE	NOTE(S)
LATCH SPRING	One drop of KS-7470 oil on the end of each spring. (2 springs)	O, Fig. 5	
ELEVATOR LATCH PIVOT PIN	One drop of KS-7470 oil on each pin. (2 pins)	P, Fig. 5	
SELECTOR, FRONT AND REAR			
UPPER LINK PINS	A film of KS-7470 oil on each upper link pin. (62 pins)	A, Fig. 6	
LOWER LINK PIN	A film of KS-7470 oil on each link pin. (64 or 62 pins)	B, Fig. 6	
SHUTTLE BAR	A film of KS-7470 oil on the top of the shuttle bar at each interposer. (62 interposers)	C, Fig. 6	
INTERPOSER	A film of KS-7470 oil on the top of each interposer at the outer and inner combs and where it engages the outer comb spring. (62 interposers)	D, Fig. 6	
LATCH STOP	A film of KS-7470 oil on the latch stop below each latch. (62 latches)	E, Fig. 6	
LATCH STOP SPRING	One drop of KS-7470 oil at the point of engagement with the latch stop. (8 springs)	F, Fig. 6	
LATCH SPRING LOOPS	A film of KS-7470 oil on the loops where they engage the latch and bracket. (62 loops)	G, Fig. 6	
BEARING STUD	A film of KS-7470 oil on the bearing stud between each interposer and the latch. (62 interposers)	H, Fig. 6	
LATCH STOP BEARING	One drop of KS-7470 oil on each bearing. (4 bearings)	I, Fig. 6	
CAM DRIVE			
CAM FOLLOWER ROLLER BEARING	One drop of KS-7470 oil on each bearing. (8 hearings)	J, Fig. 6	
CAM FOLLOWER YOKE	A film of KS-7470 oil distributed evenly over the sliding surfaces of each yoke. (4 yokes)	K, Fig. 6	

TABLE A

LUBRICATION (Cont)

LUBRICATION POINTS	INSTRUCTIONS	FIG. REFERENCE	NOTE(S)
SHUTTLE BAR CAM	A film of KS-7470 oil distributed evenly over the peripheral surface of each cam. (4 cams)	L, Fig. 6	
ECCENTRIC SHAFTS (Refer to 3.02.)	Without lubrication pads: A film of KS-7470 oil distributed evenly over the surface of each eccentric shaft. (4 shafts) With lubricator pads: Saturate each pad with KS-7470 oil. (2 pads)	M, Fig. 6	
CAM DRIVE GEAR	A film of ARAPEN lubricant No. 295 distributed evenly over the gear teeth. (3 gears)	N, Fig. 6	
LATCH ASSEMBLY			
BACKWARD STOP PAWL BEARING	One drop of KS-7470 oil on each side of pawl at bearing.	A, Fig. 7	
BACKWARD STOP PAWL SPRING	One drop of KS-7470 oil on shaft between convolutions of spring.	B, Fig. 7	
PAWL AND SPRING CONTACTING SURFACE	One drop of KS-7470 oil on contacting surfaces of spring and pawl.	C, Fig. 7	
LATCH SHAFT BEARINGS	One drop of KS-7470 oil on shafts of both bearings. (2 bearings)	D, Fig. 7	
FORWARD STOP ROLLER BEARING	One drop of KS-7470 oil on each side of the roller.	E, Fig. 7	
FORWARD STOP ROLLER TINES	One drop of KS-7470 oil on each tine. (2 tines)	F, Fig. 7	
FORWARD STOP ROLLER ARM BEARING	One drop of KS-7470 oil on each side of roller arms at bearing.	G, Fig. 7	
ARMATURE ROLLER BEARING	One drop of KS-7470 oil on each side of the roller.	H, Fig. 7	
ARMATURE BACKSTOP TINE	One drop of KS-7470 oil on each tine. (2 tines)	I, Fig. 7	
GEAR	A film of ARAPEN lubricant No. 295 distributed evenly over the gear teeth.	J, Fig. 7	

TABLE A

LUBRICATION (Cont)

LUBRICATION POINTS	INSTRUCTIONS	FIG. REFERENCE	NOTE(S)
FORWARD STOP CAM	A film of KS-7470 oil distributed evenly over the cam surface.	K, Fig. 7	
BRAKE CAM	A film of KS-7470 oil distributed evenly over the cam surface.	L, Fig. 7	
BRAKE ROLLER BEARING	One drop of KS-7470 oil on each side of the roller.	M, Fig. 7	
BRAKE ARM BEARING	One drop of KS-7470 oil on each side of the arm.	N, Fig. 7	
CLUTCH DRIVE ASSEMBLY			
GEARS INSIDE HOUSING	A film of KS-7470 oil on each gear inside the housing. (3 gears)	A, Fig. 8	4
INTERMITTENT CLUTCH JAWS	A film of KS-7470 oil on each jaw. (2 jaws)	B, Fig. 8	4
INTERMITTENT CLUTCH ACTUATING ROLLER STUD	One drop of KS-7470 oil on each stud at junction of roller and yoke. (2 studs)	C, Fig. 8	4
CONTINUOUS CLUTCH ACTUATING ROLLER STUD	One drop of KS-7470 oil on each stud at junction of roller and yoke. (2 studs)	C*, Fig. 8	5
INTERMITTENT CLUTCH ACTUATING ROLLER	Two drops of KS-7470 oil on each roller surface. (2 rollers)	D, Fig. 8	4
CONTINUOUS CLUTCH ACTUATING ROLLER	Two drops of KS-7470 oil on each roller surface. (2 rollers)	D*, Fig. 8	5
	A film of ARAPEN lubricant No. 295 distributed evenly over the teeth of each gear. (2 gears)	E, Fig. 8	
OILCUP	Fill with KS-7470 oil to 1/4 inch of cup top. Oil in the cup shall be visible at all times.	F, Fig. 8	
CLUTCH OILHOLES	Three drops of KS-7470 oil in both oilholes.	G, Fig. 8	6
CONTROL SHAFT FRONT BEARING	One drop of KS-7470 oil.	H, Fig. 8	7
CARD OPERATING STUD	One drop of KS-7470 oil.	I, Fig. 8	7

TABLE A

LUBRICATION (Cont)

LUBRICATION POINTS	INSTRUCTIONS	FIG. REFERENCE	NOTE(S)
CENTERING PLUNGER	One drop of KS-7470 oil on each plunger end. (2 plungers)	J, Fig. 8	
CENTERING PLUNGER BEARING	One drop of KS-7470 oil to both bearings.	K, Fig. 8	
ANTIOVERTHROW SPRING	A film of KS-7470 oil on the spring ends.	L, Fig. 8	
ANTIOVERTHROW PAWL BEARING	One drop of KS-7470 oil.	M, Fig. 8	
COCKING AND CHECKING STOPS	A film of KS-7470 oil on the abutting surfaces.	N, Fig. 8	
CONTROL SHAFT FORKED ARM	One drop of KS-7470 on each rubbing surface.	O, Fig. 8	
CONTROL SHAFT REAR BEARING	Three drops of KS-7470 oil in oilhole.	P*, Fig. 8	

* 2.02 (a)

Notes:

1. Remove cover using the 3-inch C screwdriver to gain access to parts.
2. These parts are not provided on later machines or assemblies.
3. Pull out motor release pin to lubricate left side of pin.
4. Remove housing top cover with R-2671 wrench to obtain access to lubrication points.
5. This illustration shows actuating rollers and studs for the intermittent clutch. Similar points are lubricated on the continuous clutch.
6. Depress ball bearings in oilhole with nozzle can before applying oil.
7. Remove cover by sliding upward to gain access to parts.
8. Use the R-2965 adjustable mirror to view lubrication points.

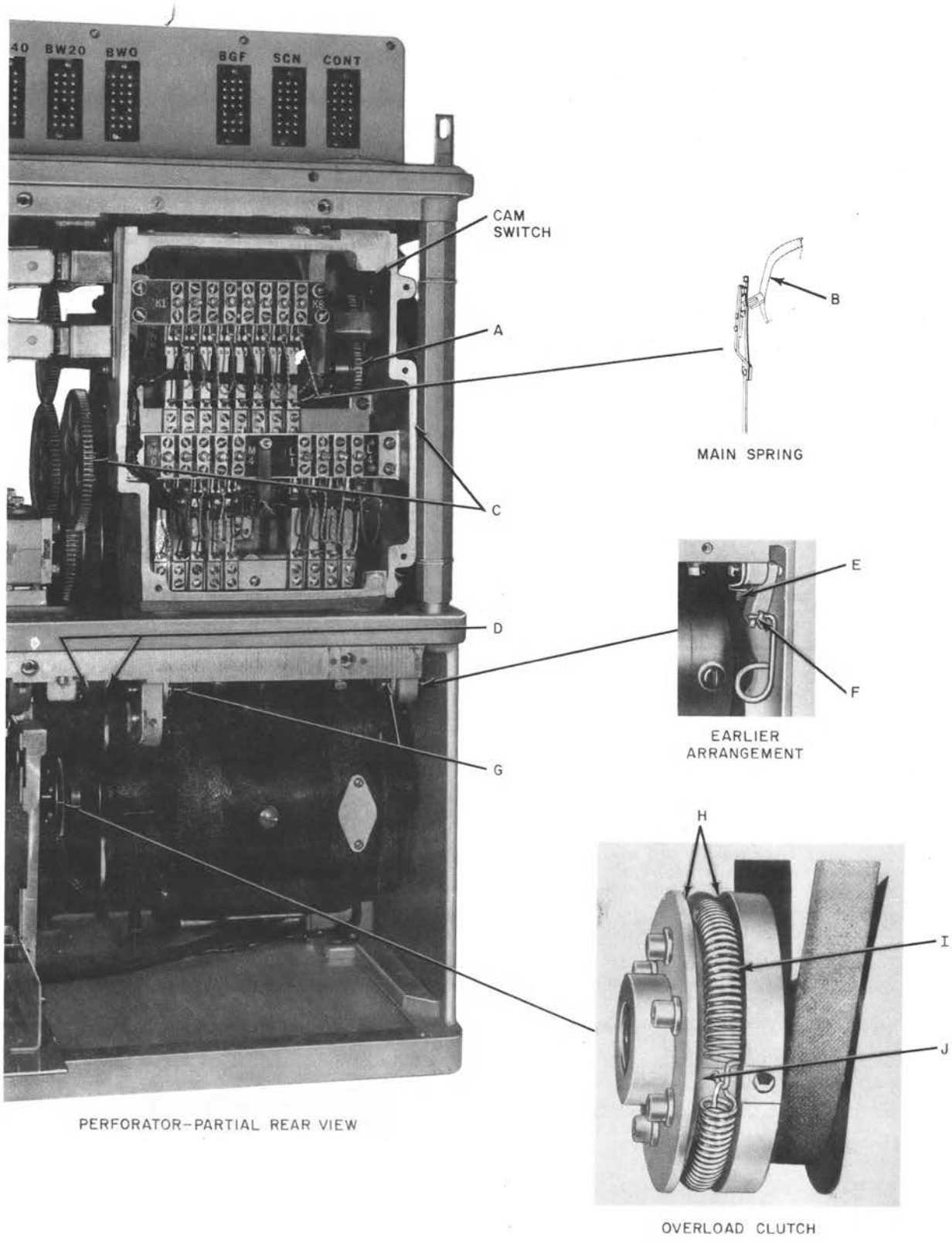
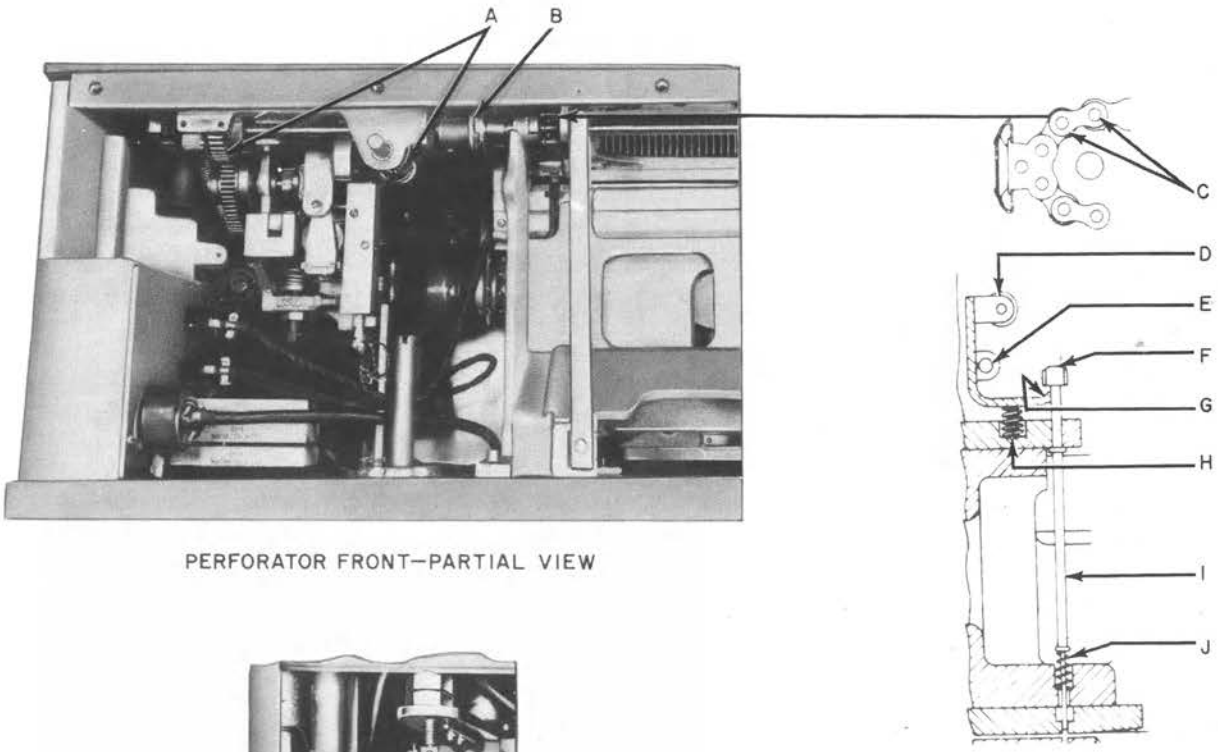


Fig. 3—Lubrication Points—Cam Switch, Motor Mounting, and Overload Clutch



PERFORATOR FRONT—PARTIAL VIEW

PUNCH

DRIVE CHAINS

Fig. 4—Lubrication Points—Hand Drive Punch and Card Feed, Drive Chains, and Associated Parts

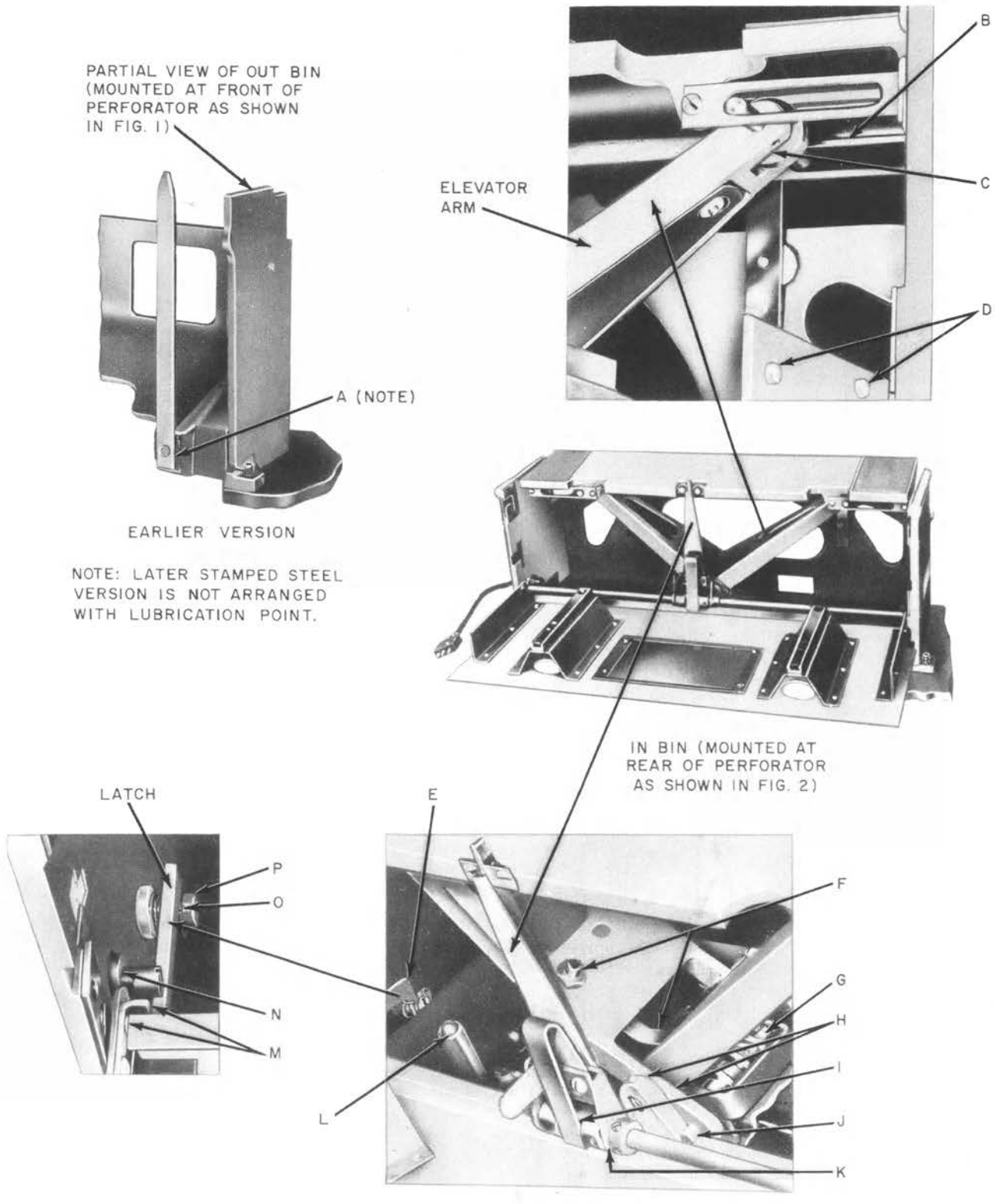


Fig. 5—Lubrication Points—In Bin and Out Bin

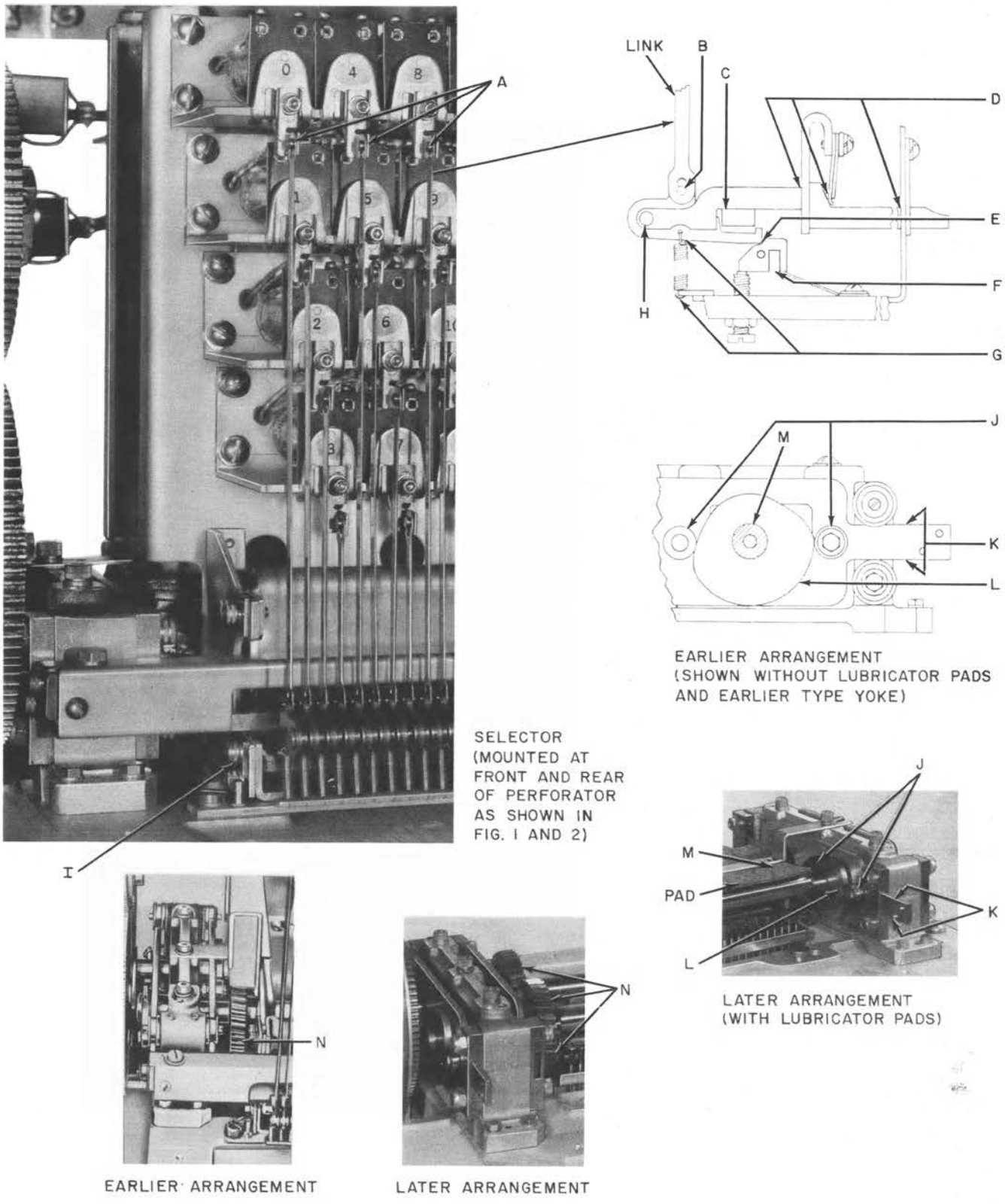


Fig. 6—Lubrication Points—Selector and Cam Drive

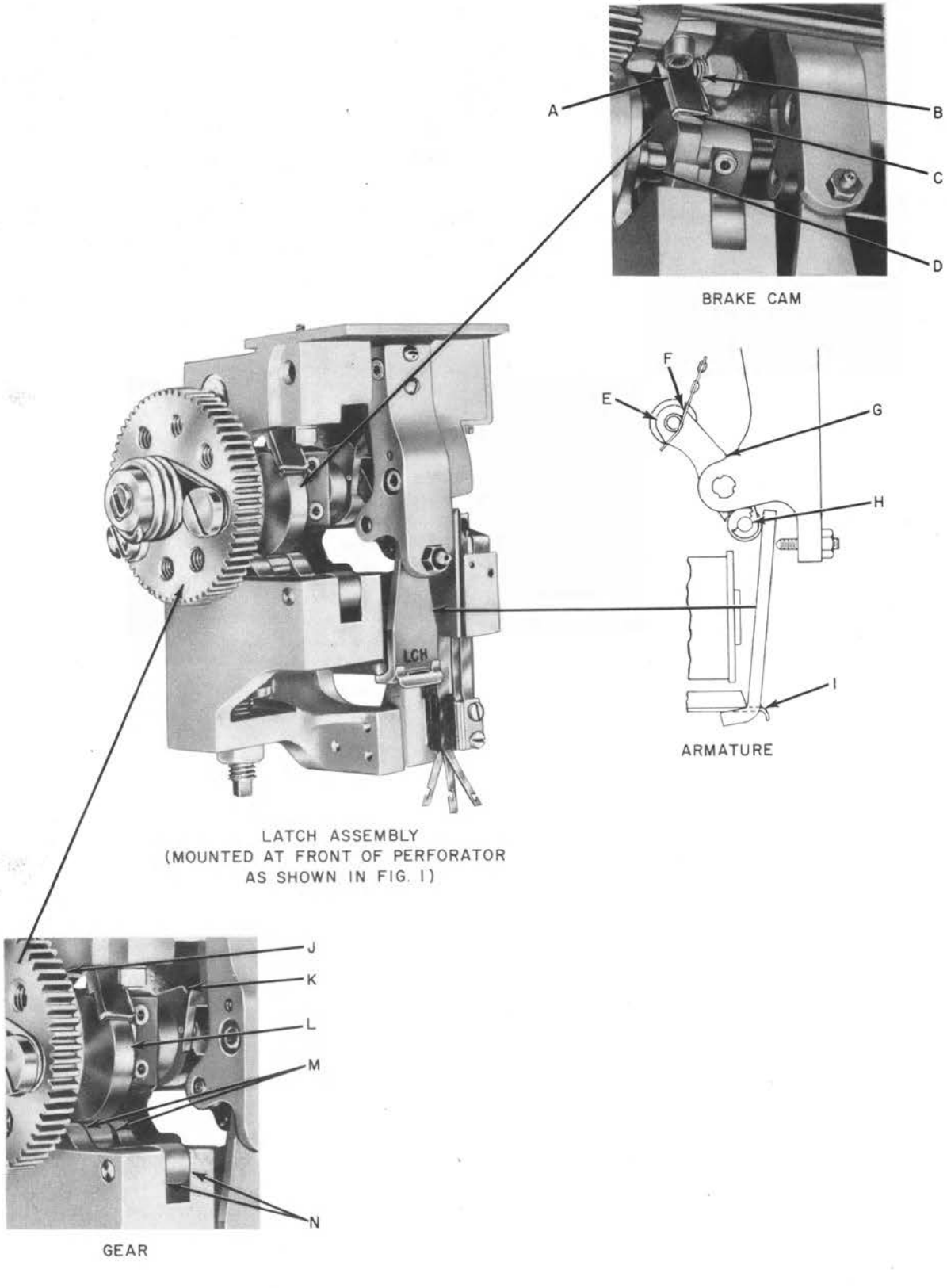


Fig. 7—Lubrication Points—Latch Assembly

D.M.

