PUNCH CLUTCH

1. Mount clutch assembly with the three mounting screws.

2. Set clutch latch stop screw for .015" clearance between the latch point and the tail of the clutch pawl when the latch is against the latch stop screw. Move magnets if necessary (Figure 29).

3. Set the clutch latch backstop screw for $\frac{1}{16}$" overlap of the latch over the tail of the pawl (Figure 30).

4. Move the magnet coil mounting plate in elongated holes to provide for .008" to .010" clearance between the armature and cores when the latch is against the stop screw (Figure 31).

5. There should be .003" clearance between the keeper and the clutch pawl arm when the pawl is latched. This is obtained by stoning or peening the keeper (Figure 32). If the clutch is removed and replaced, the clutch plate should be mounted with the mounting screws in the center of the oversize holes. The other adjustments should then be checked.

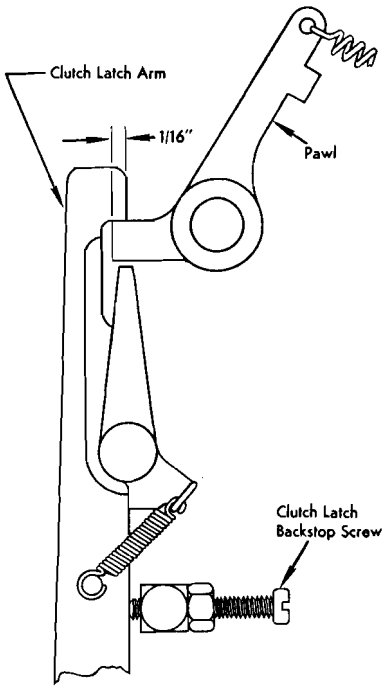

Figure 30. Clutch Adjustment

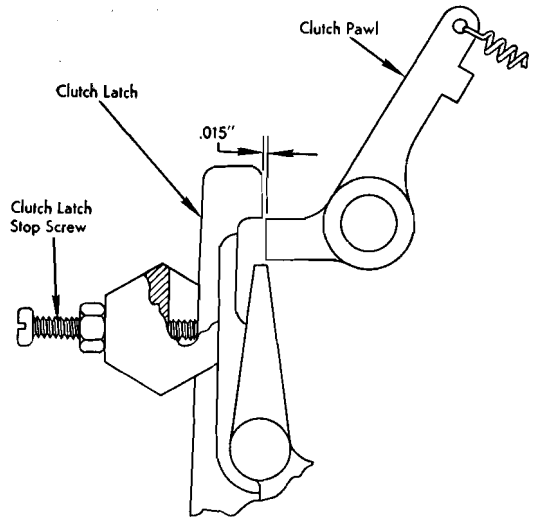

Figure 29. Clutch Adjustment

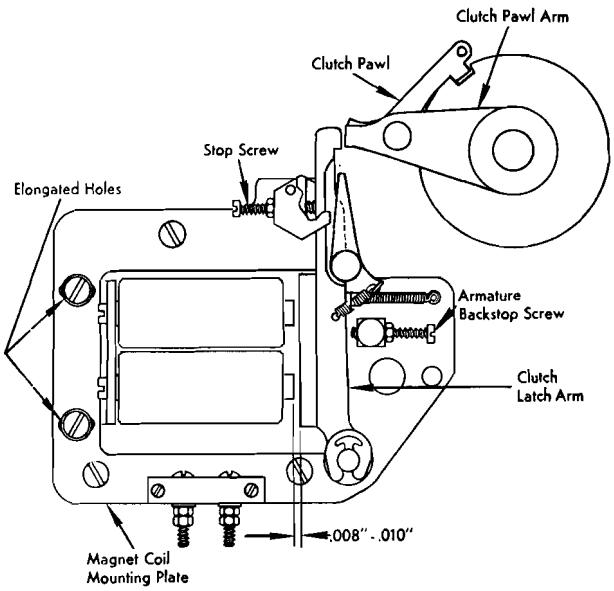

Figure 31. Clutch Adjustment

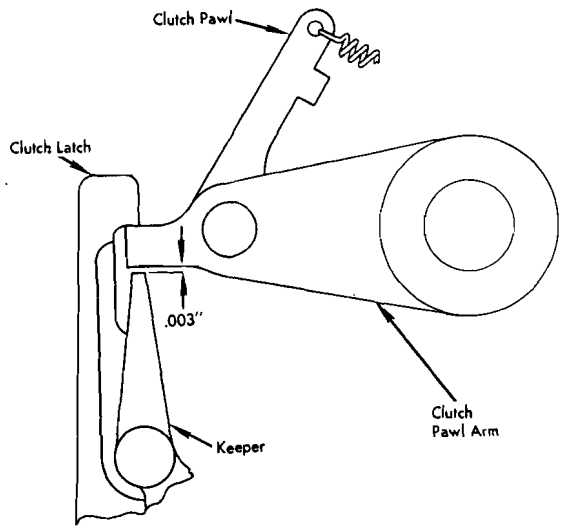

Figure 32. Clutch Adjustment

GENEVA MECHANISM

Single Revolution Timing Cam

This cam should be timed so that the flat side of the cam is up and in a horizontal position at one tooth past 14 on the index. Move the cam and gear out on the shaft far enough to unmesh the teeth and remesh for above condition (Figure 33).