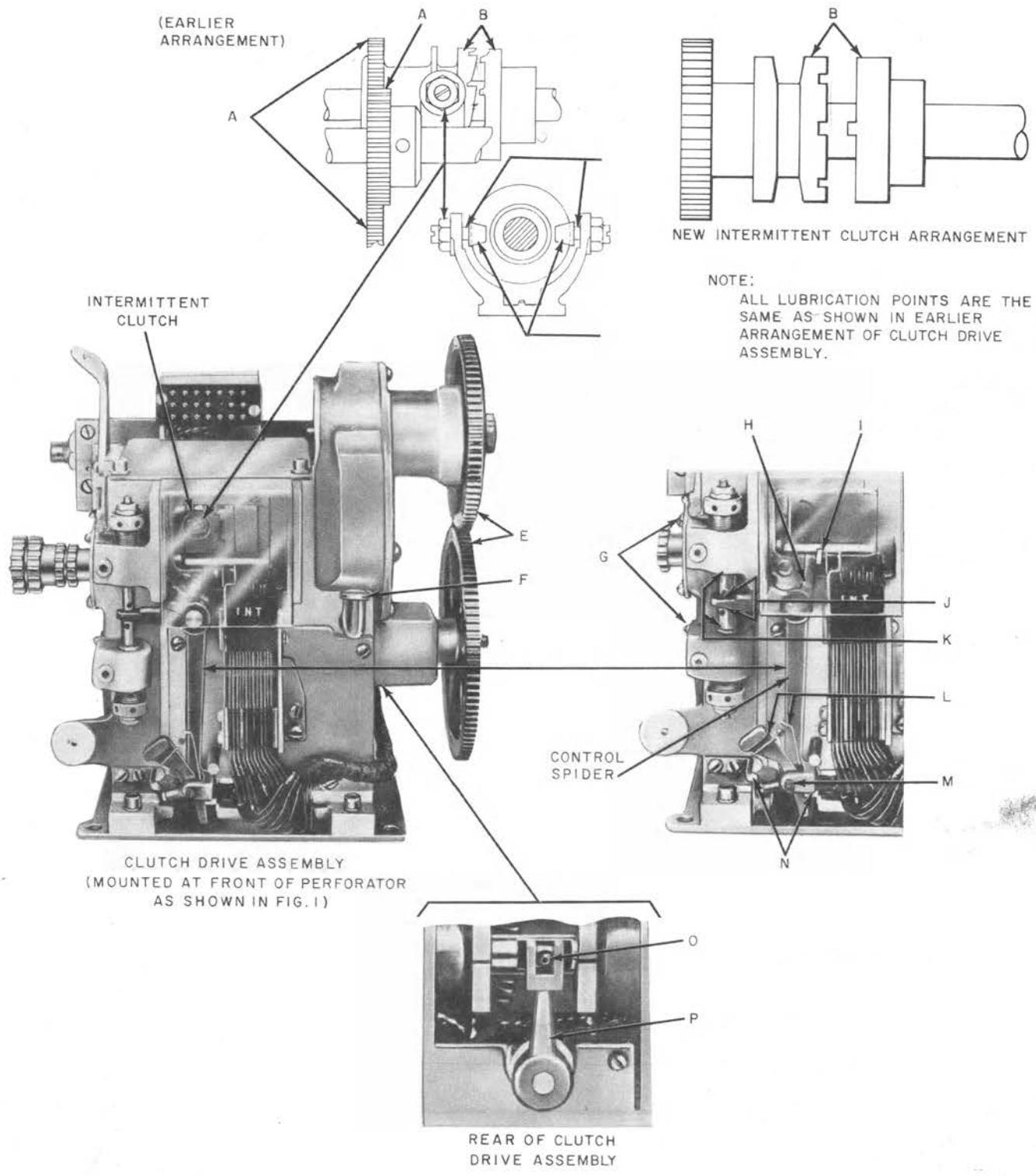


Fig. 8—Lubrication Points—Clutch Drive Assembly

even with the bottom surface of the torque rod.

(4) Mark another line 3/8 inch below the first line.

(5) Apply the gauge to the end of the torque rod, and depress the rod to the second line.

(6) Note the gauge indication.

(b) ***Clutch Drive to Hand Drive Chain:*** A force of 4500 grams applied to the clutch drive (Fig. 1) to hand drive chain shall deflect the chain inward

Min 1/4 inch
Max 3/8 inch

Use the 79F gauge and R-8550 scale. To check the requirement, apply the gauge to the chain approximately 1/8 inch above the guard supporting lug top on the left-hand side of the clutch drive unit.

2.06 ***Motor and Pulley Assembly Position***

(a) With the motor stop screw engaging the perforator frame, the motor shall clear the latch unit. Gauge by eye and feel. To check the requirement, proceed as follows.

(1) Place a trouble record card between the latch unit and motor.

(2) Carefully swing the motor upward until the stop screw touches the frame.

(3) Note that the card does not bind.

(b) The motor shall be positioned so that the mounting plate clears the motor release pin and the motor stop screw clears the frame. Gauge by eye and feel. To check the requirement, proceed as follows.

(1) Make sure that the motor mounting plate clears the motor release pin.

(2) Also, when applying pressure to the motor front, note that the motor swings slightly upward before the motor stop screw touches the perforator frame.

2.07 ***Phasing***

(a) ***Eccentric Cam Shaft Dial:*** As the shuttle bar starts inward, the eccentric camshaft dial shall indicate

270 degrees $\pm$10 degrees

Gauge by eye. To check the requirement, pull upward on the motor belt.

Note: Each dial division is equivalent to 2 degrees.

(b) ***Clutch Drive Dial*** (Where Provided): When the eccentric camshaft dial indicates 0 degrees, the clutch drive dial shall indicate

0 degrees $\pm$3 degrees

Gauge by eye. To check the requirement, pull upward on the motor belt.

(c) ***M Cam:*** When the eccentric camshaft dial indicates 0 degrees, the M cam dial shall indicate

0 degrees $\pm$3 degrees

Gauge by eye. To check the requirement, pull upward on the motor belt.

(d) ***Intermittent Clutch Rotation:*** The intermittent clutch drive shall begin to rotate when the eccentric camshaft dial indicates

Min 190 degrees
Max 210 degrees

Gauge by eye. To check the requirement, pull upward on the motor belt.

(e) ***Brake Cam Position***

(1) With the latch shaft rotated in the normal (forward) direction until the raised portion of the forward stop cam is against the forward stop roller, the clearance between the end of the backward stop pawl and the brake cam notch [Fig. 32, (A)] shall be

Min 0.005 inch
Max 0.008 inch

Use the KS-6909 gauge. To check the requirement, proceed as follows.

(a) Make sure that the perforator is in the home position (1.05).

(b) Place the manual control handle on the stub shaft.

(c) Rotate the handle clockwise until the forward stop roller is seated against the forward stop cam.

(d) Hold the handle to maintain the roller and cam position while checking the requirement.

(2) The brake cam face shall lie completely within the brake roller face. Gauge by eye.

(f) ***Card Feed Mechanism:*** With the perforator in the home position (1.05), the card feed mechanism index lines shall be in alignment within

1/32 inch

Use the R-8550 scale. To check the requirement, proceed as follows.

(1) Make sure the perforator is in the home position (1.05).

(2) Place the manual control handle on the stub shaft.

(3) Apply a slight pressure by rotating the handle slightly counterclockwise.

(4) Note that the end of the backward stop pawl (Fig. 32) engages the notch of the brake cam.

(5) Apply and maintain a slight pressure while checking the requirement by rotating the handle clockwise.

(g) ***Intermittent Clutch Alignment:*** With the perforator in the home position (1.05) and the eccentric camshaft dial indicating 150 (and 330) degrees, the jaws of the intermittent clutch drive shall not lead or lag the driven jaws by more than the amount shown in Fig. 9, (A) and (B), respectively. Gauge by eye. This requirement shall be checked in two positions. To check the requirement, proceed as follows.

(1) Make sure that the perforator is in the home position (1.05).

(2) Apply a slight pressure in each direction by rotating the manual control handle first counterclockwise and then clockwise.

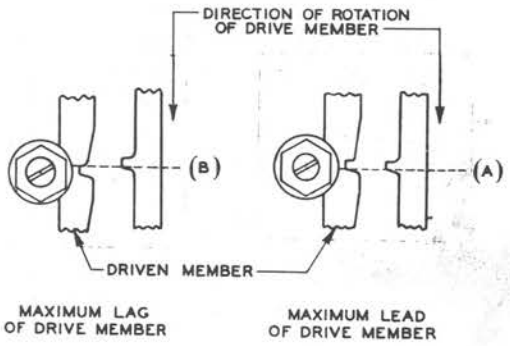


Fig. 9—Alignment of Jaws—Later Arrangement of Intermittent Clutch

(h) ***K Cam:*** With the perforator in the home position (1.05), the K cam dial (Fig. 10) shall indicate

Not less than 359 degrees

Not greater than 7 degrees

This requirement shall be checked in four consecutive home positions. To check the requirement, proceed as follows.

(1) Place the manual control handle on the stub shaft.

(2) Manually operate the LCH armature.

(3) Rotate the handle clockwise until the perforator is out of the home position.

(4) Release the LCH armature.

(5) Continue to rotate the handle until the perforator again reaches the home position.

(6) Apply a slight counterclockwise pressure to the handle to remove backlash.

(7) Maintain handle pressure while checking the requirement.

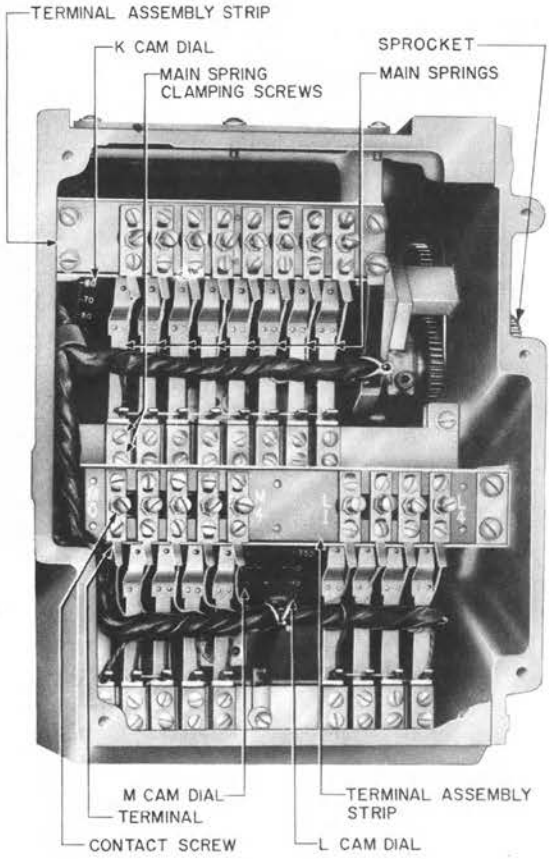


Fig. 10—Cam Switch

(i) ***L Cam:*** With the L cam dial indicating 0 degrees, the K cam dial (Fig. 10) shall indicate

0 degree, $\pm$1 degree

Gauge by eye. To check the requirement, proceed as follows.

(1) Place the manual control handle on the stub shaft.

(2) Manually operate the LCH armature.

(3) Rotate the handle clockwise until the perforator is out of the home position.

(4) Release the LCH armature.

(5) Continue to rotate the handle until the K cam dial is at 0 degree which corresponds to the L cam 0 degree position when the perforator is near the home position.

(j) ***Brake Cam:*** The brake cam of the latch unit shall engage the brake cam roller when the L cam dial (Fig. 10) indicates

Min 323 degrees
Max 337 degrees

Gauge by eye. To check the requirement, proceed as follows.

(1) Place the manual control handle on the stub shaft.

(2) Manually operate the LCH armature.

(3) Rotate the handle clockwise until the perforator is out of the home position.

(4) Continue to rotate the handle until the brake roller just engages the brake cam.

(5) Return the perforator to the home position when the check is complete.

2.08 ***Eccentric Shaft Speed:*** The speed of the eccentric shaft shall be

Min 475 RPM
Max 580 RPM

Use the KS-3008 stopwatch or equivalent.

(a) To check the requirement using the register method, proceed as follows.

(1) Operate the motor start key in accordance with Table B. Allow the motor to warm up for 15 minutes.

(2) If the office is equipped with SD-25682-01 test circuit, disconnect the CONT and MP plugs and connect the T-CONT and T-MP plugs.

(3) If the central office is equipped with other than SD-25682-01 test circuit (listed in Table B), operate the trouble recorder TST key.

(4) In accordance with Table B, note the register indication.

(5) Determine the speed of the eccentric shaft by operating the trouble recorder SPC or MST key, as required, for 1 minute.

(6) Again, note the register indication.

(7) Compute the eccentric shaft speed by subtracting the first register indication from the second.

(8) Restore the motor start key.

(9) If the office is equipped with SD-25682-01 test circuit, reverse the plug connections made in (2).

(10) If the office is equipped with other than SD-25682-01 test circuit, restore the recorder TST key.

(11) Restore the recorder motor start key.

(b) To check the requirement using the tachometer method, proceed as follows.

(1) Operate the motor start key, and allow the motor to warm up for 15 minutes.

(2) Using together the tachometer and stopwatch, pressure connect the tachometer to the exposed shaft end at the eccentric camshaft dial end and at the same time start timing.

(3) Maintain the tachometer to shaft connection for 1 minute; then disconnect.

(4) Note the accumulated RPM indicated by the tachometer.

Cam Switch Assembly

2.09 ***Position of Mainspring Shoe on Cam***

(a) Each mainspring shoe edge [Fig. 11, (A) and 12, (A)] shall rest flat when bearing on the low portion of the cam. Gauge by eye using the P-220366 or R-2965 mirror.

(b) The shoe sides [Fig. 11, (B) and 12, (B)] shall be wholly within the cam surface and clear the cam sides by approximately 0.020 inch.

TABLE B

TROUBLE RECORDER TEST KEYS AND REGISTERS

	CENTRAL OFFICE TYPE				
	XBT SXB	SXB	SXB	SXS 1XB 4A AND 4M 4XB	4A OR 4M
	SD-25572-01	SD-25679-01	SD-25682-01	SD-32233-01	SD-68389-01
RECORDER MOTOR START KEY	MCC	MCC	MC	MCC	MCM
REGISTER COUNT START KEY	SPC	SPC	MST	SPC	SPC
REGISTER USED TO RECORD SHAFT ROTATIONS	SPC	SPC	MST	SPC	SPC

Gauge by eye using the P-220366 or R-2965 mirror.

(c) The vertical center line of the mainsprings shall be approximately perpendicular to the camshaft axis consistent with (b).

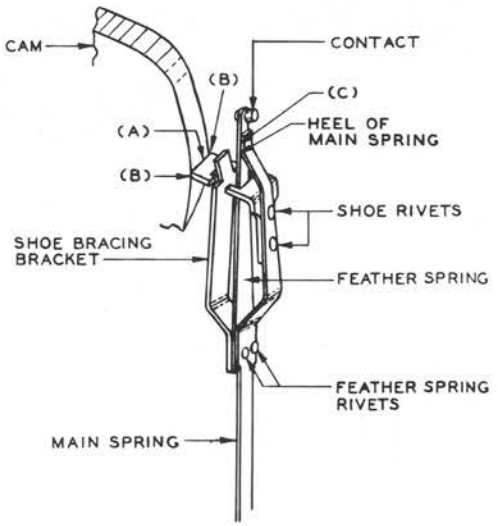


Fig. 11—Position of Shoe on Cam Assembly With Shoe Bracing Bracket

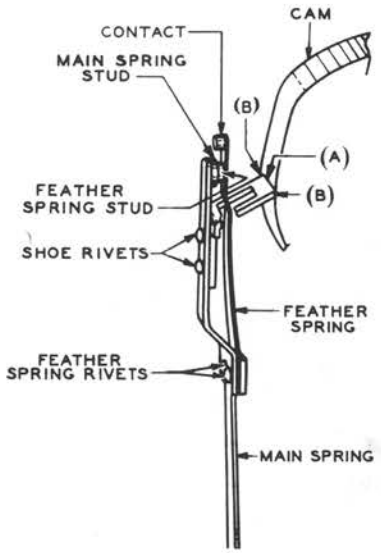


Fig. 12—Position of Shoe on Spring Assembly Without Shoe Bracing Bracket

2.10 ***Mainspring Shoe Pressure:*** The mainspring shoe edge shall bear upon the low portion of the cam with a pressure of

Test—Min 25 grams, Max 50 grams
Readjust—Min 30 grams, Max 40 grams

Use the 79C gauge. To check the requirement, apply the gauge at a point midway between the shoe rivets.

2.11** ***Feather Spring Stud Pressure: With the shoe on the lower portion of the cam, the feather spring pressure against the mainspring shall be

Test—Min 65 grams, Max 80 grams
Readjust—Min 65 grams, Max 75 grams

Use the 79C gauge. To check the requirement, proceed as follows.

(1) Disconnect the terminal assembly strip (3.11).

(2) Apply the gauge to the feather spring just below the contact.

2.12** ***Feather Spring Alignment

(a) ***Spring Assembly With Shoe Bracing Bracket:*** The feather spring shall rest approximately flat against the full length of the end of the mainspring, never against only the heel of the mainspring [Fig. 11, (C)]. Gauge by eye.

(b) ***Spring Assembly Without Shoe Bracing Bracket:*** With the shoe on the low portion of the cam, the feather spring (Fig. 12) portion above the offset shall be approximately parallel with the end of the mainspring. Gauge by eye.

2.13 ***Contact Alignment:*** The feather spring contact and the contact adjusting screw shall not be out of alignment more than 15 percent of the contact diameter (Fig. 13). Gauge by eye.

2.14 ***Make and Break of Cam Switch Contacts:*** The cam switch contacts shall make or break when the center of the indicator engraved line is in alignment with the corresponding dial or space center in accordance with Table C. Each space between the dial engraved lines is equivalent to 2 degrees. The limits shall be

Fig. 13—Contact Alignment

Test—±2 degrees
Readjust—±1 degree

To check the requirements, proceed as follows.

(1) Place the manual control handle on the stub shaft.

(2) Block operated the latch armature, using the R-1102 spudger inserted between the armature and backstop screw.

(3) Rotate the K and L cams to positions in accordance with Table C by turning the manual control handle clockwise.

(4) Rotate the M cams by pulling downward on the motor belt to check the M cam contacts make and break. Use the 510C test lamp to aid in checking the requirement.

Clutch Drive Assembly (Fig. 14 and 15)

2.15 ***Position of Pointer (Where Provided):*** On perforators equipped with a clutch drive unit dial, the following requirements shall be met.

(a) There shall be a clearance between end of the pointer and dial [Fig. 16, (A)]. The clearance shall not exceed

1/16 inch

Gauge by eye. The degree dial marks are approximately 1/16 inch apart.

(b) The top edge of the pointer shall be approximately parallel to the Geneva drive shaft. Gauge by eye.

Note: When dowel pins are provided to locate the pointer, requirements (a) and (b) do not apply.

TABLE C

CAN SWITCH REQUIREMENTS

DESIGNATION	MAKE (Degrees)	BREAK (Degrees)
K1	357	39
K2	39	80
K3	80	122
K4	122	163
K5	163	205
K6	205	246
K7	246	288
K8	288	330
L1	7	353
L2	108	355
L3	275	355
L4	7	300
M0	55	117
M1	125	45
M2	45	285
M3	195	280
M4	113	275

(c) The pointer face [Fig. 17, (A)] shall coincide with the dial face within

1/32 inch

Gauge by eye. The pointer thickness is approximately 1/32 inch.

2.16 ***Clearance Between Centering Plungers and Centering Arm***

(a) The adjusting nuts [Fig. 18, (A)] of the centering plungers shall contact their respective

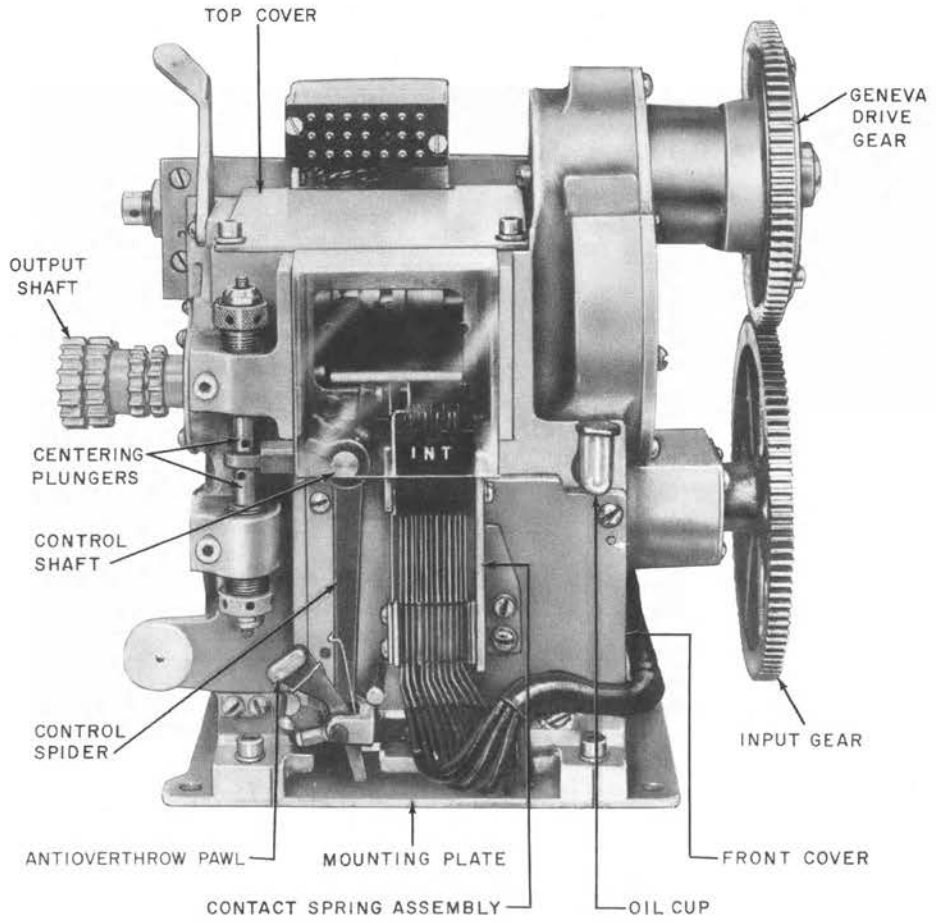


Fig. 14—Clutch Drive—Front View

plunger adjusting bushings. Gauge by eye. To check the requirement, proceed as follows.

(1) Press vertically on the threaded end of each plunger.

(2) Note that the plunger does not move.

(b) With the control shaft in the neutral position, the control spider centering arm may just touch either of the centering plungers; or the control spider centering arm may not touch either centering plunger, but the combined clearance between both plungers and the centering arms shall not exceed

Test—Max 0.003 inch
Readjust—Max 0.002 inch

Use the KS-6909 gauge. To check the requirement, proceed as follows.

(1) Hold the adjusting nut(s) against the centering plunger(s) by pressing firmly on the threaded end of the plunger with the left-hand thumb and index finger.

(2) Grasp the control spider just below the hub with the right-hand fingers.

(3) Rotate the control shaft alternately in each direction, and note the presence of play between the plunger(s) and centering arm.

(4) While holding the plunger(s), attempt to insert the proper KS-6909 gauge blade between either plunger tip and centering arm.

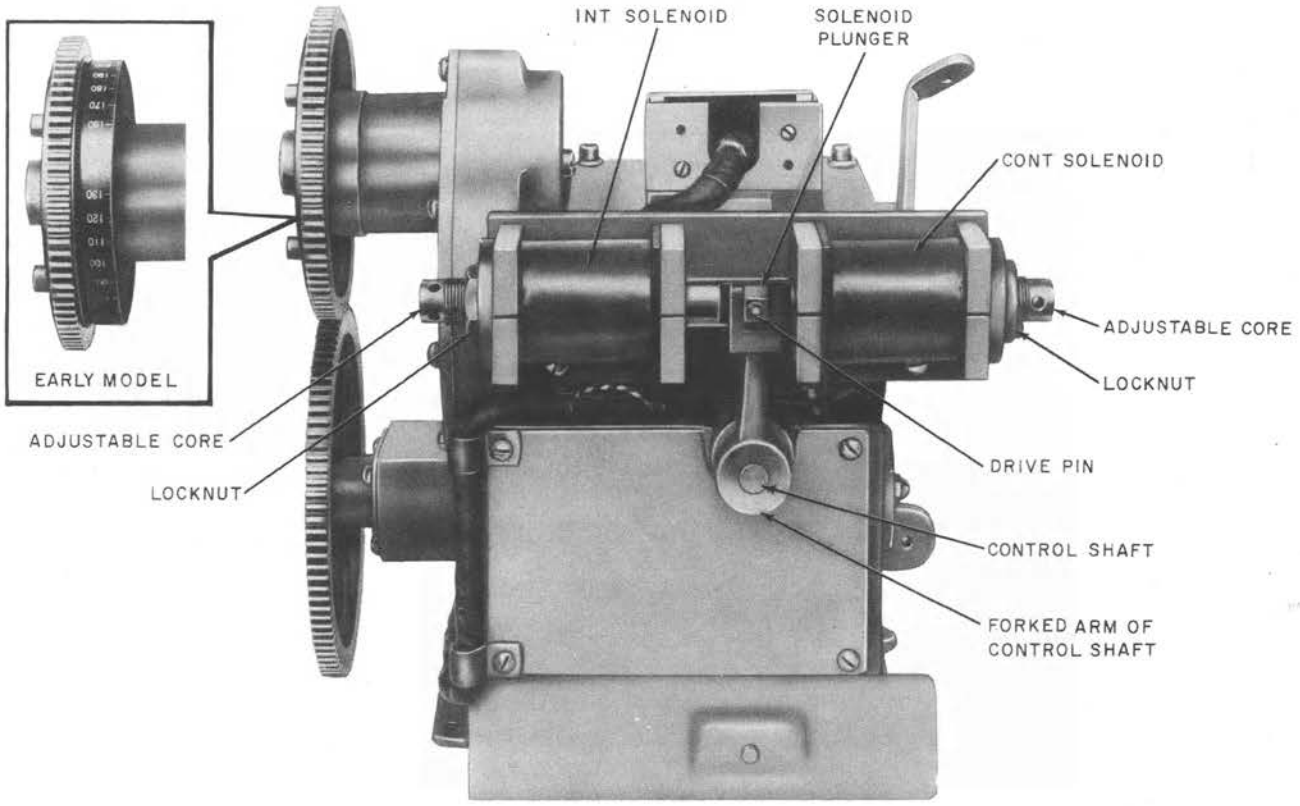


Fig. 15—Clutch Drive—Rear View

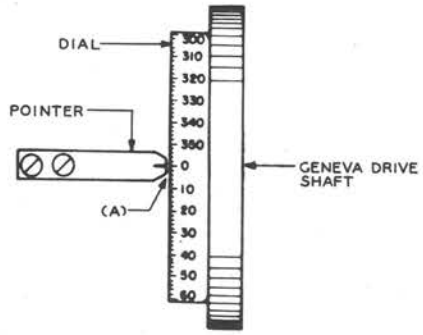


Fig. 16—Clearance Between Pointer and Dial

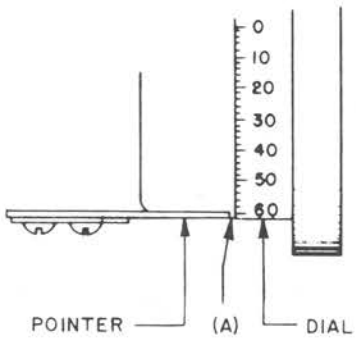


Fig. 17—Alignment of Pointer and Dial

If the gauge will not enter or binds upon entering, the requirement is considered met.

2.17 *Pressure of Centering Plungers*

(a) The pressure of the lower centering plunger adjusting nut against the plunger adjusting bushing shall be

Test—Min 500 grams, Max 850 grams
Readjust—Min 550 grams, Max 800 grams

Use the 79B gauge with the push finger inserted into the hole in the plunger tip.

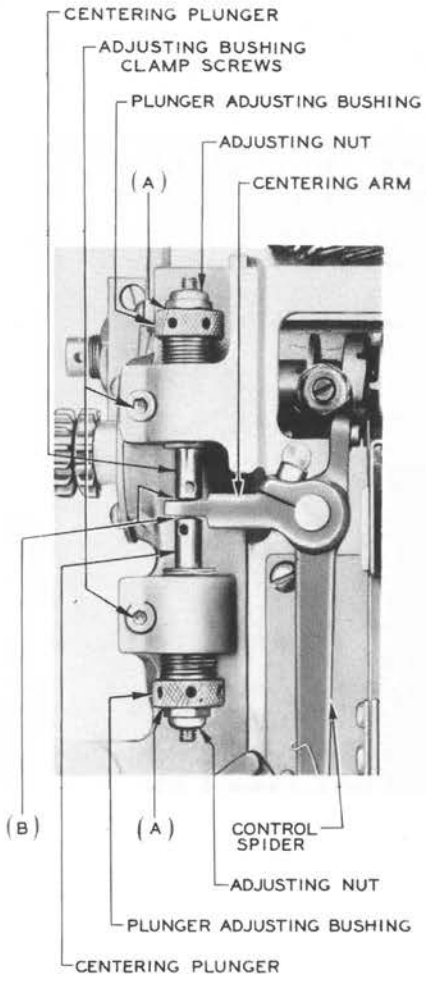


Fig. 18—Clearance Between Centering Plungers and Centering Arms

(b) The pressure of the upper centering plunger adjusting nut against the plunger adjusting bushing shall be

Test—Min 650 grams, Max 900 grams
Readjust—Min 700 grams, Max 850 grams

Invert the 79B gauge with the push finger inserted into the hole in the plunger tip.

2.18** ***Separation Between Intermittent Clutch Members (Earlier Arrangement)

(a) With the INT solenoid electrically operated and the clutch members in mesh, the separation [Fig. 19, (A)] between the flat surface of the flange at the base of each tooth of the intermittent clutch drive member and the nearest point on the face of the associated driven member shall be

Min 0.002 inch
Max 0.008 inch

Use the 92W gauge. Check in four positions of the intermittent clutch drive member, approximately 90 degrees apart. To check the requirement, proceed as follows.

(1) Rotate the driven member until the member corresponds with the position shown in Fig. 19 by pulling upward on the motor belt.

(2) Electrically operate the INT solenoid by applying battery to terminal 2 and ground to terminal 13 of the DRV connector (3.011).

(b) With the control shaft in the neutral position, the separation [Fig. 20, (A)] between the drive and intermittent clutch driven member measured between nearest surfaces shall be

Test—Min 0.025 inch, Max 0.040 inch
Readjust—Min 0.030 inch, Max 0.035 inch

Use the KS-6909 and KS-6938 gauges. This requirement shall be checked in four positions of the intermittent clutch drive member, approximately 90 degrees apart. To check the requirement, rotate the intermittent clutch drive member until the drive member corresponds with the position shown in Fig. 20 by pulling upward on the motor belt.

(c) With the CONT solenoid electrically operated, the separation [Fig. 20, (A)] between the intermittent clutch drive and driven members measured between nearest surfaces shall be

Min 0.080 inch
Max 0.100 inch

Use the 83B gauge. This requirement shall be checked in four positions of the intermittent clutch drive member, approximately 90 degrees apart. To check the requirement, proceed as follows.

(1) Rotate the intermittent clutch drive member until the drive member corresponds

with the position shown in Fig. 20 by pulling upward on the motor belt.

(2) Electrically operate the CONT solenoid in accordance with 2.31(a).

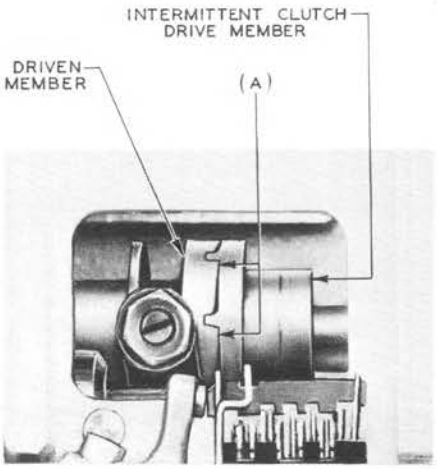


Fig. 19—Operated Clearance Between Intermittent Clutch Members (Earlier Arrangement)

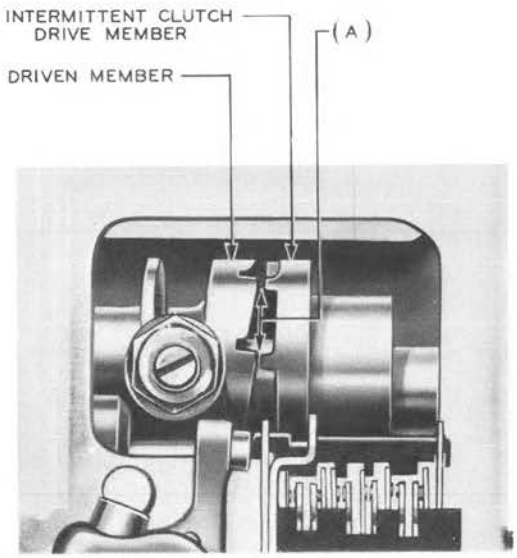


Fig. 20—Separation Between Intermittent Clutch Members (Earlier Arrangement)

2.19 ***Pressure of Antioverthrow Pawl:*** With the control shaft in the neutral position, the cocking arm of the overthrow pawl [Fig. 21, (A)] shall bear against the cocking stop with a pressure of

Min 9 grams
Max 17 grams

Use the 70H gauge. To check the requirement, proceed as follows.

(1) Apply the gauge to the point shown in Fig. 21.

(2) Read the gauge pressure just as the pawl begins to move.

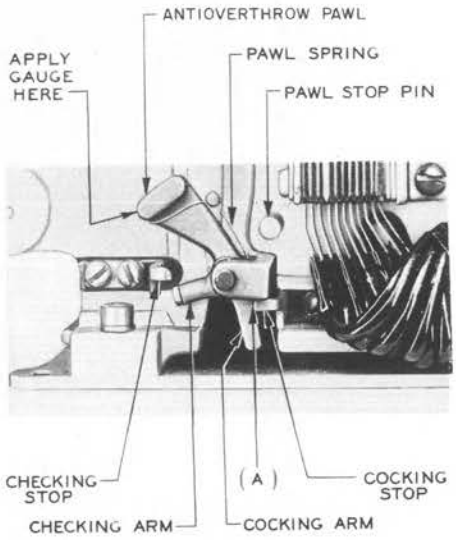


Fig. 21—Pressure and Freedom of Antioverthrow Pawl

2.20 ***Freedom of Antioverthrow Pawl:*** When the antioverthrow pawl (Fig. 21) is manually rotated in a clockwise direction, the checking arm shall clear the checking stop and move freely within the limits of the pawl stop pin. When the antioverthrow pawl is slowly released, the pawl cocking arm shall restore reliably to the rest position.

Gauge by eye and feel.

2.21 ***Position of Cocking Stop***

(a) With the CONT clutch in the electrically operated position, the antioverthrow pawl shall clear the back wall of the mounting clevis [Fig. 22, (A)]. Gauge by eye. To check the

requirement, electrically operate the CONT solenoid [2.31(a)].

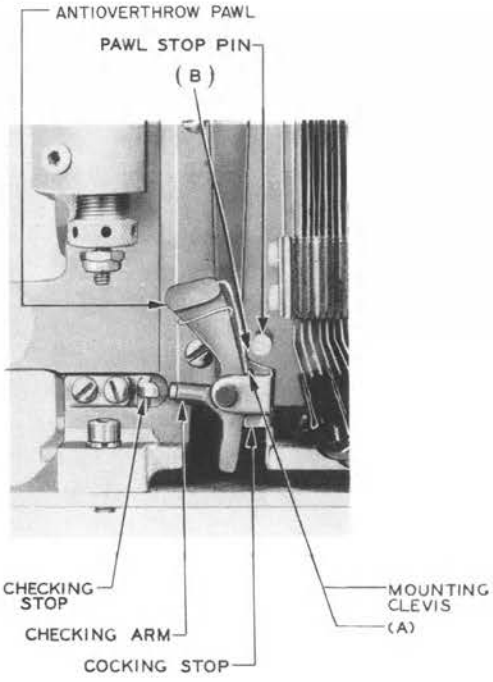


Fig. 22—Position of Cocking Step

(b) With the CONT clutch in the electrically operated position, the antioverthrow pawl shall clear the pawl stop pin [Fig. 22, (B)] by

Test—Min 1/64 inch
Readjust—Min 1/32 inch

Gauge by eye. To check the requirement, electrically operate the CONT solenoid [2.31(a)].

(c) With the CONT clutch in the electrically operated position, the top horizontal overlap of the antioverthrow pawl and checking arm with the bottom surface of the checking stop [Fig. 23, (A)] shall be

Min 1/32 inch

Gauge by eye. To check the requirement, electrically operate the CONT solenoid [2.31(a)].

2.22 *Position of Checking Stop*

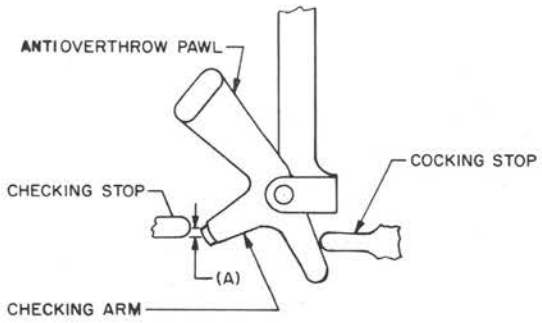


Fig. 23—Checking Arm Engagement

(a) When the INT solenoid is electrically operated, the antioverthrow pawl shall clear the checking stop [Fig. 24, (A)]. Gauge by eye. To check the requirement, electrically operate the INT solenoid [2.31(b)].

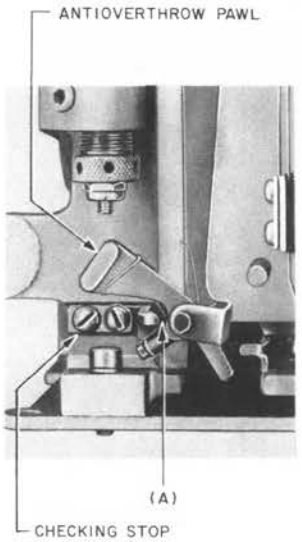


Fig. 24—Position of Checking Stop

(b) With the checking arm of the antioverthrow pawl abutting the checking stop as shown in Fig. 23, the gap between the jaws of the intermittent clutch member shall be

Test—Min 0.023 inch
Readjust—Min 0.028 inch

Use the KS-6909 and KS-6938 gauges. This requirement shall be checked in four positions of the drive member, approximately 90 degrees apart. To check the requirement, proceed as follows.

(1) Rotate the intermittent clutch drive member by pulling upward on the motor belt until the drive and driven members are in the position shown in Fig. 20.

(2) Position the antioverthrow pawl so that the checking arm and the checking stop are abutting.

(3) Electrically operate the INT solenoid [2.31(b)].

(4) Take up any play between the actuating rollers and intermittent clutch driven member by sliding the driven member to the right.

(5) Measure the gap between the nearest surfaces of the clutch members.

(c) With the checking arm of the antioverthrow pawl abutting the checking stop as shown in Fig. 25, (A), the vertical sides of the checking stop shall fall within the diameter of the checking arm. Gauge by eye.

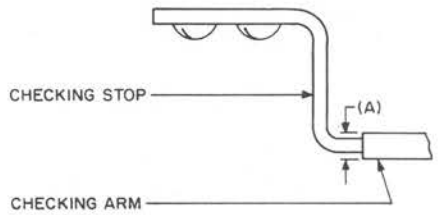


Fig. 25—Checking Stop Alignment

2.23 ***Clearance Between Movable Card and Card Operating Stud:*** With the control shaft in the neutral position, the clearance [Fig. 26, (A)] between the movable card of the contact spring assembly and the card operating stud shall be

Min Perceptible
Max 0.012 inch

Use the KS-6909 gauge.

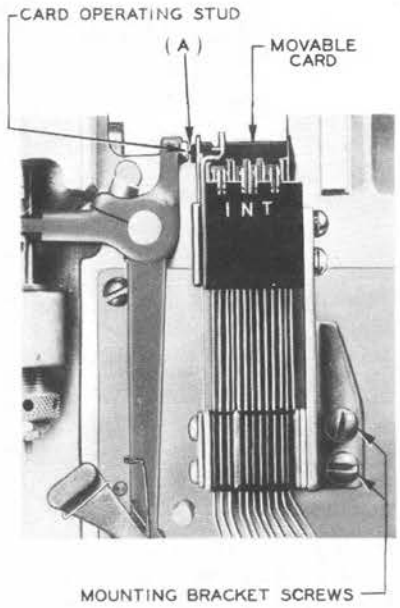


Fig. 26—Clearance Between Movable Card and Card Operating Stud

2.24** ***Contact Alignment: Contact alignment shall be within the limits indicated in Fig. 27. Gauge by eye.

2.25 ***Spring Tang Position***

(a) The end of the spring tang [Fig. 28, (A)] shall be below the top surface of the stationary card by

Min 1/32 inch

Gauge by eye.

(b) The full width of the spring tang [Fig. 28, (B)] shall engage the notch of the stationary card. Gauge by eye.

(c) The spring tang (Fig. 28, (C)] shall not rub on the stationary card when moved in the

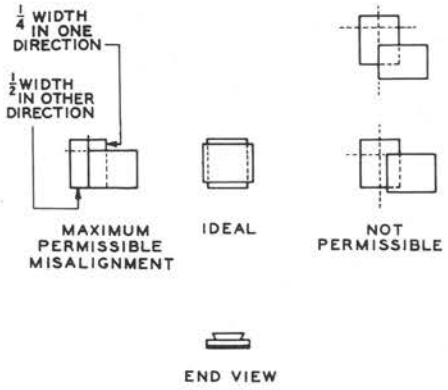


Fig. 27—Contact Alignment—Clutch Drive

direction of spring travel from the normal rest position on the card.

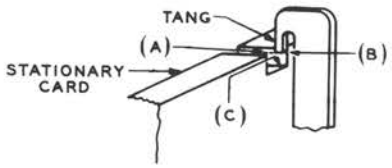


Fig. 28—Spring Tang Position—Clutch Drive

2.26 *Card Stop Position*

(a) With the moving card play taken up in a downward direction, the bottom edge of the card stop shall lie below the top surface of the movable card [Fig. 29, (A)] by

Min 1/32 inch

Gauge by eye.

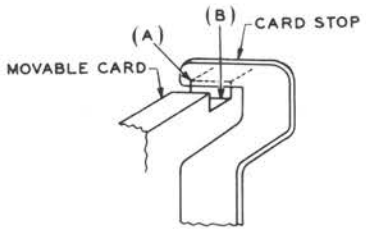


Fig. 29—Card Stop Position—Clutch Drive

(b) With the moving card play taken up in an upward direction [Fig. 29, (A)], the card stop shall not rub on the card during card travel. Gauge by eye and feel. To check the requirement, manually operate the intermittent clutch with a finger applied to the mounting clevis of the antioverthrow pawl.

2.27 *Clearance Between Moving Springs and Card*

(a) With the play of the movable card taken up in an upward direction [Fig. 30, (A)], the bifurcated end of each moving spring (designated B in Fig. 31) shall be above the bottom surface of the movable card by

Min 1/32 inch

Gauge by eye.

(b) With the play of the movable card taken up in a downward direction [Fig. 30, (B)], the movable card shall not rub on the bifurcated ends of the moving spring during card travel. Gauge by eye. To check the requirement, manually operate the intermittent clutch with a finger applied to the mounting clevis of the antioverthrow pawl.

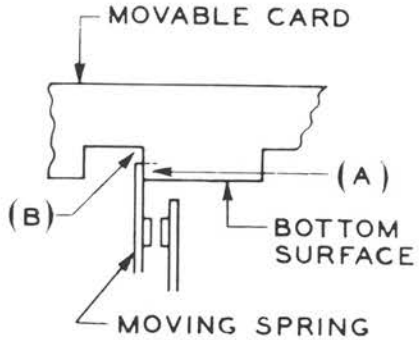


Fig. 30—Clearance Between Moving Springs and Card—Clutch Drive

2.28 *Spring Tension*

(a) ***Balancing Springs:*** (Springs Designated E)—With the control shaft in the neutral position, the combined tension of the balancing springs shall be such that the movable card is held against the right-hand side of the card stop (Fig. 31) with a pressure of

Test—Min 15 grams
Readjust—Min 20 grams

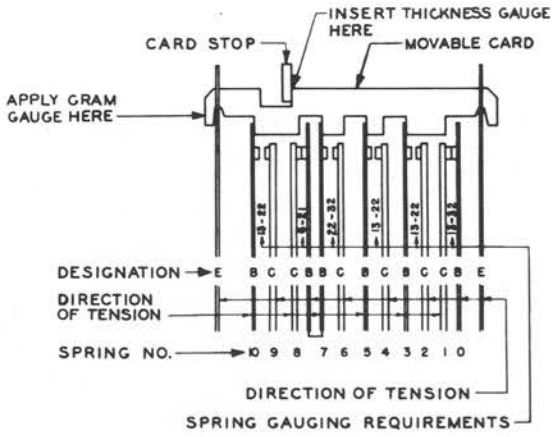


Fig. 31—Spring Tension and Gauging—Clutch Drive

Use the 70D gauge. To check the requirement, manually swing the control spider counterclockwise and apply the gauge to the left end of the movable card.

(b) ***Stationary Card Springs:*** (Springs Designated C)—The tension of the stationary card spring(s) shall be such that the spring tang is held against the stationary card with a pressure of

Test—Min 25 grams
Readjust—Min 30 grams

Use the 70D or 79C gauge. To check the requirement, proceed as follows.

(1) Apply the gauge to the tang just above the stationary card.

(2) When checking springs 1 and 8, manually operate the intermittent clutch with a finger applied to the mounting clevis of the antioverthrow pawl.

*(c) ***Moving Springs:*** (Springs Designated B)—The tension of each moving spring shall be such that the contacts shall have a pressure of

Test—Min 15 grams
Readjust—Min 20 grams

against the contacts of the associated stationary card spring, distributed approximately equal between the two bifurcations of the spring. Use the 70D gauge applied to the tip of one bifurcation and then to the other tip and add the two values. To check the requirement, disengage the mounting plate on which the contact spring assembly is mounted.

2.29** ***Separation Between Springs: The clearance between adjacent springs, when the control shaft is in the neutral position or when the INT solenoid is in the electrically operated position, shall be

- ***All springs except adjacent B springs***

Min 0.008 inch

- ***Adjacent B spring***—Shall not touch

Gauge by eye.

2.30 ***Spring Gauging***

(a) The spring gauging requirements specified in Fig. 31 shall be met. For make and break contacts, the make contacts shall ***not*** make and the break contacts shall ***not*** break when a gauge corresponding to the lesser specified value is inserted between the card stop and the movable card; but make contacts shall make and break contacts shall break when a gauge corresponding to the greater specified value is used. Use the KS-6909 and KS-6938 gauges. To check the requirement, visually check the opening and closing of the contacts. The 510C lamp will aid the checking of the requirement.

(b) Both contacts of the bifurcated spring shall make with associated contacts with the INT solenoid in the electrically operated position for normally open contacts, and the control shaft in the neutral position for normally closed contacts. Use the 35-type test set. Refer to the appropriate section in Division 100 for 35-type test set connection and operation information. To check the requirement, connect the test set to terminals 2 and 13 of the DRV connector.

(c) With the intermittent clutch drive member in the maximum lag position as shown in Fig. 9, (B) and the intermittent clutch manually operated, the transfer make contacts (6 and 7) shall make and there shall be a clearance between the moving spring and the right-hand side of

the notch in the movable card. Gauge by eye. To check the requirement, proceed as follows.

(1) Rotate the clutch drive member to the position shown in Fig. 9, (B) by pulling upward on the motor belt.

(2) Manually operate the intermittent clutch so that the jaws come together but do not seat.

2.31 *Electrical Requirements*

(a) ***CONT Solenoid:*** The solenoid plunger shall operate without perceptible hesitation and engage the adjustable core of the CONT solenoid on

Max 250 mA

Use the 35-type test set. Refer to the appropriate section in Division 100 for 35-type test set connection and operation information. To check the requirement, connect the test set to terminals 2 and 4 of the DRV connector.

(b) ***INT Solenoid:*** The solenoid plunger shall operate without perceptible hesitation and engage the adjustable core of the INT solenoid on

Max 250 mA

Use the 35-type test set. Refer to the appropriate section in Division 100 for 35-type test set connection and operation information. To check the requirement, connect the test set to terminals 2 and 13 of the DRV connector.

2.32 *Brake Cam Position*

(a) With the latch shaft rotated in the normal (forward) direction until the raised portion of the forward stop cam is against the forward stop roller [Fig. 32, (A)], the clearance between the end of the backward stop pawl and the notch of the brake cam notch shall be

Min 0.005 inch
Max 0.008 inch

Use the KS-6909 gauge. To check the requirement, proceed as follows.

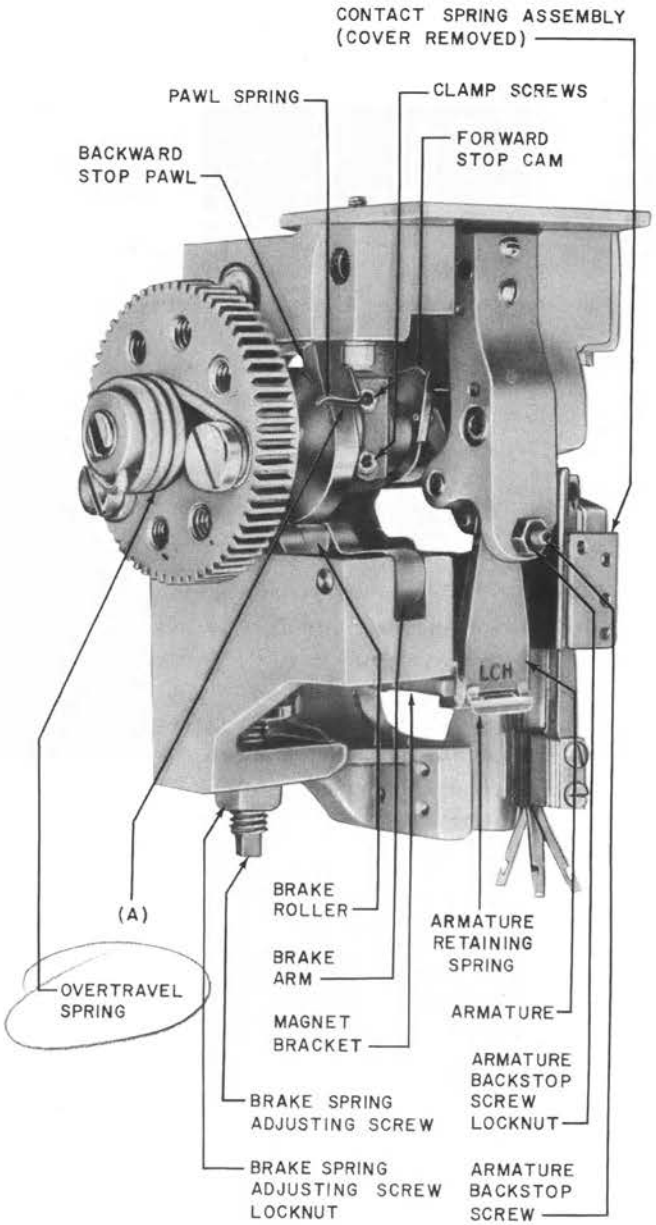


Fig. 32—Latch Assembly

(1) Make sure that the perforator is in the home position (1.05).

(2) Place the manual control handle on the stub shaft.

(3) Rotate the handle clockwise sufficiently to seat the forward stop roller against the forward stop cam.

(4) Hold the handle in this position while checking the requirement.

(b) The face of the brake cam shall lie wholly within the face of the brake roller. Gauge by eye.

Latch Assembly (Fig. 32)

2.33 ***Pressure of Forward Stop Roller:*** With the perforator in the home position (1.05), the pressure of the forward stop roller against the forward stop cam [Fig. 33, (A)], measured at the forward stop roller pin as shown in Fig. 38, shall be

Test—Min 300 grams, Max 500 grams
Readjust—Min 350 grams, Max 450 grams

Use the 62B gauge. To check the requirement, proceed as follows.

(1) Hold the gauge in a horizontal position, and apply the push finger to the forward stop roller operating pin as shown in Fig. 38.

(2) Observe the pressure just as the roller starts to move away from the cam.

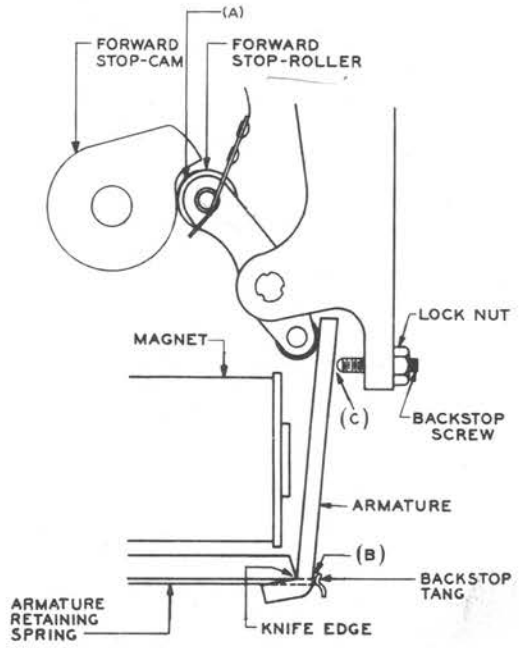


Fig. 33—Clearance Between Armature and Backstop Screw and Armature Base Gap

2.34 ***Armature Retaining Spring Tension:*** The tension of the armature retaining spring against the knife edge (front) [Fig. 33, (B)] of the magnet bracket shall be

Test—Min 150 grams
Readjust—Min 200 grams

Use the 79B gauge. To check the requirement, apply the gauge to the front end of the spring at the center while supporting the armature with the fingers.

2.35 ***Armature Base Gap:*** With the armature in contact with the backstop screw and the knife edge of the magnet bracket, the clearance between the armature(s) and armature retaining spring(s) [Fig. 33, (B)] shall be

Test—Min 0.003 inch, Max 0.010 inch
Readjust—Min 0.005 inch, Max 0.008 inch

Use the KS-6909 gauge.

2.36 ***Clearance Between Armature and Backstop Screw:*** With the forward stop roller against the forward stop cam and the armature in contact with both the armature roller and knife edge of the magnet bracket, there shall be a clearance [Fig. 33, (C)] between the armature and the backstop screw. The clearance shall not exceed

0.008 inch

Use the KS-6909 gauge. Check the requirement with the perforator in the home position (1.05).

2.37 ***Pawl Spring Tension:*** With the perforator in the home position (1.05), the tension of the pawl spring against the backward stop pawl (Fig. 32) shall be

Test—Min 150 grams, Max 350 grams
Readjust—Min 200 grams, Max 300 grams

Use the 79B gauge applied to the pawl spring tip. To check the requirement, proceed as follows.

(1) Place the manual control handle on the stub shaft.

(2) Rotate the handle sufficiently clockwise to provide perceptible clearance between the end of the pawl and the stopping edge of the cam.

(3) Hold the handle in this position while checking the requirement.

*2.38 ***Contact Alignment:*** Contact alignment shall be within the limits shown in Fig. 34. Gauge by eye. To check the requirement, remove the out bin in accordance with 3.007 and then remove the cover of the contact spring.

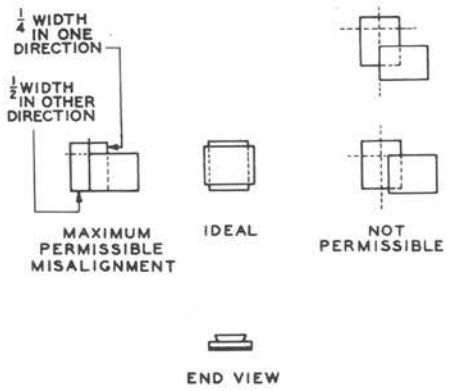


Fig. 34—Contact Alignment—Latch Assembly

2.39 ***Spring Tang Position***

(a) The end of the spring tang [Fig. 35, (A)] shall be below the top surface of the stationary card by

Min 1/32 inch

Gauge by eye.

(b) The full width of the spring tang shall engage the notch [Fig. 35, (B)] of the stationary card. Gauge by eye.

(c) When the spring tang is moved in the direction of spring travel [Fig. 35, (C)] from the normal rest position, the tang shall not rub on the stationary card. Gauge by eye and feel.

2.40 ***Card Stop Position***

(a) With the play of the movable card [Fig. 36, (A)] taken up in a downward direction, the bottom edge of the card stop tang shall lie below the top surface of the movable card by

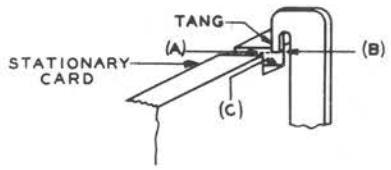


Fig. 35—Spring Tang Position—Latch Assembly

Min 1/32 inch

Gauge by eye.

(b) With the play of the movable card taken up in an upward direction [Fig. 36(B)]), the card stop shall not rub on the movable card during card travel. Gauge by eye and feel. To check the requirement, manually operate the LCH armature.

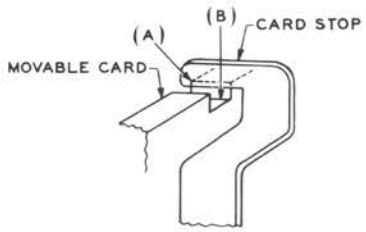


Fig. 36—Card Stop Position—Latch Assembly

2.41 ***Clearance Between Moving Springs and Card***

(a) With the moving card play [Fig. 37, (A)] taken up in a upward direction, the bifurcated end of each moving spring (designated B in Fig. 38) and the end of the card operating spring (designated F in Fig. 38) shall be above the bottom surface of the movable card by

Min 1/32 inch

(b) With the moving card play [Fig. 37, (B)] taken up in a downward direction, the movable card shall not rub on the bifurcated ends of the moving spring(s) during card travel. Gauge by eye. To check the requirement, manually operate the LCH armature.

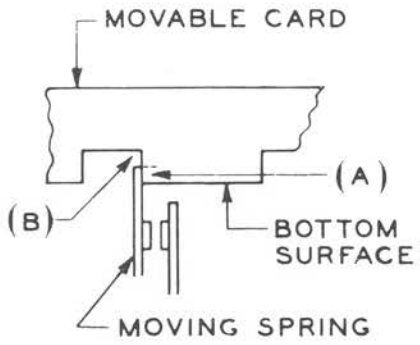


Fig. 37—Clearance Between Moving Springs and Card—Latch Assembly

2.42** ***Spring Tension

(a) ***Balancing Springs:*** (Spring Designated E)—With the perforator in the home position (1.05) and the LCH armature unoperated, the combined tension of the balancing springs shall be such that the movable card (Fig. 38) is held against right-hand side of the card stop with a pressure of

Test—Min 20 grams, Max 60 grams
Readjust—Min 30 grams, Max 50 grams

Use the 79C gauge applied to the left-hand end of the movable card. To check the requirement, proceed as follows.

(1) Remove the out bin (3.007).

(2) Disengage the contact spring assembly mounting bracket from the latch unit.

(b) ***Stationary Card Springs:*** (Spring Designated C)—The tension of the stationary card spring(s) shall be such that the spring tang is held against the stationary card with a pressure of

Test—Min 25 grams
Readjust—Min 30 grams

Use the 70D gauge applied to the tang just above the stationary card. To check the requirement, proceed as follows.

(1) Remove the out bin (3.007).

(2) Disengage the mounting bracket of the contact spring assembly from the latch unit.

(c) ***Moving Springs:*** (Springs Designated B)—The tension of the moving spring(s) shall be such that the contact(s) shall have a pressure of

Test—Min 25 grams
Readjust—Min 30 grams

against the associated contact(s) of the stationary card spring distributed approximately equal between the two spring bifurcations. Use the 70D gauge applied first to one bifurcation tip and then to the other tip and add the two values. To check the requirement, proceed as follows.

(1) Remove the out bin (3.007).

(2) Disengage the mounting bracket of the control spring assembly from the latch unit.

(d) ***Card Operating Spring:*** (Spring Designated F)—With the LCH magnet electrically operated, the card operating spring shall hold the movable card to the left-hand side of the card stop with a pressure of

Test—Min 35 grams, Max 50 grams
Readjust—Min 40 grams, Max 50 grams

Use the 35-type test set. Refer to the appropriate section in Division 100 for 35-type test set connection and operation information. Connect test set to terminals 2 and 8 of the CONT connector. Also, use the 70D gauge applied to the right-hand side of the movable card. To check the requirement, proceed as follows.

(1) Remove the out bin (3.007).

(2) Disengage the mounting bracket of the contact spring assembly from the latch unit.

2.43** ***Separation Between Springs: The clearance between adjacent springs whether the LCH magnet is in the released or the electrically operated position shall be

Min 0.008 inch

Gauge by eye.

2.44 ***Spring Gauging***

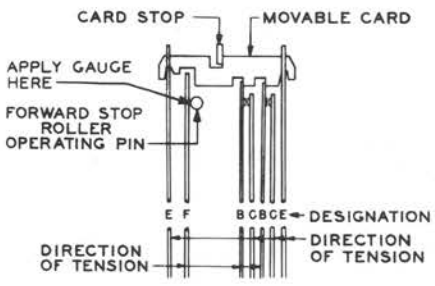


Fig. 38—Spring Tension and Gauging—Latch Assembly

(a) The separation between the B and C spring contacts when a 0.040-inch gauge is inserted between the armature and the backstop screw shall be

Min 0.005 inch

Use the 0.040-inch blade of the KS-6938 gauge, and gauge the separation by eye.

*(b) With the LCH magnet electrically operated, both contacts on the bifurcated springs shall close and the clearance between the ends of the B spring(s) and the right-hand side of the associated notch(es) of the movable card shall be

Min 0.005 inch

Gauge by eye.

2.45 ***Electrical Requirements:*** The LCH magnet armature shall operate to cause the armature to contact the knife edge of the magnet bracket and the nonfreeze plate to contact the magnet core on

Test—Max 275 mA
Readjust—Max 240 mA

Use the 35-type test set. Refer to the appropriate section in Division 100 for 35-type test set connection and operation information. To check the requirement, connect test set to terminals 2 and 8 of the CONT connector.

Punch and Card Feed Assembly (Fig. 39)

2.46** ***Gate Gap: The gate gap [Fig. 40, (A)] of each throat assembly shall be

Min 0.009 inch
Max 0.010 inch

Use the KS-6909 gauge.

Caution: Do not force the gauge.

To check requirement, proceed as follows.

(1) Remove the in bin (3.006).

(2) Loosen the throat stop screw using an Allen wrench, and swing the stop outward to remove the throat assembly.

(3) Lift the throat assembly while pulling gently outward, and remove the assembly.

(4) Insert the straightedge offset portion (not the rounded end) of the gauge into the gap in the same direction as the card is fed. The requirement is met if the 0.009-inch gauge blade enters the gap, and the 0.010-inch blade does not.

2.47 ***Throat Freedom:*** The throat shall move freely within the limits permitted by the guide slots and the throat stop.

2.48 ***Throat Spring Position***

(a) The throat spring shall clear the side of the chain guide channel throughout the length of spring travel. Gauge by eye.

(b) The sides of the throat spring shall be approximately parallel to the sides of the chain guide channel. Gauge by eye.

2.49 ***Throat Spring Tension:*** The tension of each throat spring measured just as the throat assembly contacts the throat stop shall be

Test—Min 60 grams, Max 115 grams
Readjust—Min 75 grams, Max 100 grams

Use the 70J gauge applied to the bottom edge of the throat.

2.50 ***Card Hook Shoe Pressure:*** The pressure of the card hook shoe (Fig. 41) when depressed to the card hook plate shall be

Min 425 grams

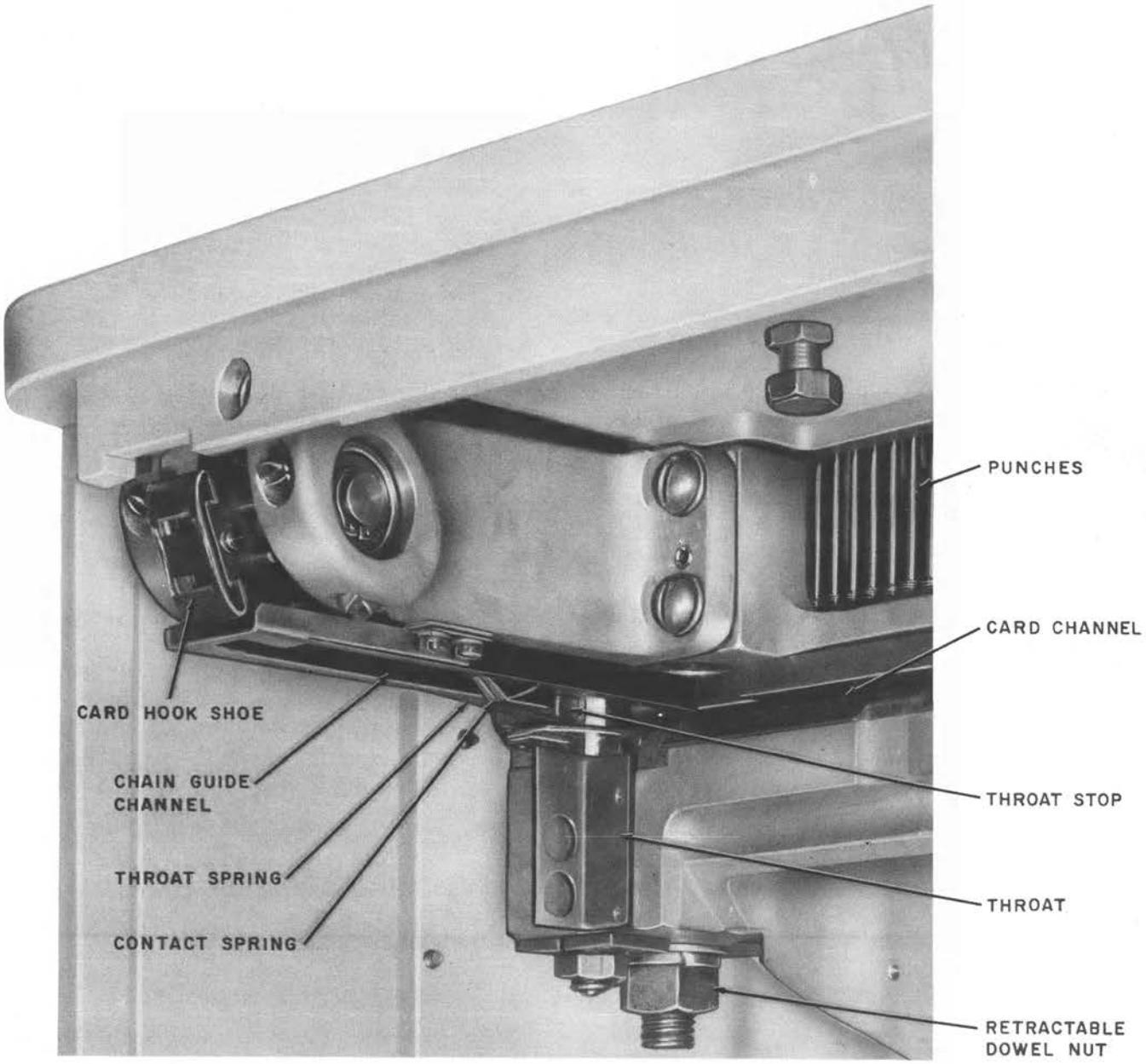


Fig. 39—Punch and Card Feed

Use the 79B gauge. To check the requirement, proceed as follows.

(1) Place the manual control handle on the stub shaft.

(2) Manually operate the LCH armature.

(3) Rotate the handle clockwise.

(4) Release the LCH armature.

(5) Continue to rotate the handle until a pair of card hook shoes are in the vertical position.

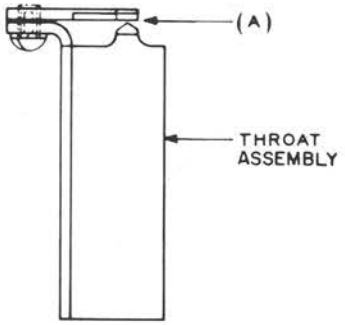


Fig. 40—Gate Gap

(6) Apply the gauge (push finger removed) to the card hook shoe between the card pickup edges at a point slightly ***above center*** as shown in Fig. 41 when checking from the perforator rear (in-bin side).

(7) When checking from the front of the perforator (out-bin side), apply the gauge to the card hook shoe between the card pickup edges at a point slightly ***below center.***

(8) Press inward with the gauge until the portion of the card hook shoe receiving the gauge pressure touches the card hook plate.

(9) Remove the gauge slowly, and observe the gauge reading as the card hook shoe just leaves the card hook plate. Make sure the shoe is parallel to the plate.

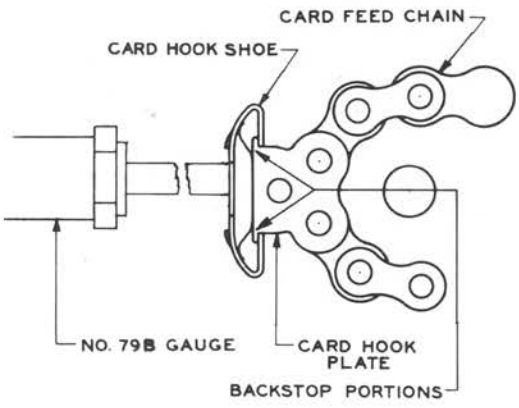


Fig. 41—Card Hook Shoe Pressure

2.51 ***Freedom of Movement of Card Hook Shoe:*** The card hook shall not stick or bind when moved or depressed in any position on the hook link assembly. Gauge by eye and feel. To check the requirement, proceed as follows.

(1) Place the manual control handle on the stub shaft.

(2) Manually operate the LCH armature.

(3) Rotate the handle clockwise.

(4) Release the LCH armature.

(5) Continue to rotate the handle until a pair of card hook shoes are in the vertical position.

(6) Using the KS-6320 orange stick, depress each corner of the card in turn and observe that the shoe returns to the original position when pressure is released.

2.52 ***Card Feed Failure Alarm Contact Spring Position:*** The ends of the contact spring tines shall project beyond the edge of the backstop portion [Fig. 42, (A)] of the spring assembly. Gauge by eye. To check the requirement, proceed as follows.

(1) Place the manual control handle on the stub shaft.

(2) Manually operate the LCH armature.

(3) Rotate the handle clockwise.

(4) Release the LCH armature.

(5) Continue to rotate the handle until a pair of contact spring assemblies is free of the card channel.

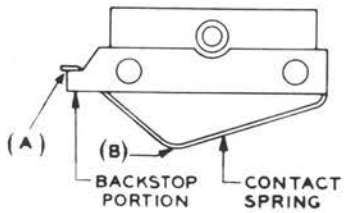


Fig. 42—Contact Spring Position

2.53 ***Card Feed Failure Alarm Contact Spring Tension:*** The tension of each contact spring tine against the backstop portion [Fig. 42, (B)] of the spring assembly shall be

Min 15 grams
Max 45 grams

Use the 70D gauge. To check the requirement, proceed as follows.

(1) Place the manual control handle on the stub shaft.

(2) Manually operate the LCH armature.

(3) Rotate the handle clockwise.

(4) Release the LCH armature.

(5) Continue to rotate the handle until a pair of contact spring assemblies is about to enter the chain guide channel.

(6) Apply the gauge at (B) of Fig. 42, and check the end of the tine at (A) as it leaves the backstop portion of the spring assembly.

In Bin Assembly (Fig. 43)

2.54 ***Platform Latch:*** The latches shall hold the platform securely when the platform is pressed downward to travel limits and then released. Restrain the latching mechanism by using the hands to prevent sudden upward release of the platform. Gauge by eye.

2.55 ***Platform Release:*** Both latches shall release from the platform and permit the platform to move upward when the door is relocated to the closed position and a downward pressure applied on the door. Gauge by eye.

Caution: Before checking this requirement, make sure that there is at least 1/2 pack of cards remaining on the platform (1.14).

2.56 ***Closed Position of Door:*** With the bin platform released, the door in the closed position shall rest upon the buffer strip. Gauge by eye.

2.57 ***Position of Card and Elevator Guide Bar:*** The guide bar shall move freely in the notch of the punch and card feed assembly when the bar is fully engaged in the notch. Gauge by feel.

2.58 ***Card and Elevator Guide Bar Tension:*** The guide bar spring tension measured just as the guide bar tip (Fig. 43) leaves the elevator platform engaging position shall be

Test—Min 20 grams, Max 55 grams
Readjust—Min 25 grams, Max 50 grams

Use the 79C gauge applied to the guide bar tip.

2.59 ***Elevator Spring Tension:*** The pressure required to depress the elevator platform [Fig. 43, (A)] to a point 7 7/8 inches from the in-bin casting base shall be

Test—Min 1050 grams, Max 1350 grams
Readjust—Min 1100 grams, Max 1300 grams

Use the 79F gauge applied to the elevator platform center. To check the requirement, proceed as follows.

(1) Remove the in bin (3.006).

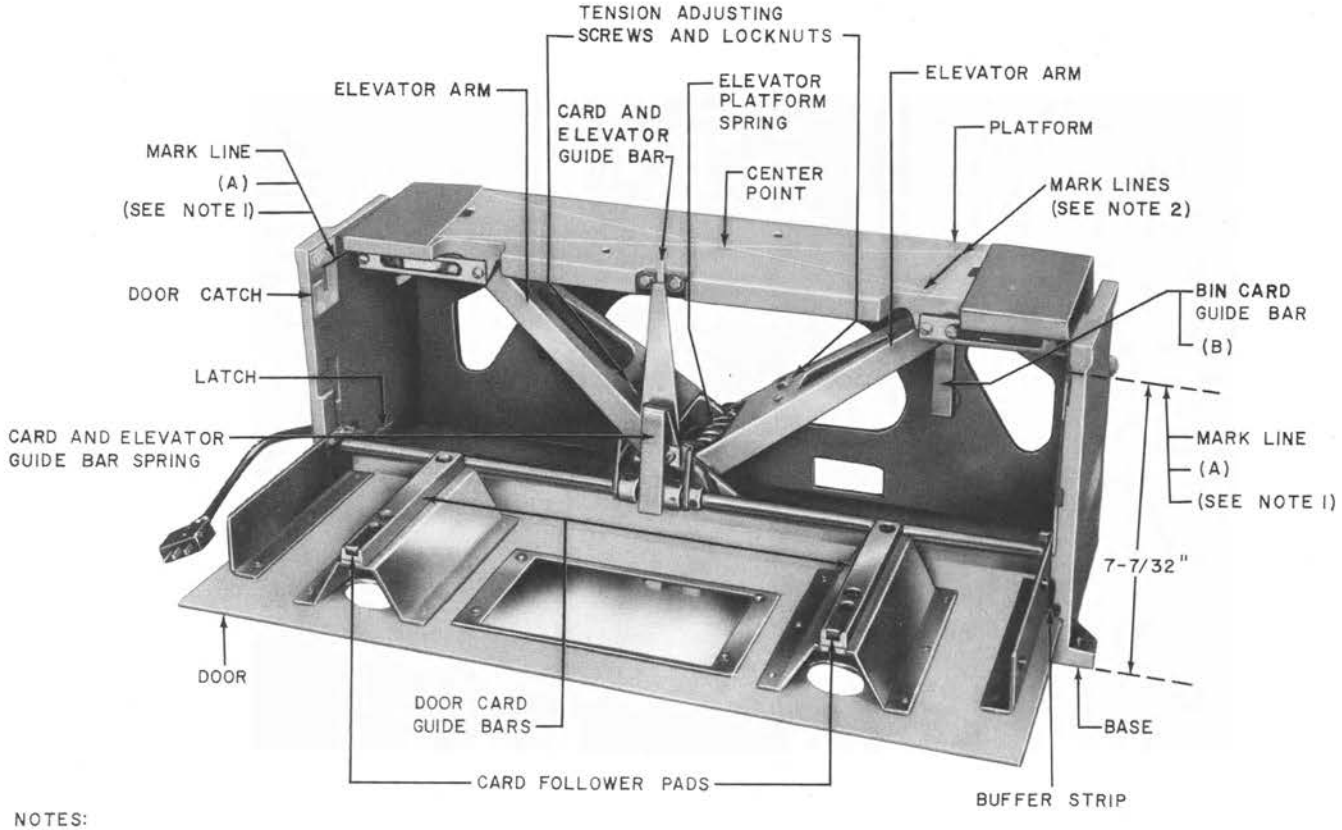
(2) Position the elevator guide bar to engage in the notch of the elevator platform.

(3) Apply the gauge at the center line of the elevator platform.

(4) Check both ends of the platform for this requirement.

Note: If the center point of the elevator platform is not designated by a mark, or if the point to which the platform is to be depressed is not designated by a line or by the reduced height of the sides of the in bin, locate these points as follows. Mark lines 7 7/32 inches up from the bottom of the base on the inside of the ends of the in-bin casting (Fig. 43). Then mark diagonal lines from corner to corner on the top of the elevator platform to locate the center point.

2.60 ***Position of Card Follower Pad:*** The card guide surface of the upper end of the card follower pad [Fig. 43, (A)] shall project above the surface of the door card guide by



NOTES:
1. NOT REQUIRED ON IN-BINS HAVING SCRIBED LINES OR HAVING HEIGHT OF SIDES BEHIND DOOR CATCHES REDUCED TO 7-7/32 INCHES.
2. NOT REQUIRED ON IN-BINS HAVING CENTER POINT OF ELEVATOR PLATFORM DESIGNATED BY MARK.

Fig. 43—In Bin

Min 5/64 inch
Max 7/64 inch

Use the R-8550 scale. To check the requirement, open the in-bin door to the horizontal position.

2.61 ***Freedom of Movement of Card Follower Pad:*** The card follower pad (Fig. 44) shall not stick or bind in the door card guide bar. Gauge by feel. To check the requirement, open the in-bin door to the horizontal position.

2.62 ***Position of Bin Card Guide Bars:*** The card guide bars [Fig. 43, (B)] mounted on the rear of the in-bin casting shall be overflush with respect to the surface of the die plate casting by

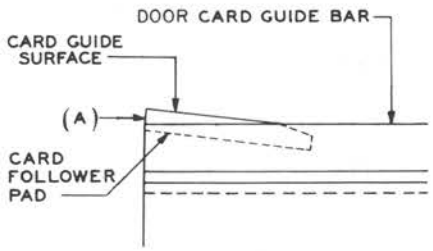


Fig. 44—Position of Card Follower Pad

Min 0.005 inch
Max 0.015 inch

Use the R-8550 scale and KS-6909 gauge. To check the requirement, proceed as follows.

(1) Depress the platform until it latches on both sides by pressing downward evenly on the card stack with the fingers of both hands.

(2) Place the R-8550 scale flat against, but projecting about 1/2 inch beyond, and at right angles to the guide bar at a point parallel to the die casting.

(3) Insert the gauge in the gap between the R-8550 scale and the die plate casting.

2.63 ***Microswitch Operation:*** The WAR microswitch (low-level card alarm) shall not operate when 60 cards or more are in the in bin and in position for card feeding. The microswitch shall operate when the card level is reduced to

Min 40 cards
Max 59 cards

To check the requirement, proceed as follows.

(1) Manually depress the platform evenly until both sides latch, using the fingers of both hands.

(2) Add or remove cards until 60 cards remain on the platform.

(3) Restrain platform rise by bowing a 12-card pack so that the end of the cards are together, and place the bowed cards at one end of the platform.

(4) Place another similarly bowed 12-card stack at the other end of the platform.

(5) Release the platform in the usual manner, and remove both folded card stacks.

(6) Grasp the 60-card stack and platform, using the fingers of both hands, and move the card stack and platform downward several inches.

(7) Release the card stack and platform to allow the platform to rise slowly until the cards contact the chain guide channels.

(8) Repeat (6) and (7) several times, and note that the microswitch does ***not*** click (operate).

(9) Remove 20 cards from the 60-card stack.

(10) Repeat (6) and (7) several times, and note that the microswitch clicks.

Interposer Latches and Selector Magnets

2.64 ***Latch Spring Tension:*** With the latch in the normal position, tension of the latch spring measured just as the latch [Fig. 45, (A)] begins to move shall be

Min 30 grams
Max 60 grams

Use the 79C gauge. To check the requirement, proceed as follows.

(1) Set the eccentric cam shaft dial between 180 and 270 degrees.

(2) Apply the 79C gauge push finger to the tip edge of the armature at the center as shown in Fig. 46, (A).

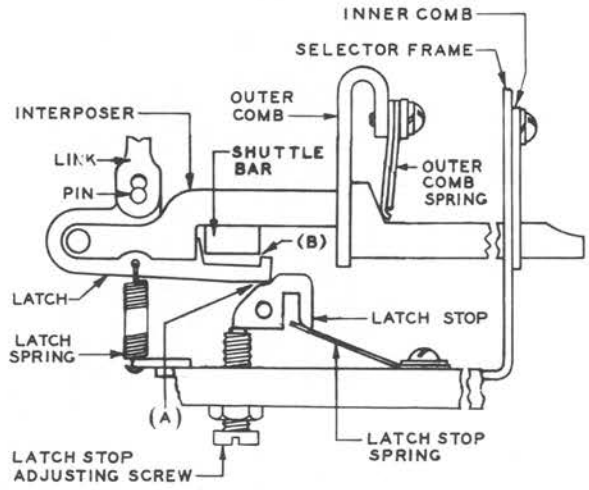


Fig. 45—Latch Spring Tension

2.65 ***Latch Clearance***

(a) When the shuttle bar moves inward [Fig. 45, (B)], the latch shall clear the shuttle bar. Gauge by eye. To check the requirement, proceed as follows.

(1) If checking the perforator ***front*** latches, pull ***up*** on the motor belt moving the

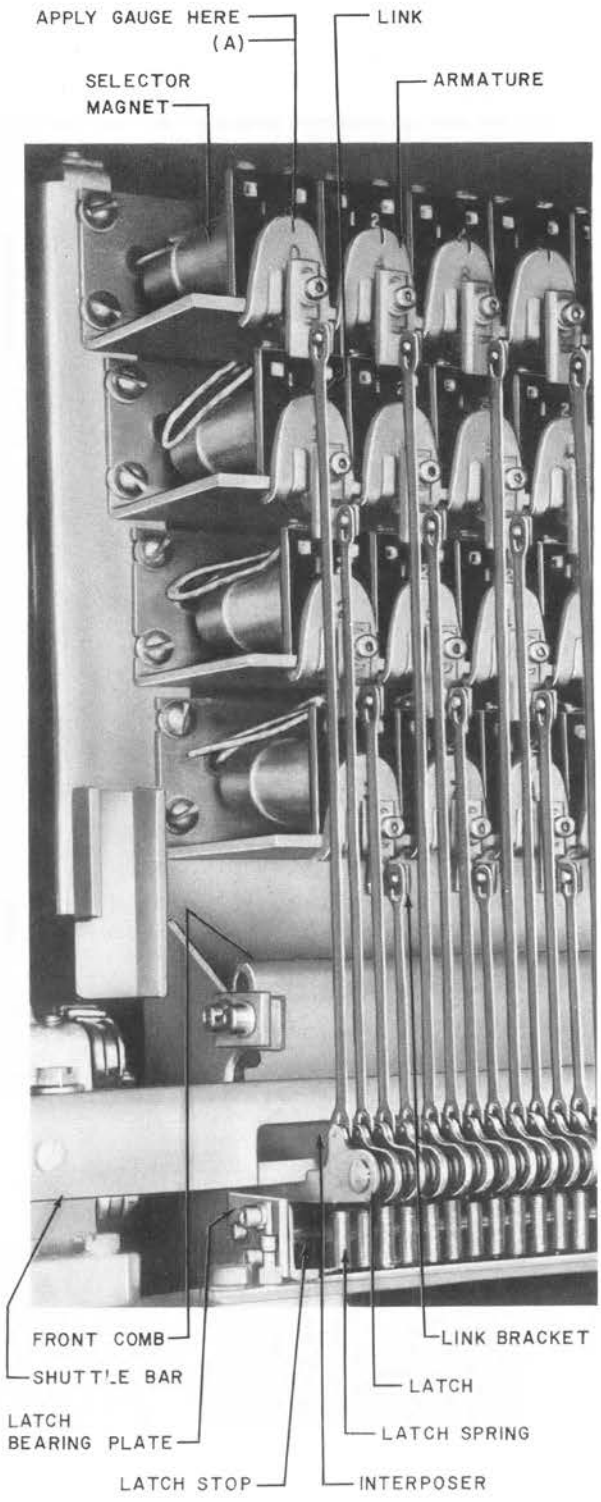


Fig. 46—Selector—Partial View

shuttle bar inward until shuttle bar is over the tip of latch.

(2) If checking the perforator ***rear*** latches, pull ***down*** on the motor belt moving the shuttle bar inward until shuttle bar is over the tip of latch.

(3) Using a KS-6320 orange stick, hold the interposer down and manually operate the associated selector magnet armature. The requirement is considered met if latch movement can be detected.

(b) When the latch is in the normal position [Fig. 45, (A)], the latch shall rest on the step of the latch stop. Gauge by eye.

(c) The latch, when operated, shall clear the top surface of the latch stop when the interposer is moved to the innermost position. Gauge by eye. To check the requirement, proceed as follows.

(1) If checking the perforator ***front*** latches, move the shuttle bar to the outward position by pulling ***up*** on the motor belt.

(2) If checking the perforator ***rear*** latches, move the shuttle bar to the outward position by pulling ***down*** on the motor belt.

(3) Manually operate each selector magnet armature, and move the shuttle bar to the innermost position.

(4) Check for clearance.

(d) When the latch is manually operated with the shuttle bar in the outermost position, the latch shall freely restore. Gauge by feel. To check the requirement, proceed as follows.

(1) If checking the perforator ***front*** latches, move the shuttle bar to the outermost position by pulling ***up*** on the motor belt until the eccentric camshaft dial indicates 180 degrees.

(2) If checking the perforator ***rear*** latches, move the shuttle bar to the outermost position by pulling ***down*** on the motor belt until the eccentric camshaft dial indicates 180 degrees.

(3) Manually operate each selector magnet armature, and note any indication of bind.

(e) The latch stop, in the normal position, shall rest on the end of the latch stop adjusting screw. Gauge by eye.

2.66 ***Locking Position of Latch:*** The latch stop shall lock the latch when the eccentric camshaft dial indicates

Min 285 degrees
Max 315 degrees

Gauge by eye. To check the requirement, proceed as follows.

(1) If checking the perforator ***front*** latches, move the shuttle bar to the outward position by pulling ***up*** on the motor belt.

(2) If checking the perforator ***rear*** latches, move the shuttle bar to the outward position by pulling ***down*** on the motor belt.

(3) Manually operate each selector magnet armature, and move the shuttle bar to the check position as indicated by the camshaft dial.

(4) Release the armature.

(5) Using the tip of the KS-6320 orange stick, press the latch down until the latch stop is reached.

(6) Remove the orange stick from the latch, and note that the interposer remains at the inward position.

2.67 ***Latch Engagement***

(a) When the armature is manually operated with a 0.014-inch gauge inserted in the armature air gap at the core center line [Fig. 47, (A)], the shuttle bar shall engage the latch as the shuttle bar moves inward. Use the KS-16837 gauge and gauge by eye. To check the requirement, proceed as follows.

(1) Move the shuttle bar to the inward position by pulling up on the motor belt.

(2) Manually operate the armature with the gauge inserted in the air gap.

(b) When the armature is manually operated with a 0.024-inch gauge inserted in the armature air gap at the core center line [Fig. 47, (A)], the shuttle shall ***not*** engage the latch as the shuttle bar moves inward. Use the KS-16831 gauge and gauge by eye. To check the requirement, proceed as follows.

(1) Move the shuttle bar to the inward position by pulling up on the motor belt.

(2) Manually operate the armature with the gauge inserted in the air gap.

2.68 ***Armature Air Gap:*** With the magnet armature engaging the backstop tines, the gap [Fig. 47, (A)] between the armature and magnet core, measured at the core center line, shall be

Test—Max 0.041 inch
Readjust—Max 0.039 inch

Use the KS-14320 gauge.

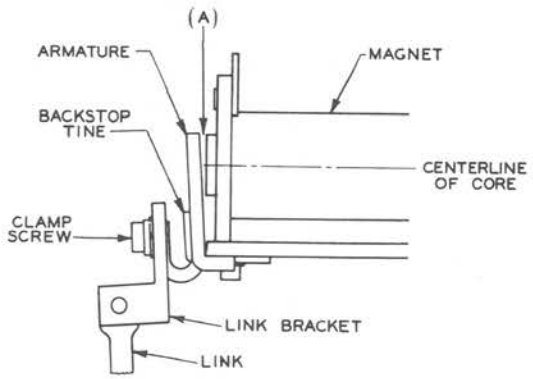


Fig. 47—Armature Air Gap

2.69 ***Electrical Requirements***

(a) ***Operation of Selector Magnet:*** The selector magnet shall operate, without hesitation, an amount sufficient to cause the armature nonfreeze plate to engage the core on

Test—Max 44 mA
Readjust—Max 38 mA

Use the 35-type test set. Refer to the appropriate section in Division 100 for 35-type test set test

connection and operation information. Disconnect the associated BG and BW plugs from the trouble recorder jacks before proceeding with requirement check. To check the requirement, proceed as follows.

(1) Move the shuttle bar to the outward position by pulling up on the motor belt.

(2) Connect test set to selector magnet under test.

(b) ***Release of Selector Magnet:*** The release of the selector magnet shall meet the selector magnet released test as follows:

No. 1 Crossbar—Section (not available)

No. 4 and 4M Toll—Section 212-101-501

No. 5 Crossbar—Section 218-218-502

Crossbar Tandem—Section 220-463-501

Step-by-Step—Section 227-203-500.

Operation

2.70 ***Card Feed and Perforation:*** With a minimum of 4 cards and a maximum of 460 cards in place for card feeding and the perforator operating from electrical power:

(a) The card feed hooks shall engage only one card at a time.

(b) The throats shall pass only one card at a time.

(c) Perforations shall be vertically located within an area bounded by the top of the number or symbol and the line above the number or symbol. Gauge by eye.

(d) Perforations shall be cut entirely through the card.

(e) The perforator shall return reliability to home position (1.05) under a 100 percent perforating load.

3. ADJUSTING PROCEDURES

3.001 ***List of Tools, Gauges, Materials, and Test Apparatus***

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
48	7/32- and 1/4-inch hex. double-end socket wrench and screwdriver
179	Spring adjuster
236	9/16-inch hex. open single-end offset wrench
245	3/8- and 7/16-inch hex. open double-end flat wrench
270	Spring adjuster
303	Spring adjuster
340	Adjusting key
363	Spring adjuster
417A	1/4- and 3/8-inch open double-end flat wrench
418A	5/16- and 7/32-inch open double-end flat wrench
455A	Adapter
485A	Smooth-jaw pliers
486A	Oilcan
510C	Portable lamp [Must be equipped with 561A straight tip or the 562B offset tip and W2BL (48-volt) cord.]
563A	90-degree offset screwdriver
564A	45-degree offset screwdriver
565A	90-degree offset screwdriver
566A	45-degree offset screwdriver

CODE OR SPEC NO. TOOLS	DESCRIPTION
KS-6320	Orange stick (2 required)
KS-8511	4-1/2 inch bent tweezers
KS-14164	Brush
KS-14322	Torque rod
KS-14334	3/4-inch 12-point box wrench
KS-14335	7/16-inch open offset box wrench
KS-14336	Screwdriver
KS-14349	Nozzle
KS-14377 L5	Vacuum cleaner (or equivalent) equipped with KS-14377 L30 flexible nozzle (or equivalent)
P-220366	Dental mirror
R-1102	Spudger
R-1770	1/2- and 9/16-inch hex. double-end flat wrench
R-2485	5/32-inch Allen socket screw wrench
R-2512	Adjustable wrench
R-2670	3/32-inch Allen socket screw wrench
R-2671	1/8-inch Allen socket screw wrench
R-2958	5/64-inch Allen socket screw wrench
R-2959	1/16-inch Allen socket screw wrench
R-2964	7/32-inch Allen socket screw wrench
R-2965	Adjustable mirror
R-2966	No. 5 artist's flat stiff brush (2 required)
R-2967*	1/8-inch straight Allen wrench with handle
R-2968*	5/32-inch straight Allen wrench with handle

*The R-2967 and R-2968 straight Allen wrenches with handle are intended to supplement the Allen wrenches specified herein when parts are inaccessible or when sufficient torque cannot be developed using the Allen wrenches.

CODE OR SPEC NO. TOOLS	DESCRIPTION
R-3193	9/32- and 11/32-inch open double-end flat wrench
R-3415	7/64-inch Allen socket screw wrench
R-3416	9/64-inch Allen socket wrench
R-3449	9/64-inch Allen straight wrench
R-5850	5/8- and 3/4-inch open double-end offset wrench
▶R-2969	Typewriter brush, toothbrush-type (2 required)◀
—	3-inch C screwdriver
—	4-inch E screwdriver
—	5-inch E screwdriver
—	3/8-inch, 12-point offset box and 3/8-inch 1160 open-end wrench, J.H. Williams & Company
GAUGES	
62B	0-700 gram gauge
70D	50-0-50 gram gauge
70H	0-30 gram gauge
70J	0-150 gram gauge
79B	0-1000 gram push-pull tension gauge
79C	0-200 push-pull tension gauge
79F	0-6000 push-pull tension gauge
83B	Gauge

CODE OR SPEC NO.	DESCRIPTION
GAUGES	
92S	0.002-inch nonmagnetic offset thickness gauge
92T	0.005-inch nonmagnetic offset thickness gauge
92W	▶0.008-inch◀ nonmagnetic offset thickness gauge
KS-3008	Stopwatch
KS-6909	Thickness gauge nest
KS-6938	Thickness gauge nest
KS-14320	0.039- and 0.041-inch double-end thickness gauge
KS-16837	0.014- and 0.024-inch double-end thickness gauge
R-8550	6-inch steel scale
—	No. 5 tachometer, Boulin Instruments (or equivalent)
MATERIALS	
KS-2423	Twill cloth
KS-6824	Sealing compound
KS-7187	Bell seal bond paper, substance No. 20, 1/2 by 2 1/2 inches
KS-7470	Oil
KS-7471	Grease
KS-7860	Petroleum spirits
KS-14666	Cloth
KS-19578 L1	Trichloroethane
KS-19139	Lubricant
—	▶ARAPEN* lubricant No. 295, Exxon Company◀

*Registered trademark of the Exxon Company.

—	12-inch length of rubber tubing (1/2-inch inside diameter)

CODE OR SPEC NO.	DESCRIPTION
TEST APPARATUS	
35-type	Test set
322A	Plug
—	893 cord [6 feet long, equipped with two 360A tools (1W13B cord) and two KS-6278 tool]
P-11B750	Clip

3.002 When reference is made in the procedures to the use of an Allen wrench, select the proper size Allen socket screw wrench from the Allen wrenches listed in 3.001.

3.003 ***Removing Outer Covers:*** To remove the outer covers of the perforator, proceed as follows.

(1) Make sure the perforator is made busy in accordance with 1.11.

(2) Insert a coin into the slotted head of the lockscrew(s), and turn the screw(s) one-fourth turn counterclockwise.

3.004 ***Removing and Remounting Top Cover of Clutch Drive Unit:*** To remove the top cover of the clutch drive unit (Fig. 14), proceed as follows.

(1) Remove the two mounting screws from the top cover using an Allen wrench.

(2) Remove the cover by moving the cover forward to disengage from the projection at the housing rear.

(3) To remount the cover, tighten the mounting screws only enough to hold the cover firmly in place.

3.005 ***Removing and Remounting Front Cover of Clutch Drive Unit:*** To remove the front cover of the clutch drive unit (Fig. 14), proceed as follows.

(1) Remove the contact spring assembly cover by sliding the cover upward.

(2) Remove the four mounting screws from the cover using a 4-inch E screwdriver.

(3) Rearrange the cable downward so that the cable clears the cover bottom.

(4) Dismount the cover from the pins and move to the right to clear the control spider and at the same time move the right-hand side of the cover outward so that the contact spring assembly clears the housing.

(5) Swing the cover outward and to the right enough to gain access to the parts inside the housing.

(6) Remount the cover in the reverse order of removal, and tighten the screws securely.

3.006 ***Removing and Remounting In Bin:*** To remove and remount the in bin, proceed as follows.

(1) Lower the front cover of the bin.

(2) Depress the platform downward evenly, using the fingers of both hands on the card stack, until the platform latches on both sides.

(3) Remove the remaining cards from the platform.

(4) Remove the ALMB plug (Fig. 1).

(5) Using an Allen wrench, remove both in bin mounting screws and slide the bin out.

(6) Disengage the card in the channel from the card hook shoes. Remove and dispose of the card.

Note: Before remounting the bin, inspect the bottom surface, bin center guide channel, and the perforator contacting surfaces for dirt and foreign particles. Clean in accordance with 3.01(2), as required.

(7) Slide the bin into place against the stops. Replace and securely tighten the mounting screws to remount the bin.

(8) Reconnect the ALMB plug.

(9) Proceed in accordance with 4.01 if cards are to be added.

(10) Close the door, and press downward to release the elevator.

(11) Feed a card into place in the channel in accordance with 4.01(20) through (25).

3.007 ***Removing and Remounting Out Bin:*** To remove and remount the out bin (Fig. 48), proceed as follows.

(1) Remove the out bin mounting screws using an Allen wrench.

(2) Slide the bin out.

Note: Before remounting the bin, inspect the bin and perforator contacting surfaces for dirt and foreign particles. Clean in accordance with 3.01(7) as required.

(3) Slide the bin into place to remount the bin.

(4) Replace and securely tighten the mounting screws.

3.008 ***Removing Gear and Chain Covers:*** Use an Allen wrench and 418A wrench or the 565A and 566A screwdrivers.

3.009 ***Removing and Remounting Punch and Card Feed Assembly:*** To remove and remount the punch and card feed assembly, proceed as follows.

(1) Remove the in bin (3.006).

(2) Remove the out bin (3.007).

(3) Using an Allen wrench, remove both mounting screws from the chaff bin; then remove the chaff bin.

(4) Remove the ALMB plug.

(5) Loosen the setscrew or clamp screws of the driving member of the feed coupling using an Allen wrench.

(6) Slide the member to the left until disengaged, and remove the coupling key plate.

Caution: When removing the punch and card feed assembly, take special care to note the number and position of shims

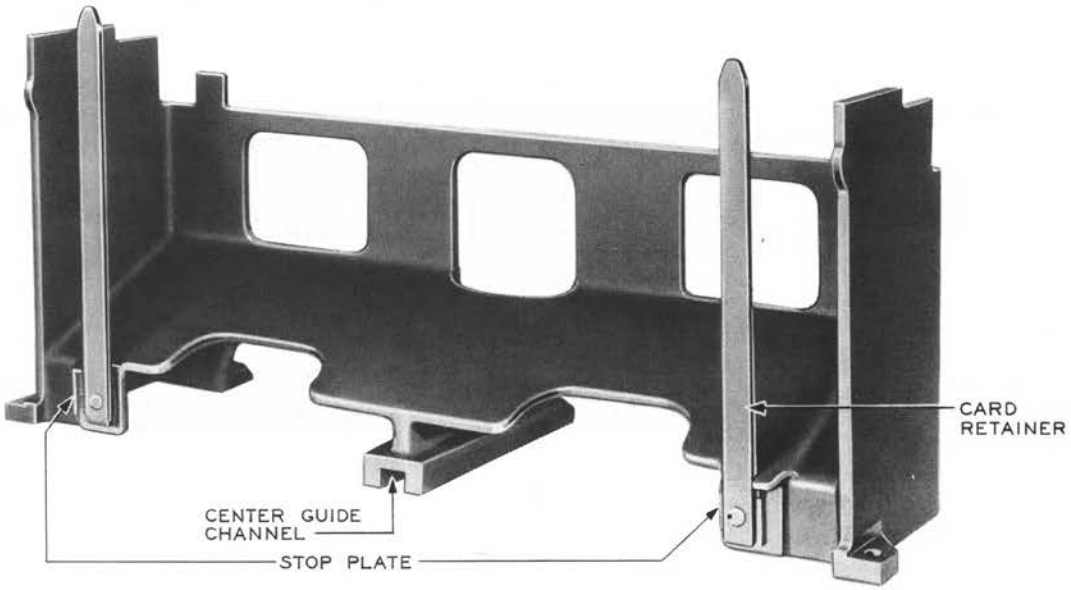


Fig. 48—Out Bin—Initially Furnished

at the mounting screw holes. Some of the shims may remain on the mounting surfaces in the perforator and others on the punch and card feed assembly. Make sure these shims are not damaged or lost as they may be of different thicknesses and must be returned to their original positions before the punch and card feed assembly is remounted.

(7) Using an Allen wrench, remove all except two mounting screws and washers at opposite ends of the punch and card feed assembly.

Note: In some cases the washers may remain in the mounting screw holes. Make sure the washers are all removed and kept with the mounting screws to prevent loss.

(8) Support the assembly, and remove the last two mounting screws and washers.

(9) Carefully lower the punch and card feed assembly, and remove from the perforator. Note the position and number of shims at the mounting screw holes.

Note: Before remounting the punch and card feed assembly, visually check the punches and punch retractor mechanism for damaged parts and missing punch retaining rings. Refer to Section 034-305-801 for ordering, piece-part, and replacement information as required.

(10) Remount the punch and card feed assembly in reverse order of removal. Tighten the screws equally in turn until all are securely tightened.

(11) Remount the card feed coupling key plate.

(12) Rotate the coupling driven member, as required, to move the index line into alignment [2.07(f)].

(13) Hold the coupling members together, and tighten the screws(s).

(14) Remount the chaff bin, out bin, and in bin.

(15) Reconnect the ALMH plug.

3.010 ***Removing and Remounting Punch and Card Feed Die Support Casting:*** To remove and remount the punch and card feed die support casting, proceed as follows.

(1) Remove the in bin (3.006).

(2) Remove the out bin (3.007).

(3) Remove the two mounting screws from the chaff bin using an Allen wrench.

(4) Remove the two throat assemblies in accordance with 3.45.

(5) Turn the two retractable nuts located on the ends of the die support casting, as viewed from the threaded bolt ends, clockwise, using the R-1770 wrench until the retractable dowel is turned out 3/4 to 7/8 inch.

Note: The retractable dowel nut should tighten at this point. Do not force the nut beyond this point.

Caution: When removing the die support casting, take special care to note the number and position of shims at the mounting stud holes. Make sure these shims are not damaged or lost as they may be of different thicknesses and must be returned to their original positions before the die support casting is remounted.

(6) While supporting the die support casting and using the R-2512 wrench, remove both of the die support casting mounting nuts located just behind the retractable dowel nuts.

(7) Carefully lower the die support casting, and remove from the perforator. Note the position and the number of shims which may be present at the mounting stud holes.

Note: Before remounting the die support casting, visually check the top surface of the die plates and remove any lint by using a stiff bristled typewriter brush, R-2969.

(8) Turn the retractable dowel nuts, as viewed from the threaded bolt ends, counterclockwise until the retractable dowels project approximately 5/16 inch above the die support casting.

(9) Mount the shims over the dowel ends, and position the dowel ends over the casting mounting holes.

(10) Using both hands, slide the die support casting on the mounting studs, seating the dowels in the punch and card feed base casting holes.

(11) While tightly holding the die support casting against the punch and feed casting, mount the washers and nuts and tighten the nuts until fingertight.

(12) Using the R-1770 wrench, turn the retractable dowel nuts, as viewed from the threaded bolt ends, counterclockwise into the casting until the washer on the dowel end is within 1/32 inch of touching the dowel nut.

(13) Turn the retractable dowel nuts clockwise one-half turn.

(14) Securely tighten the mounting nuts using the R-2512 wrench.

(15) Remount the throat assemblies, chaff bin, out bin, and in bin.

3.011 ***Method of Connecting 35-Type Test Set:*** When using the 35-type test set to check current requirements, arrange the test set for B/G application. Connections to the apparatus under test should be made from the test set T and R terminals, using leads connected to terminals indicated in the requirement. For other 35-type test set information, refer to the appropriate section in Division 100.

General

3.01 ***Cleaning***

(1) Clean spring assembly and cam switch unit contacts in accordance with the appropriate section in Division 069.

(2) Clean selector magnet armature(s) and core(s) as follows.

(a) Insert KS-7187 paper between the armature and core.

(b) Press the armature toward the core, using a KS-6320 orange stick so that a slight pressure exists between the paper strip and parts being cleaned.

(c) Withdraw the paper, taking care not to tear the paper when removed.

(d) Repeat (1) through (3) until the paper strip shows no evidence of dirt. Use a clean paper strip for each operation.

(3) Clean frame covers and external parts with a clean KS-14666 cloth.

(4) Loosen the lint from the card engaging edges of the card hook shoe, using a stiff bristled typewriter brush. Remove the loosened lint wth a vacuum cleaner.

(5) Clean the card channel openings as follows.

(a) Remove the in bin (3.006).

(b) Remove the out bin (3.007).

(c) Loosen any lint accumulations on the card channel openings, using a stiff bristled typewriter brush. Remove the loosened lint with the vacuum cleaner.

(6) ***Emptying Chaff Bin***

(a) ***Chaff Bin Without Cleanout Hole in Window:*** To empty the chaff bin, proceed as follows.

(1) Remove the in bin (3.006).

(2) Remove the out bin (3.007).

(3) Remove the two mounting screws from the chaff bin using an Allen wrench.

(4) Remove the chaff bin, and dispose of the contents.

(5) Remount and secure the bin. Make sure the chaff-bin window faces the out bin.

(6) Remount the out bin and in bin.

(b) ***Chaff Bin With Cleanout Hole in Window:*** A chaff bin with cleanout hole is emptied without removing the bin from the perforator. To empty the chaff bin, proceed as follows.

(1) Connect one end of the 1/2-inch inside diameter 12-inch length rubber tubing to the 455A adapter.

(2) Cut the other tubing end to an approximate 45-degree angle.

(3) Connect the adapter to the vacuum cleaner hose.

(4) Remove all cards from the out bin.

(5) Reach through the center hole in the out bin, and swing the pivoted cover on the chaff-bin window upward to gain access to the cleanout hole.

(6) Insert the rubber tubing into the cleanout hole, and empty the chaff bin using the vacuum cleaner.

(7) When the chaff bin is empty, remove the rubber tubing and restore the pivoted cover to the original position over the cleanout hole.

(7) ***General Cleaning:*** For general cleaning, proceed as follows.

(a) Remove lint and other loose material from the perforator with the vacuum cleaner.

(b) Remove oily residue from accessible parts, including the inside of the covers, by wiping with a KS-2423 twill cloth moistened with KS-7860 petroleum spirits.

(c) Follow by wiping the parts with a clean, dry KS-2423 twill cloth.

3.02 ***Lubrication***

(1) ***KS-7470 Oil:*** Apply the specified oil quantity indicated in Table A to parts shown on Fig. 3 through 8 using the 486A oilcan and KS-14164 brush. Use the KS-14349 nozzle when lubricating with the 486A oilcan.

(2) ***ARAPEN Lubricant No. 295:*** Apply the lubricant using an R-2966 brush. Remove any excess from the sides of the gears using a KS-2423 cloth.

(3) ***KS-7471 Grease:*** Apply the grease using a different R-2966 brush than that used for ARAPEN lubricant No. 295.

(4) To gain access to the asterisk (*) items of the punch and card feed mechanism, cam drive assembly, and the eccentric shafts, the punch and card feed mechanism removal in accordance with 3.009 is required.

(5) After lubrication is completed, operate the perforator under electrical power for a short period to distribute the lubricants.

3.03 ***Record of Lubrication:*** The SD-4-1275 form used during the period of perforator installation by installers to record lubrication dates shall be turned over to the operating company when the installation is complete.

Overall

3.04 ***Engagement of Card Feed Coupling***

(1) If the card feed coupling backlash is unsatisfactory, replace the parts in accordance with Section 034-305-801.

(2) If the coupling endplay is unsatisfactory, loosen the drive member clamping screws and reposition in accordance with 3.009(11) through (15).

3.05 ***Chain Tension***

(1) Adjust the spring tension of the idler sprocket on the clutch drive to cam switch chain by loosening the locknut and turning the adjusting nut. Use the R-1770 and 236 wrenches. Securely tighten the locknut.

(2) Using an Allen wrench, adjust clutch drive to hand drive tension by slightly loosening the screw which holds the idler sprocket mounting bracket. Tap the bracket base forward to decrease or backward to increase chain tension. Take care to maintain idler sprocket with hand drive and clutch drive alignment. Securely tighten the screws.

3.06 ***Motor and Pulley Assembly Position***

(a) If the motor does not clear the latch unit, proceed as follows.

(1) While supporting the motor by hand, operate the release lever of the take-up bracket and push the bracket forward to release the drive belt tension.

(2) Ease the motor down against the motor release pin.

(3) If the perforator is equipped with a motor spring, pull on the ringed handle of the motor spring to disengage the handle pin part from the arm.

(4) Carefully swing the motor upward while supporting the motor, and remove the motor belt from both the idler pulley and the eccentric camshaft pulleys.

(5) Remove the belt from the motor pulley.

(6) While supporting the motor, pull the motor release pin to the left and carefully swing the motor outward until the mounting bracket is vertical and the seated pin prevents the motor from dropping.

(7) Loosen the motor stopscrew locknut using the 417A wrench.

(8) Turn the screw clockwise with the 4-inch E screwdriver.

(9) Securely tighten the locknut.

(10) Perform 2.06(a) and readjust, as required, until the motor just clears the latch unit with the motor stopscrew against the frame.

Note: Further screw adjustment in the clockwise direction limits the allowable motor belt stretch range.

(11) Reposition the motor, and remount the belt in reverse order.

(12) Pull backward on the take-up bracket to remove motor belt slack.

(13) Continue to pull backward on the take-up bracket while lifting the motor and with the motor supported by the belt until the mounting plate is approximately midway between allowed limits.

(14) If the requirement cannot be met because the take-up bracket is at the bracket travel limit, the belt is excessively stretched and should be replaced in accordance with Section 034-305-801.

3.07 ***Phasing***

(a) If the eccentric camshaft dial requirement is not met, proceed as follows.

(1) Loosen the dial hub setscrews using an Allen wrench.

(2) Reposition the dial so that the eccentric camshaft gear dot is adjacent to and in line with the dot on the mating gear when the dial indicates 180 degrees.

(3) Securely tighten the setscrews.

(b) If the clutch drive dial (where provided) and the eccentric cam shaft dial do not correspond, proceed as follows.

(1) Set the eccentric camshaft dial to indicate 0 degrees.

(2) Loosen the four screws which hold the Geneva drive gear using an Allen wrench.

(3) Hold the Geneva drive gear stationary, and rotate the clutch drive dial with the fingers until the dial corresponds.

(4) Securely tighten the screws.

(c) If the M cam dial and eccentric camshaft dial do not correspond, proceed as follows.

(1) Loosen the gear clamp screws which drive the M cam using an Allen wrench.

(2) Rotate the M cam with the fingers while holding the gear stationary until the eccentric camshaft dial and the M cam dial correspond.

(3) Securely tighten the screws.

(d) If the intermittent clutch rotation requirement is not met, proceed as follows.

(1) Remove the gear guard using an Allen wrench and 418A wrench or the 565A and 566A screwdrivers.

(2) Set the eccentric cam shaft dial at 200 degrees by pulling upward on the motor belt.

(3) Remove the two clutch drive mounting screws at the front of the unit using an Allen wrench.

(4) Loosen the mounting screws, located under the rear of the unit just above the mounting plate, enough to disengage the gears using the 4-inch E screwdriver.

(5) As viewed from the end of the gear shaft, rotate the Geneva drive gear clockwise until the intermittent drive member just begins to move.

(6) Reengage the gears in this position.

(7) Securely tighten the rear mounting screws.

(8) Remount and securely tighten the front mounting screws.

(9) Perform 2.07(d) and readjust as required.

(e) If the brake cam position requirement is not met, proceed as follows.

(1) If the clearance between the backward stop pawl and the notch in the brake cam stop pawl and the notch in the brake cam is not satisfactory, proceed as follows.

(a) Where the clearance is ***too large,*** insert the 0.005 blade of the KS-6909 gauge between the backward stop pawl and the notch in the brake cam and loosen the clamp screws using an Allen wrench.

(b) Hold the brake cam stationary, and turn the manual control handle sufficiently clockwise until the forward stop roller seats against the stop cam.

(c) Tighten the screws equally and securely.

(d) Perform 2.07(e)(1).

(e) Where the clearance is ***too small,*** loosen the clamp screws and slightly turn the manual control handle counterclockwise to increase the clearance.

(f) Temporarily tighten the clamp screws.

(g) Turn the manual control handle clockwise.

(h) Insert the KS-6909 gauge 0.005 blade between the backward stop pawl and the notch in the brake cam, and loosen the clamp screws using an Allen wrench.

(i) Hold the brake cam stationary, and turn the manual control handle clockwise until the forward stop roller seats against the stop cam.

(j) Tighten the screws equally and securely.

(k) Perform 2.07(e)(1).

(2) If the face of the brake cam does not lie wholly within the face of the brake roller, proceed as follows.

(a) Loosen the clamp screws using an Allen wrench.

(b) Slide the brake cam along the shaft as required.

(c) Temporarily tighten the clamp screws.

(d) Perform 2.07(e)(1) and readjust as required.

(e) Tighten the screws equally and securely.

(f) If the card feed mechanism requirement is not met, proceed as follows.

(1) Assure that the perforator is in the home position (1.05), and perform 2.07(e) as required.

(2) Loosen the clamping screws of the card feed coupling driven member using an Allen wrench.

(3) Rotate the punch and card feed drive shaft to align the index lines just as a card hook is leaving the chain guide.

(4) Reposition the coupling drive member in accordance with 3.009(11) through (15).

(g) If the intermittent clutch alignment requirement, for the later arrangement, is not met, proceed as follows.

(1) Perform 2.05(b) and 2.07(e) as required.

(2) Assure that the perforator is in the home position (1.05).

(3) Loosen the clamping screws of the hand drive sprocket located just below and to the left of the clutch drive unit by using an Allen wrench.

(4) Rotate the sprocket as required.

(5) Tighten the clamping screws equally and securely.

(h) If the K cam requirement is not met, proceed as follows.

(1) Perform 2.07(g) as required.

(2) Loosen the clamping screws of the gear that drives the K and L cam gears inside the cam switch housing using an Allen wrench.

(3) Rotate the K cam as required.

(4) Tighten the clamp screws equally and securely.

(5) Perform 2.07(h).

(i) If the L cam requirement is not met, proceed as follows.

(1) Perform 2.07(h) as required.

(2) Loosen the L cam gear clamp screws using an Allen wrench.

(3) While holding the L cam gear stationary, rotate the L cam with the fingers until the dials are in alignment.

(4) Tighten the clamp screws equally and securely.

(5) Perform 2.07(i).

(j) If the brake cam requirement is not met, proceed as follows.

(1) Perform 2.07(i) as required.

(2) Lower the motor [3.06(a)].

(3) Loosen the brake arm backstop screw locknut using the 1160 Williams wrench.

(4) Adjust the brake arm backstop screw, as required, using an Allen wrench.

(5) Securely tighten the locknut.

(6) Reposition the motor [3.06(a)].

3.08 *Eccentric Shaft Speed*

(a) ***Perforators Equipped With Adjustable Motor Pulleys:*** If the requirement is not met, proceed as follows.

(1) Disconnect the MP and CONT plugs.

(2) Remove the in bin (3.006).

(3) Remove the gear and pulley guard mounted on the left side of the cam switch using an Allen wrench.

(4) Release the take-up bracket level and slide the idler forward to release drive belt tension.

(5) Push the motor forward to release motor pulley tension.

(6) Support the motor and slip the belt over the side of the eccentric camshaft pulley.

(7) Loosen the setscrew in the wide flange of the pulley using an Allen wrench.

Note: Turn the setscrew out sufficiently to clear the threads of the adjustable flange to avoid setscrew thread damage when the flange is rotated on the shaft.

(8) Hold the wide flange of the pulley stationary with the left hand, and rotate the adjustable flange with the right hand through 180 degree arc(s) as required.

Note: Turning the adjustable flange 180 degrees will change the speed of the eccentric shaft approximately 25 RPM; 360 degrees will change the speed approximately 50 RPM. Adjustments should be made in 180-degree steps in order to allow the setscrew to engage a flat surface on the threaded portion of the adjustable flange.

(9) Rotate the flange, as viewed from the motor shaft end, clockwise to decrease the eccentric shaft speed or counterclockwise to increase speed.

(10) Securely tighten the setscrew, taking care that the setscrew contacts a flat surface on the threaded portion of the adjustable flange.

(11) Remount the motor belt.

(12) Reconnect the MP and CONT plugs.

(13) Perform 2.08 and readjust as required.

(14) Remount the in bin (3.006).

(15) Remount the guard.

(b) ***Perforators Equipped With Nonadjustable Pulleys:*** If the requirement cannot be met, refer to Section 034-305-801 for ordering and replacement information.

Cam Switch Assembly

3.09 *Position of Mainspring Shoe on Cam*

(a) If the edge of the shoe does not rest flat on the low portion of the cam, adjust the mainspring with the 303 spring adjuster applied to the spring at a point just below the feather spring rivets.

(b) If the shoe sides are not wholly within the cam surface or the side clearance is unsatisfactory, proceed as follows.

Note: When making this adjustment, exercise extreme care not to shift the mainspring upward or downward in order not to affect the contact make and break of the cam switch.

(1) Loosen slightly the mainspring clamping screws using the 3-inch C screwdriver.

(2) Shift the mainspring position laterally as required.

(3) Securely tighten the clamping screws.

(c) If the vertical center line of the mainspring is not approximately perpendicular to the camshaft axis, proceed as follows.

Note: When making this adjustment, exercise extreme care not to shift the mainspring upward or downward in order not to affect the contact make and break of the cam switch.

(1) Loosen slightly the mainspring clamping screws using the 3-inch C screwdriver.

(2) Shift the mainspring position laterally as required.

(3) Securely tighten the clamping screws.

3.10 ***Mainspring Shoe Pressure:*** If the mainspring shoe pressure to cam is unsatisfactory, apply the 303 spring adjuster to the mainspring at a point near the mainspring clamping screws. With the shoe resting on the lower portion of the cam, adjust the spring toward the cam to increase the pressure or away from the cam to decrease pressure. Sharp bends or excessive bows in the spring should be avoided.

3.11 ***Feather Spring Stud Pressure:*** To adjust the feather spring stud pressure, proceed as follows.

(1) Remove the four terminal assembly strip mounting screws (Fig. 10) using the 4-inch E screwdriver.

(2) Move the assembly strip, as permitted by the skinners, to gain access to the feather springs. Exercise care not to damage the wires.

(3) To adjust the feather spring stud pressure against the mainspring, apply the 270 spring adjuster to the feather spring at a point near the rivets (Fig. 11) which attach the feather spring to the mainspring.

(4) Move the handle of the mainspring adjuster upward to decrease pressure or downward to increase pressure.

(5) Remount the terminal assembly strip, and dress the skinners.

(6) Inspect all connections for loose and broken wires.

(7) ▶Check contact alignment (2.13).◀

3.12 ***Feather Spring Alignment:*** If the feather spring is not approximately flat or parallel with the mainspring, proceed as follows.

(1) Remove the four terminal assembly strip screws in accordance with 3.11.

(2) Adjust the feather spring using the 270 spring adjuster applied to a point midway between the feather spring rivets and the feather spring stud.

(3) Move the spring adjuster handle horizontally or vertically, as required, to straighten the spring. Exercise care that no sharp kinks are produced.

(4) Perform 2.11 and readjust as required.

3.13 ***Contact Alignment***

(a) If the feather spring contact and contact screw are not in alignment, proceed as follows.

(1) Loosen the screws which hold the individual contact screw and terminal using the 3-inch C screwdriver.

(2) Shift the contact screw as required.

(3) Securely tighten the mounting screws.

(b) If all contacts of either the K cam or L and M cams are out of alignment in the same direction, the terminal assembly strip may be shifted to correct the misalignment. Proceed as follows.

(1) Loosen the mounting screws of the terminal assembly strip using the 4-inch E screwdriver.

(2) Adjust the terminal assembly strip as required.

(3) Securely tighten the mounting screws.

3.14 ***Make and Break of Cam Switch Contacts***

Note 1: K, L, and M cam contact adjustment may be checked by using local battery and the 510C test lamp connected in series with an individual pair of contacts. The lamp will indicate contacts opened or closed.

Note 2: The cam switch contacts may be altered to meet requirements listed in Table C by adjusting the contact screw(s) in or out or by shifting the mainspring(s) up or down. Contact screw adjustment and mainspring shifting, in combination, may also be used to achieve the requirement. Before making any adjustment, consider contact adjustment effects and mainspring shifting effects produced upon contact make and break as shown in Table D.

TABLE D

ADJUSTMENT 3.14 GUIDE

ADJUSTING CONTACT SCREW	EFFECT ON CONTACTS	
	MAKE	BREAK
OUT	LATER	EARLIER
IN	EARLIER	LATER
SHIFTING MAINSPRING	**EFFECT ON CONTACTS**	
	MAKE	BREAK
UP	LATER	LATER
DOWN	EARLIER	EARLIER

(a) To adjust the contact screw, proceed as follows.

(1) Loosen the locknut using the 48 combination wrench and screwdriver tool.

(2) Turn the contact screw, as required, using the 48 combination wrench screwdriver portion.

(3) Securely tighten the locknut(s) after each adjustment.

(4) Perform 2.14.

(b) To shift the mainspring, proceed as follows.

(1) Loosen the mainspring clamping screws using a 3-inch C screwdriver.

(2) Shift the spring as required.

(3) Securely tighten the clamping screws.

(4) Perform 2.09 and 2.10.

(5) Readjust the contact screw in accordance with 3.13(a).

Clutch Drive Assembly

3.15 ***Position of Pointer (Where Provided):*** To adjust the pointer, loosen the pointer mounting screws using the 3-inch C screwdriver, shift the pointer with the fingers as required, and securely tighten the screws.

3.16 ***Clearance Between Centering Plungers and Centering Arm:*** To adjust the clearance between the centering plungers and the spider control centering arm, proceed as follows.

(1) Loosen both adjusting bushing clamp screws using an Allen wrench.

(2) Advance or back off slightly each bushing in turn, as required, using the fingers or the 340 adjusting key.

(3) Securely tighten the clamp screws.

(4) Perform 2.16.

3.17 ***Pressure of Centering Plungers:*** To adjust the pressure of the centering plunger, proceed as follows.

(1) Loosen both adjusting bushing clamp screws using an Allen wrench.

(2) Back off on both adjusting bushings using the fingers or the 340 adjusting key.

(3) Adjust the pressure of the plunger by turning the adjusting nut with the R-3193

wrench while holding the plunger stationary by means of a 340 adjusting key inserted into the hole near the end of the plunger.

(4) As viewed from the threaded end of the plunger, turn the nut clockwise to increase pressure or counterclockwise to decrease pressure as required.

(5) Adjust the clearance between plungers and control spider centering arm in accordance with 2.16.

(6) Securely tighten the bushing clamp screws.

(7) Perform 2.16.

3.18** ***Separation Between Intermittent Clutch Members (Earlier Arrangement)

(a) To adjust the separation between the flat surface of the flange at the base of each tooth of the intermittent clutch drive member and the nearest point on the associated driven member, proceed as follows.

(1) Remove the clutch drive unit in accordance with Section 034-305-801.

(2) Loosen the INT solenoid locknut using the KS-14334 wrench.

(3) Adjust the separation between the clutch members by turning the adjustable core using the 340 adjusting key. Turn the core, as viewed from the outer end of the core, clockwise to increase separation or counterclockwise to decrease separation as required.

(4) Securely tighten the locknut.

(5) Perform 2.18(a).

(6) Remount the clutch drive unit.

(b) To adjust the separation between the drive and intermittent clutch drive member, proceed as follows.

(1) Adjust the position of the centering plungers by loosening both adjusting bushing clamp screws using an Allen wrench.

(2) Position the adjusting bushings using the fingers or 340 adjusting key in accordance with 2.16 and 2.17.

(3) Securely tighten the bushing clampscrews.

(4) Perform 2.16 and 2.17.

(c) To adjust the separation between the intermittent clutch drive and driven members, proceed as follows.

(1) Remove the clutch drive unit in accordance with Section 034-305-801.

(2) Loosen the CONT solenoid locknut using the KS-14334 wrench.

(3) Adjust the separation between the intermittent clutch members by turning the adjustable core using the 340 adjusting key. Turn the core, as viewed from the outer end of the core, counterclockwise to increase the separation or clockwise to decrease separation as required.

(4) Securely tighten the locknut.

(5) Perform 2.18(c).

(6) Remount the clutch drive unit.

3.19 ***Pressure of Antioverthrow Pawl:*** If the pawl spring pressure requirement cannot be met, replace the spring. Refer to Section 034-305-801 for ordering and piece-part information.

3.20 ***Freedom of Antioverthrow Pawl:*** If gummy oil accumulation prevents free pawl movement, proceed as follows.

(1) Flush the bearing using KS-7860 petroleum spirits applied with the KS-14164 brush. Place a folded KS-2423 twill cloth below the bearing to prevent the petroleum spirits from dripping on equipment below and prevent splatter upon adjacent perforator parts.

(2) Exercise the pawl bearing to loosen the deposit.

(3) Relubricate the bearing in accordance with 2.02 when the parts have dried.

(4) Perform 2.22.

3.21 ***Position of Cocking Stop:*** To adjust the cocking stop position, proceed as follows.

Note: The purpose of the antioverthrow pawl is to prevent the jaws of the intermittent clutch members from reengaging when the CONT solenoid is released at the completion of a trouble record. The adjustable cocking stop positions the antioverthrow pawl when the continuous clutch is electrically operated so that, upon the release of the clutch, the checking arm will effectively engage the adjustable checking stop.

(1) Loosen the cocking stop mounting screws using the 3-inch C screwdriver.

(2) Shift the stop left to raise or right to lower the cocked checking arm position as required.

(3) Securely tighten the mounting screws.

3.22 ***Position of Checking Stop:*** To adjust the checking stop position, proceed as follows.

(1) Refer to 3.21 ***Note.***

(2) Loosen the cocking stop mounting screws using the 3-inch C screwdriver.

(3) Shift the stop up or down to align with the cocked position of the antioverthrow pawl checking arm as required.

(4) Shift the stop right to increase or left to decrease the gap between the intermittent clutch members when in the cocked position.

(5) Securely tighten the mounting screws.

(6) Bend the stop as required to meet 2.22(c).

3.23 ***Clearance Between Movable Card and Card Operating Stud***

(a) To adjust for clearance between the movable card and card operating stud on a spring assembly which does not have a pinned spring assembly bracket, proceed as follows.

(1) Loosen the contact spring assembly mounting bracket screws using the 4-inch E screwdriver.

(2) Shift the assembly as required.

(3) Securely tighten the mounting bracket screws.

(b) To adjust the clearance between the movable card and card operating stud on a spring assembly which does have a pinned spring, proceed as follows.

(1) Remove the bracket mounting screws from the contact spring assembly using the 4-inch E screwdriver.

(2) Remove the cable clamp mounting screw.

(3) Carefully pry the mounting bracket off the pins of the contact spring assembly mounting plate using the 4-inch E screwdriver.

(4) Carefully rearrange the spring assembly and attached wires away from the perforator and let the cable supported spring assembly hang in front of the perforator. Do not break wires or damage springs.

(5) Remove the contact spring assembly mounting plate screws.

(6) Pry the mounting plate from the mounting pins of the clutch drive assembly housing.

(7) Remove the pins from the spring assembly mounting plate.

(8) Remount the plate on the clutch drive assembly.

(9) Carefully remount the contact spring assembly on the spring assembly mounting plate.

(10) Adjust the assembly as required.

(11) Securely tighten the mounting screws.

(12) Perform 2.28, 2.29, and 2.30.

(13) Apply a small amount of KS-6824 sealing compound to the side and ends of the mounting bracket and adjacent mounting surface using the KS-14164 brush.

3.24 ***Contact Alignment:*** If contacts are not properly aligned, replace the contact spring assembly. Refer to Section 034-305-801 for ordering and piece-part information.

3.25 ***Spring Tang Position:*** If the requirement is not met, proceed as follows.

(1) Perform 3.26.

Note: If the requirement cannot be met by adjusting the stationary card, no attempt should be made to adjust individual springs in the pileup.

(2) Perform 2.25.

(3) If 2.25 cannot be met now, replace the contact spring assembly. Refer to Section 034-305-801 for ordering and piece-part information.

3.26 ***Card Stop Position:*** To adjust the stationary card or card stop position, proceed as follows.

(1) Loosen the screws which hold the stationary card and card stop to the mounting bracket using the 3-inch C screwdriver.

(2) Adjust the card stop or stationary card as required.

(3) Securely tighten the screws.

3.27 ***Clearance Between Moving Springs and Card:*** If the relation between the ends of the spring and the movable card is unsatisfactory, replace the contact spring assembly. Refer to Section 034-305-801 for ordering and piece-part information.

3.28 ***Spring Tension:*** To remove the contact spring assembly, proceed as follows.

(1) Remove the four screws that secure the mounting plate to the clutch drive casting using the 4-inch E screwdriver.

(2) Remove the mounting plate from the dowel pins, and move to the right sufficiently to clear the control spider.

(3) Swing the mounting plate out, and rotate sufficiently to gain access to the springs.

Note 1: Do not attempt to remove the two distinct kinks from the springs because the springs have been pretensioned (formed before assembly) and removing the kinks will destroy the adjustment. If spring tension, contact pressure, or separation between springs is not satisfactory, radjust the spring(s) in 3.28, 3.29, and 3.30 in sequence.

Note 2: If the spring pileup and movable card are saturated with oil, replace the spring contact assembly. Refer to Section 034-305-801 for ordering and piece-part information.

(a) ***Balancing Springs:*** Adjust tension of each balancing spring by applying the 485A pliers to the spring just above the pileup. Tension the spring in the direction shown in Fig. 31. Take care that the spring is not twisted from front to rear.

(b) ***Stationary Card Springs:*** Adjust the springs in accordance with (a). Take care that adjacent springs are not disturbed.

(c) ***Moving Springs:*** Adjust tension of each moving spring using the 363 adjuster applied to the spring just above the pileup. Adjust the spring using a minimum of operations because repeated adjustments may damage the spring.

3.29 ***Separation Between Springs:*** To adjust the separation between springs, use the 485A pliers and adjust as required. If the requirement cannot be met due to excessively worn spring contacts, replace the spring contact assembly. Refer to Section 034-305-801 for ordering and piece-part information.

3.30 ***Spring Gauging:*** To adjust for spring gauging, proceed as follows.

(1) Adjust the C spring tangs right or left as required using the 485A pliers.

(2) Hold the tip of the spring away from the card using the KS-6320 orange stick when adjusting the tang toward the stationary card.

Note: Regard the condition as satisfactory where the spring tang does not rest flat on the spoolheads. However, any appreciable tang twist from front to rear is undesirable.

(3) If both B spring contacts do not leave the C spring at approximately the same time, which may be due to unequal tension of the bifurcations of the B spring, adjust the rear bifurcation using the 363 adjuster.

(4) Remount the contact assembly mounting plate.

(5) Securely tighten the screws.

(6) Perform 2.23 and adjust as required.

(7) Perform 2.28, 2.29, and 2.30.

3.31 ***Electrical Requirements***

(a) If the CONT solenoid does not meet the electrical requirement, reduce the pressure of the lower centering plunger slightly in accordance with 3.17.

(b) If the INT solenoid does not meet the electrical requirement, reduce the pressure of the upper centering plunger slightly in accordance with 3.17.

Latch Assembly

3.32 ***Brake Cam Position***

(a) If the clearance between the backward stop pawl and notch in the brake cam is not satisfactory, proceed as follows.

(1) If the clearance is ***too large,*** insert the 0.005-inch blade of the KS-6909 gauge between the backward stop pawl and the notch in the brake cam.

(2) Loosen the clamp screws using an Allen wrench.

(3) Hold the brake cam stationary, and turn the manual control handle sufficiently clockwise until the forward stop roller seats against the forward stop cam.

(4) Tighten the screws equally and securely.

(5) Perform 2.32.

(b) If the clearance is ***too small,*** loosen the clamp screws and turn the manual control handle slightly counterclockwise to increase the clearance.

(7) Temporarily tighten the clamp screws.

(8) Turn the manual control handle clockwise.

(9) Insert the 0.005-inch blade of the KS-6909 gauge between the backward stop pawl and the brake cam notch.

(10) Hold the brake cam stationary, and turn the manual control handle sufficiently clockwise until the forward stop roller seats against the forward stop cam.

(11) Tighten the screws equally and securely.

(12) Perform 2.32.

(b) If the face of the brake cam does not lie wholly within the face of the brake roller, proceed as follows.

(1) Loosen the clamp screws using an Allen wrench.

(2) Slide the brake cam along the shaft as required.

(3) Temporarily tighten the screws.

(4) Perform 2.32.

(5) Tighten the screws equally and securely.

Latch Assembly

3.33 ***Pressure of Forward Stop Roller:*** To adjust the pressure of the forward stop roller, proceed as follows.

(1) Loosen the forward stop roller nut using the 418A wrench, holding adjustable screw stationary with the KS-14336 screwdriver.

Note: Access to the adjusting screw is just below the mounting plate through the hole in the casting on the contact spring side.

(2) Turn the adjusting screw clockwise to decrease tension or counterclockwise to increase tension as required.

Caution: Excessive tension applied to either the locknut or screw will break the screw.

(3) Securely tighten the locknut.

3.34 ***Armature Retaining Spring Tension:*** To adjust the tension of the armature retaining spring against the magnet bracket, proceed as follows.

(1) Using the 417A wrench, loosen the screw which holds the spring and remove the spring from the bracket.

(2) Slightly bend the spring downward to disengage from the bracket pin.

(3) Pull the spring forward and remove.

(4) Using the 485A pliers, hold the forked end of the spring back of the bend and tension the spring as required.

(5) Remount the spring.

(6) Securely tighten the screws.

3.35 ***Armature Base Gap:*** Using the 417A wrench to adjust the armature base gap, loosen the armature retaining spring holding screw and adjust the spring position in or out as required.

3.36 ***Clearance Between Armature and Backstop Screw:*** To adjust the clearance, loosen the locknut using the 418A wrench and adjust the screw in or out, as required, using an Allen wrench. Securely tighten the locknut.

3.37 ***Pawl Spring Tension:*** To adjust the pawl spring tension, proceed as follows.

(1) Loosen the pawl spring adjusting collar locknut using the 418A wrench, while holding the collar stationary with the KS-14335 wrench.

(2) Turn the collar, as viewed from the right, slightly clockwise to increase tension or counterclockwise to decrease the tension as required.

(3) Securely tighten the locknut.

3.38 ***Contact Alignment:*** If contacts are not properly aligned, replace the contact spring assembly (Section 034-305-801).

3.39 ***Spring Tang Position:*** If the spring tang position requirement is not met, proceed as follows.

(1) Perform 3.40 and adjust the stationary card.

(2) If the spring tang position requirement still cannot be met, replace the contact spring assembly (Section 034-305-801).

Note: No attempt should be made to adjust the individual springs in the pileup.

3.40 ***Card Stop Position:*** To adjust the stationary card or card stop position, proceed as follows.

(1) Loosen the screws which hold the stationary card and card stop to the mounting bracket using the 563A and 564A offset screwdrivers.

(2) Adjust the card stop or stationary card as required.

(3) Securely tighten the screws.

3.41 ***Clearance Between Moving Springs and Card:*** If the clearance between moving springs and movable card does not meet the requirement, replace the contact spring assembly (Section 034-305-801).

3.42 ***Spring Tension:*** To disengage the mounting bracket, remove the mounting bracket screws.

Note: Do not attempt to remove the two distinct kinks from the springs because the springs have been pretensioned (formed before assembly) and removing the tension will destroy the adjustment. If the spring tension, contact pressure, or separation between springs is not satisfactory, readjust spring(s) in 3.42, 3.43, and 3.44 in sequence. If the requirement(s) cannot be met, replace the spring assembly in accordance with Section 034-305-801.

(a) ***Balancing Springs:*** Adjust tension of both balancing springs by applying the 485A pliers to the spring just above the pileup. Tension the spring in the direction shown in Fig. 38.

Take care that the spring is not twisted from front to rear.

(b) ***Stationary Card Springs:*** Adjust tension of the spring(s) in accordance with (a).

(c) ***Moving Springs:*** Adjust the tension of the spring(s) using the 363 adjuster applied to the spring just above the pileup. Adjust the spring using a minimum of operations because repeated adjustments may damage the spring.

(d) ***Card Operating Spring:*** Adjust the spring tension in accordance with (a), and perform 2.33. Any adjustment of this spring has a direct effect upon the forward stop roller pressure.

3.43 ***Separation Between Springs:*** To adjust separation between springs, use the 485A pliers and adjust as required. If the requirement cannot be met due to excessively worn spring contacts, replace the contact spring assembly. Refer to Section 034-305-801 for ordering and piece-part information.

3.44 ***Spring Gauging:*** If the spring gauging requirement on both pairs of springs is not met, proceed as follows.

(1) Loosen the mounting bracket screws using the 4-inch E screwdriver.

(2) Position the contact spring assembly left or right, as required, for best general relation of the C springs and movable card.

(3) Securely tighten the screws.

(4) Adjust individual C spring tangs, as required, using the 485A pliers while holding the top of the spring away from the card with the KS-6320 orange stick.

Note: Regard the condition as satisfactory where the spring tang does not rest flat on the spoolhead. However, any appreciable tang twist from front to rear is undesirable.

3.45 ***Electrical Requirements***

(a) If the LCH magnet does not fully operate, reduce slightly the forward stop roller pressure in accordance with 3.33.

(b) If the LCH magnet hesitates in operating, increase the card operating tension in accordance with 3.42(d) or decrease the armature base gap in accordance with 3.35.

Punch and Card Feed Assembly

3.46 ***Gate Gap:*** To adjust the throat gate gap, proceed as follows.

(1) Remove the horizontal top plate using the 3-inch C screwdriver.

(2) Remove or add shims as required.

(3) Remount the horizontal top plate, and securely tighten the plate mounting screw.

(4) Remount the throat assembly in reverse order of removal.

(5) Swing the throat into place against the casting.

(6) Securely tighten the screw.

Note: Failure to meet the requirement is due to excessive or insufficient shim thickness (Fig. 49) between the horizontal top plate and horizontal top plate mounting surface. Two types of shims are provided: The P-485091 shim (0.001 inch thick) and P-484435 shim (made up of 0.002-inch laminations), arranged so that laminations may be removed as required.

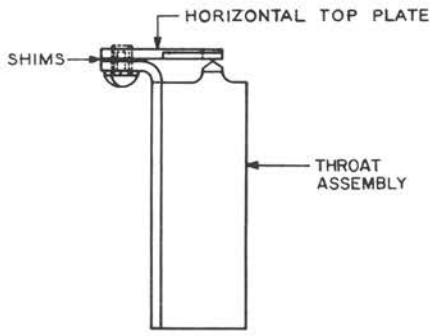


Fig. 49—Gate Gap

3.47 ***Throat Freedom:*** If the throat binds or sticks, proceed as follows.

(1) Remove the throat assembly in accordance with 2.46.

(2) Clean the contacting surfaces of the throat and guide plate using a clean KS-2423 twill cloth moistened with KS-7860 petroleum spirits.

(3) Clean the guide plate slots and throat guide pins using a clean portion of the KS-2423 twill cloth wrapped around a KS-6320 orange stick moistened with KS-7860 petroleum spirits.

(4) Wipe the parts dry using a clean KS-2423 twill cloth.

(5) Remount the throat assembly in accordance with 2.46.

3.48 ***Throat Spring Position:*** Using the 3-inch C screwdriver, adjust the throat spring position by loosening both mounting screws and position the spring as required. Securely tighten the screws.

3.49 ***Throat Spring Tension:*** Adjust the throat spring tension using the 179 spring adjuster applied at the base of the spring. Adjust the spring upward to decrease the tension or downward to increase the tension as required.

3.50 ***Card Hook Shoe Pressure:*** If the card hook pressure does not meet the requirement, replace the card hook spring (Section 034-305-801).

3.51 ***Freedom of Movement of Card Hook Shoe:*** If the card hook shoe does not restore to original position after being depressed, inspect the contacting surfaces of the card hook shoe and link assembly to determine the obstruction location(s). Replace the card hook shoe or link assembly as required (Section 034-305-801).

3.52 ***Card Feed Failure Alarm Contact Spring Position:*** If the contact spring assembly position does not meet the requirement, replace the contact spring assembly (Section 034-305-801).

3.53 ***Card Feed Failure Alarm Contact Spring Tension:*** If the contact spring assembly line tension does not meet the requirement, replace the contact spring assembly (Section 034-305-801).

In Bin

3.54 ***Platform Latch:*** If the latch does not engage the platform due to a weak or broken spring, replace the spring (Section 034-305-801). If proper platform release still cannot be obtained, platform catches P-484208 (shown in Section 034-305-801, Fig. 12) may need adjustment. Proceed as follows. Remove in-bin assembly per 3.006. Loosen screws in catches, and shift catches to a position that will facilitate an earlier release.

Note: Make sure catches securely hold platform in its down position for safe future maintenance procedures. Gauge by eye.

3.55 ***Platform Release:*** If the buffer strip is high and prevents proper platform release, loosen the five buffer strip screws using the 4-inch E screwdriver and adjust the strip as required. Securely tighten the screws.

3.56 ***Closed Position of Door:*** If the buffer strip is low and the door, in the closed position, does not rest upon the buffer strip, loosen the five buffer strip screws using the 4-inch E screwdriver and adjust the strip as required. Securely tighten the screws.

3.57 ***Position of Card and Elevator Guide Bar:*** To correct for bind, loosen the four setscrews in the guide bar positioning collars located on the door hinge rod using an Allen wrench. Slide the guide bar left or right, as required, and securely tighten the setscrews.

3.58 ***Card and Elevator Guide Bar Tension:*** To adjust the guide bar spring tension, pry the spring away from the guide bar to increase tension using the 4-inch E screwdriver. To decrease tension, grasp the spring tip with the forefinger and thumb and pull outward. Perform 2.58.

3.59 ***Elevator Spring Tension:*** To adjust the elevator spring tension, proceed as follows.

(1) Loosen the locknut of each tension adjusting screw using the 245 wrench.

(2) Turn both screws one-fourth turn clockwise to increase tension or counterclockwise to decrease tension as required.

Note: Any subsequent adjusting screw adjustment(s) should be accomplished in one-fourth turn steps. Avoid increasing the tension too much which causes card feed failures due to excessive friction between the card and the chain guide channel card guide surfaces.

(3) Securely tighten the locknuts.

(4) Perform 2.59.

3.60 ***Position of Card Follower Pad:*** To adjust the card follower pad, proceed as follows.

(1) Expose the upper adjusting nut by grasping the opened door with the left-hand thumb and forefinger, as shown in Fig. 50, and exert pressure on the end of the pad so as to force the pad into the channel in the card guide bar.

(2) Raise the door to a convenient angle.

(3) Adjust the nut using the 485A pliers by turning the nut clockwise to lower the pad position or counterclockwise to raise the pad position as required.

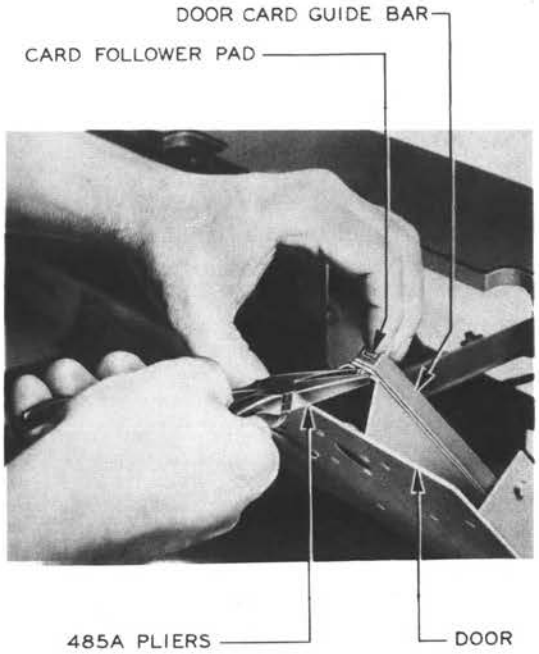


Fig. 50—Method of Adjusting Card Follower Pad

3.61 ***Freedom of Movement of Card Follower Pad:*** If the card follower pad sticks or binds, proceed as follows.

(1) Remove any dirt or other loose material accumulation from the card follower pad and adjacent surfaces using the vacuum cleaner.

(2) Wipe clean the pad and adjacent surfaces using a KS-2423 twill cloth slightly moistened with KS-7860 petroleum spirits.

(3) Wipe the parts with a clean, dry KS-2423 twill cloth.

3.62 ***Position of Bin Card Guide Bars:*** If the bin card guide bar position does not meet the requirement, proceed as follows.

Note: The irregularity may be due either to the in-bin location or to in-bin stop positions.

(1) To relocate the in bin, loosen the in-bin mounting screws using an Allen wrench.

(2) Shift the in bin as far as possible.

(3) Securely tighten the mounting screws.

(4) Perform 2.62.

(5) If the requirement is not met, remove the out bin (3.007).

(6) Loosen the in-bin stop mounting screws using an Allen wrench.

(7) Loosen again the in-bin mounting screws.

(8) Shift the in-bin position until satisfactory.

(9) Securely tighten the in-bin mounting screws.

Note: Make sure that both bin card guide bars are overflush approximately the same amount.

(10) Slide the in-bin stops toward the in bin until the stops are in contact with the in-bin locating feet.

(11) Securely tighten the stop mounting screws.

(12) Remount the out bin (3.007).

3.63 ***Microswitch Operation:*** To adjust the microswitch position, proceed as follows.

(1) Loosen the two microswitch mounting screws using the 3-inch C screwdriver inserted into the holes in the front of the in bin just below the buffer strip.

(2) Shift the switch position as required.

(3) Securely tighten the screws.

Interposer Latches and Selector Magnets

3.64 ***Latch Spring Tension***

(a) If the spring tension is insufficient, replace the spring (Section 034-305-801).

(b) If the spring tension is excessive, proceed as follows.

(1) Disconnect the spring from the latch using the KS-8511 tweezers.

(2) Test the latch for bind, and if present, clean the bearing with KS-7860 petroleum spirits applied with the KS-14164 brush.

(3) If no bind is located in the latch, link, or armature, replace the spring.

Note: If bind is located in the link or armature, refer to Section 034-305-801 for ordering, piece-part, and replacing procedure information.

(4) When the parts have dried, lubricate in accordance with 2.02.

(5) Reconnect the spring.

3.65 ***Latch Clearance***

(a) ***Failure of Latch to Clear Shuttle Bar:*** If the latch rests upon the latch stop, lower the stop position by adjusting the latch stop as follows.

(1) Remove the shuttle bar guide and shims located at the middle of shuttle bar using an Allen wrench.

Note: To loosen the screws which hold the latch stop bearing plates, modify an Allen wrench by filing a notch around the six sides, breaking off the short end to a length of 1/4-inch, and removing any burrs.

(2) Loosen the bearing plate mounting plate screws just enough to permit adjusting the stop using the modified wrench.

(3) Adjust the stop up or down, as required, by tapping or prying on the bearing plates using the 3-inch C screwdriver.

(4) Securely tighten the screw and adjusting nut.

(5) Remount the shuttle bar and shims.

(6) Tighten the bearing plate screws.

(b) ***Failure of Latch to Rest on Latch Stop:*** If the latch does not rest upon the latch stop, proceed as follows.

(1) Check for link vertical play.

Note: Vertical play of the link is indicated when possible to operate the armature slightly without lifting the latch. A small amount of link play is desirable but not necessary if other requirements can be met.

(2) If no play is evident, loosen link bracket clamp screw using an Allen wrench.

(3) Tap the bracket down to increase vertical play or up to decrease vertical play as required.

Note: Avoid increasing the play to the extent that a considerable amount of lost motion results between the latch and armature because other requirements may be difficult to meet.

(4) Securely tighten the screw.

(5) Perform 2.65(b).

(6) If the requirement cannot be met, reposition the outer comb assembly in accordance with outer comb replacement procedure in Section 034-305-801.

(c) ***Failure of Latch to Clear Latch Stop Top Surface:*** If the latch stop does not clear the top of the latch, perform 3.65(b).

(d) ***Failure of Latch to Restore Freely:*** If the latch fails to restore freely, clean the armature hinge, link connections, and latch bearing stud with KS-19578 L1 trichloroethane applied with a clean KS-14164 brush. Relubricate in accordance with 2.02.

3.66 ***Locking Position of Latch:*** Failure to meet the requirement indicates that the latch stop is too low or too far in toward the perforator center. Adjust the stop in accordance with 3.65(a). Perform 2.66 and 2.65(b) on all latches associated with the stop.

3.67 ***Latch Engagement:*** Failure to meet the requirement may be due to excessive link vertical play. Adjust the link bracket in accordance with 3.65(b).

3.68 ***Armature Air Gap:*** If the requirement is not met, proceed as follows.

(1) Apply the tip of the R-1102 spudger to the end of each backstop tine in turn, and press slightly inward to decrease the armature air gap. Adjust each tine equally.

(2) If the armature does not contact both tines or if necessary to increase armature air gap, insert the short end of the R-2670 wrench vertically between the armature back and the turned up portion to which the link bracket is attached. Bear downward on the long end of the wrench with a finger, pivoting the armature backward to equalize the position of the tines.

(3) Perform 2.68.

3.69 ***Electrical Requirements***

(a) ***Operation of Selector Magnet:*** If the requirement is not met, decrease the armature air gap in accordance with 3.68. Adjust the vertical link play, as required, in accordance with 3.65(b). Then perform 2.65 through 2.68.

(b) ***Release of Selector Magnet:*** If the selector magnet fails to meet the interposer magnet release test, proceed as follows.

(1) Apply a P-11B750 clip over the armature, as shown in Fig. 51.

(2) If a P-11B750 clip has been previously applied and is now worn or damaged, remove the clip by grasping the tab at the top of the clip with the KS-8511 tweezers.

Note: Before mounting the clip, make sure that the P-11B750 clip is not wrinkled or deformed.

(3) Place the clip on a flat surface with the tab facing upward.

(4) Grasp the clip tab with the KS-8511 tweezers, and hold the clip with the tab at the top.

(5) Carefully position the clip flat portion on the armature inner surface, and move the clip downward so that the clip legs fit over the outer surface of the armature.

(6) Centrally position the clip on the armature, as shown in Fig. 51.

(7) Perform 2.67 and 2.68.

(8) Perform 2.69.

Note: When the clip is mounted on the armature, the legs obscure the stamped numerals designating the selector magnet position number. The selector magnet may be readily identified by reference to the schematic on the inside of both upper covers of the perforator or by carefully raising the clip with the tweezers and then repositioning the clip.

Operation

3.70 ***Card Feed and Perforation***

(a) If the requirement is not met, the failure may be due to card feed irregularities. Perform 2.46 through 2.50.

(b) If the requirement is not met, proceed as follows.

(1) If perforations on both halves of the card are out of alignment in one direction,

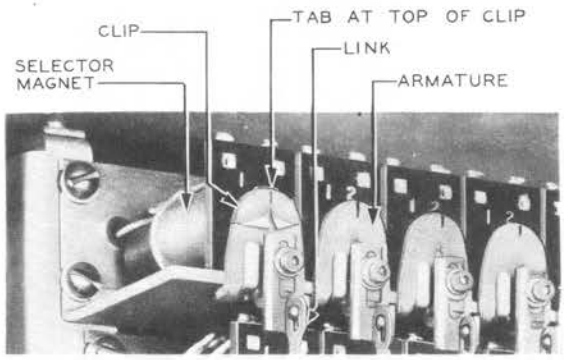


Fig. 51—Selector Magnets

either high or low, adjust the card feed coupling in accordance with 3.07(f).

(2) If perforations are high on one side of the card and low on the other side (not parallel to the horizontal lines on the card), advance or retard the left-hand position of the card chain and card hooks. Back off on card feed chain sprocket adjustable coupling screw, and advance the other as required using an Allen wrench. The coupling is located at the right of the card feed coupling. Securely tighten both screws.

(c) If the requirement is not met, proceed as follows.

(1) If perforations are not entirely through the card or embossing occurs, perform 2.65 and 2.66.

(2) If two perforations occur in the same perforating position as indicated by egg-shaped holes, perform 2.07(g).

(d) If the requirement is not met, reduce brake spring pressure of the latch unit by loosening the locknut of the brake spring adjusting screw using the R-5850 wrench and adjust the screw with the 418A wrench. Adjust in steps of one-fourth turn(s) until the requirement is met. Securely tighten the locknut.

4. GENERAL INFORMATION

4.01 ***Method of Loading In Bin:*** To load in bin, proceed as follows.

(1) Make the perforator busy in accordance with 1.11.

(2) Lower the in-bin door by lifting and swinging the door outward and down.

(3) Press down evenly upon the top of the remaining cards, using the fingers of both hands until the platform securely latches.

(4) Swing the card guide and elevator downward until the bar and guide rests on the door.

(5) Remove the cards remaining on the platform.

(6) Remove the protective wrapping from a new package of cards.

Note: A stack of new cards should be riffled before loading in the in bin to overcome the tendency for the cards to stick together.

(7) Firmly grasp one end of the card stack with one hand, and hold the stack vertically suspended.

(8) Grasp the lower end of the card stack with the other hand, and pull out and upward approximately 30 degrees from the vertical position. The card stack will bow, and cause the lower edges of the cards to overlap one another.

(9) Release the lower edges of the card, one card at a time, until all cards in the stack return to the original vertical position.

(10) Repeat (7) through (9) for the other end of the stack.

(11) Place the new card stack on the in-bin card and elevator guide bar with aligning notches down and printed side away from the perforator.

(12) Move the card stack laterally until the aligning notch of all cards engage the card and elevator guide bar.

(13) Grip the card stack firmly at both ends and place on the platform the notched side of the cards out and printed side up, aligning the center notches with the platform notch.

(14) Place the cards which were removed from the in bin on top of the new cards in a like manner.

(15) Carefully disengage the card that is in place in the channel, and destroy the card.

(16) Swing the card elevator and guide bar upward until the bar engages the notches of the cards, the elevator platform, and the punch and card feed assembly.

(17) Close the in-bin door by swinging the door upward to a vertical position, and push the door down. The elevator platform should rise and hold the card in position for feeding.

(18) Reopen the door, and make certain that the card and elevator guide bar does not bind on the cards by pulling out and pushing the bar back into position.

(19) Close the door.

Note: During the entire in-bin loading procedure, care should be taken that the corners and edges of all cards are free of mutilation especially the card hook shoe pickup notches. Remove and destroy any cards that are damaged.

(20) Place the manual control handle on the stub shaft.

(2) Manually operate the LCH magnet armature, and turn the handle clockwise.

(22) Release the LCH magnet armature.

(23) Continue to turn the handle, noting that a card is picked up by the card hook shoes and carried into the card channel.

(24) Continue turning the handle until the perforator is in the home position (1.05).

(25) Repeat (21) through (24) for a total of five cards to check the ability of the remaining card hook shoes to pick up and eject cards before operating the perforator with electrical power.

4.02 ***Method of Removing Perforator Cards***

(a) ***Out Bin Initially Furnished:*** Swing the card retainers (Fig. 48) toward the out-bin center, and remove the cards. Return the retainer to the vertical position.

(b) ***Later-Type Out Bin:*** Bow the card stack sufficiently to allow removal.

4.03 ***Method of Extracting Stuck Cards:*** When necessary to remove a card, proceed as follows.

Note: Perforator adjustments may be affected by improper removal of stuck cards.

(1) Make the perforator busy in accordance with 1.11.

(2) Lower the in-bin door by lifting and swinging the door outward.

(3) Press down evenly upon the card stack using the fingers of both hands until the platform securely latches.

(4) Remove the front upper and lower covers and make sure that the INT clutch is ***not*** engaged.

(5) Release any depressed punches by pulling upward on the motor belt, as required, while facing the front of the perforator. On perforators equipped with an early model clutch drive (Fig. 15), pull upward on the motor belt until the clutch drive dial indicates between 180 and 360 degrees.

(6) Withdraw the card from the rear of the perforator, taking care that the card hook shoes and contact springs of the card feed mechanism are not damaged. Note which pair of card hook shoes operated.

(7) Place the manual control handle on the stud shaft.

(8) Manually operate the LCH magnet armature, and turn the handle clockwise.

(9) Release the LCH magnet armature.

(10) Continue to turn the handle until the perforator is in the home position (1.05).

(11) Repeat (8) through (10) until the pair of card hook shoes associated with the failure is in approximately the position to pick up a card.

(12) Swing the card and elevator guide bar into position, making sure that the card stack slot is freely engaged.

(13) Elevate the card stack by closing the in-bin door and pressing the door down while in the closed position.

(14) Open the door, and again check the freedom of the card and elevator guide bar in the card stack slot.

(15) Close the door.

(16) Repeat (8) through (10).

(17) If failure does not occur, test the ability of the remaining card hook shoes to successfully pick up and reject cards before operating the perforator with electrical power.

(18) If, when removing the card (6), a piece of card is torn off and stuck in the card channel, remove the support die casting to remove the card piece in accordance with 3.010 as required.

4.04 ***Effects and Possible Causes of Irregularities in Perforator Performance (Table E)***

TABLE E

TROUBLE SYMPTOM	POSSIBLE CAUSE	SUGGESTED REMEDY
(a) Perforator jams. Overload clutch operates. Perforator may go out of phase.	(1) Insufficient tension of clutch drive to cam switch chain.	Perform 2.05(a) and 3.05.
	(2) Weak latch unit over travel spring.	Adjust over travel spring tension (Fig. 32).
	(3) Weak brake spring pressure.	Adjust brake spring (Fig. 32).
	(4) L cam contacts of cam switch unit out of adjustment.	Perform 2.13 and 3.13.
	(5) Ineffective antioverthrow pawl.	Perform 2.19 and 3.19.
	(6) Maladjustments of latch contacts that close the INT clutch circuit.	Perform 2.42, 3.42, 2.43, 3.43, 2.44, and 3.44 as appropriate.
(b) Card feed failures.	(1) Defective throat or gate gap incorrect.	Perform 2.46, 3.46, 2.47, 3.47, 2.48, 3.48, 2.49, and 3.49.
	(2) Lack of throat freedom.	Perform 2.47 and 3.47.
	(3) Chaff bin overfull.	Empty chaff bin.
	(4) Elevator spring tension incorrect.	Perform 2.59 and 3.59.
	(5) Misalignment of cards on platform.	Adjust alignment of cards on platform.
	(6) Broken card hook shoe spring.	Replace card hook shoe spring (Section 034-305-801).
	(7) Cards excessively warped.	Remove and discard warped cards; replace with serviceable cards.
	(8) Worn card hook shoes.	Replace card hook shoe (Section 034-305-801).
	(9) Bent elevator platform.	Replace elevator platform (Section 034-305-801).
	(10) Punch fails to retract.	Replace punch (Section 034-305-801).
(c) Excessive variation of perforation location on first line of card.	(1) Excessive backlash of card feed coupling.	Replace worn part (Section 034-305-801).
	(2) Backward stop pawl of latch unit ineffective or excessive clearance.	Replace backward stop pawl spring and/or stop pawl (Section 034-305-801).
(d) Double punching of first or second line card perforations.	(1) Clutch drive to hand drive chain loose causing misalignment of intermittent clutch jaws in home position.	Perform 2.05(b) and 3.05.

TABLE E (Cont)

TROUBLE SYMPTOM	POSSIBLE CAUSE	SUGGESTED REMEDY
(e) First line record repeated on all lines of card.	(1) Transfer contacts of clutch drive unit spring assembly out of alignment.	Perform 2.24 and 3.24.
(f) No record on second line of card. Duplication of first line record on second line. Combination of first and second line record on first line of card.	(1) Intermittent clutch jaws slow in seating due to misalignment in home position. (2) Transfer contacts of clutch drive unit spring assembly out of adjustment.	Perform 2.18 and 3.18 or 2.07(g) and 3.07(g) as appropriate. Perform 2.24 and 3.24.
(g) Continuous punching of line of card.	(1) Intermittent clutch jaws slow in seating due to misalignment in home position. (2) Latch contacts out of adjustments. (3) Defective antioverthrow pawl spring. (4) Antioverthrow pawl prevents INT clutch jaw engagement. (5) Open INT clutch magnet.	Perform 2.18 and 3.18 or 2.07(g) and 3.07(g) as Perform 2.38 and 3.38. Perform 2.21, 3.21, 2.22, 3.22, and/or replace spring (Section 034-305-801). Perform 2.21, 3.21, 2.22, 3.22, and/or replace spring (Section 034-305-801). Replace magnet (Section 034-305-801).
(h) Incorrect record on various card lines. (Information punched on wrong card lines.)	(1) K contact of cam switch unit out of adjustment.	Perform 2.13 and 3.13.
(i) Perforator does not come home.	(1) Chain too tight. (2) Excessive latch unit brake spring pressure. (3) Failure of CONT clutch to operate.	Perform 2.05 and 3.05. Perform 2.05 and 3.05. Adjust spring pressure (Fig. 32). Perform 2.18 and 3.18 or 2.07(g) and 3.07(g) as appropriate.
(j) Continuous high-speed ejection of cards until circuit times out.	(1) Latch unit not effective in stopping perforator in home position.	Replace latch unit (Section 034-305-801).
(k) No perforations. Excessive perforations.	(1) Open selector magnet. (2) Faulty interposer latch.	Replace selector magnet (Section 034-305-801). Replace latch (Section 034-305-801).

TABLE E (Cont)

TROUBLE SYMPTOM	POSSIBLE CAUSE	SUGGESTED REMEDY
	(3) Selector magnet too slow in release (weak latch spring).	Perform 2.67 and 3.67 and replace latch spring (Section 034-305-801).
	(4) Latch stop out of adjustment.	Perform 2.66 and 3.66.
(l) Motor cuts off.	(1) Card feed failure.	Perform 2.70 and 3.70.
	(2) Card supply exhausted.	Replenish card supply.
	(3) Failure of INT clutch to release.	
	(4) Failure of selector magnet to release.	Perform 2.69 and 3.69(b).