The geneva pawl should be engaged when checking this adjustment.

Single Revolution Timing Cam Bracket

Loosen the holding screw. Move the bracket up or down until the cam holds the geneva pawl disengaging roller in position to hold the geneva pawl away from the one-tooth ratchet on the geneva gear when the punch clutch is latched up at D and the machine is operated by hand. Only the raised portion of the tail of the pawl should operate against the roller.

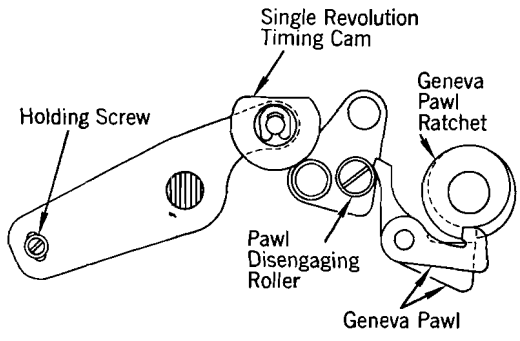

Figure 33. Single Revolution Timing Cam and Bracket Adjustment

Set bracket so that geneva clutch pawl just nips the one-tooth ratchet. Then move the left end of the bracket up until the pawl just clears the one-tooth ratchet.

An approximate adjustment may be obtained by setting the bracket so that the locking screw is about one-third of the way up from the bottom of the elongated hole (Figure 33).

Geneva Clutch

A two-pawl geneva clutch is used with the 603 punch unit. This assembly is more positive in its action than the single-pawl type, and is interchangeable with the geneva clutch assembly on all high-speed punches.

Two pawls, one a driving pawl and the other a detenting pawl, are used to eliminate the critical knockout timing of the clutch. The pawl disengaging roller is not adjustable because it is pinned to the bracket.

PUNCH UNIT

Belt Tension

The belt tension is adjustable by moving the motor up or down on its pedestal. The belt should be adjusted for enough tension to prevent slippage; excessive tension, however, will cause the motor bearings to overheat and should be avoided.

Feed Roll Tension

Feed roll tension is determined by compression springs in the feed roll pressure bracket. If for any reason any pressure spring in any one bracket is replaced, all springs in the bracket should be replaced to provide for even tension. The pressure bracket is equipped with holes tapped for 5-40 screws which may be used to lock the pressure shoe under spring tension before removing the bracket.

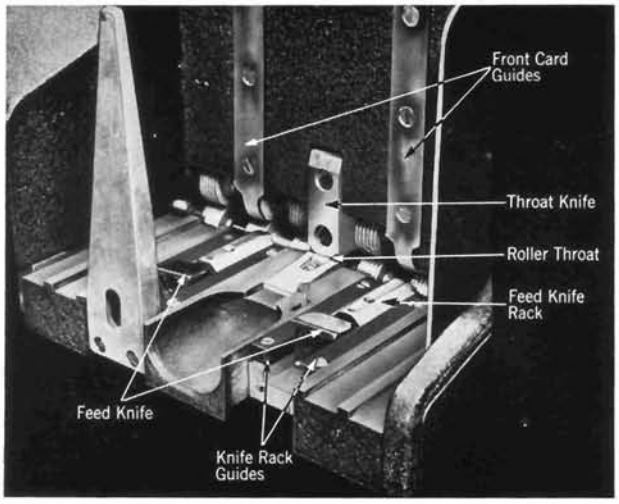

Figure 34. Feed Hopper

Feed Knife Guides

The adjustable guides for the feed knife racks should be positioned for a minimum of play of the racks between the guides without causing any binds. Check this over the entire length of the stroke (Figure 34).

Feed Knife Projection

The card feed knives are adjustable and should be set evenly on each side for a projection of .004" to .0045". To adjust a feed knife, remove the feed knife block from the feed knife rack. This may be done without changing the left-to-right position of the knife block if the knife holder adjusting screw is held with a $\frac{1}{4}$" open end wrench while the knife block holding screw is removed.

A Go-No Go gauge is provided with two accurately ground surfaces at opposite ends. The surface marked "Go" is cut .0045" deep and the opposite surface marked "No Go" is cut .004" deep. When the feed knives are adjusted, the locking screws should be loosened until they are just snug enough to prevent the knives from moving with a slight pressure. Turn either in or out on the adjusting screws, as required, to raise or lower the feed knife. If the knife is properly adjusted, the "Go" end of the gauge will pass over the feed knife on either side and the "No Go" end will not pass over the projection.

The knife must project evenly all the way across, and both knives must be adjusted for the same condition.

After a period of use, the knife blocks may wear, particularly at a point near the feed knife, in which case accurate adjustment is not obtainable. If such a condition exists, it should be remedied in the following manner before the above adjustment is performed.

Set feed knife for the slightest possible projection above the knife block. Stone knife and block assembly until the top surface of the knife and block are even. Then proceed as above.

Feed Knife Block

The knife block pivot screws should be adjusted so that at the extreme forward stroke ($2\frac{1}{2}$ teeth before 1) the feed knife edge travels .015" past the edge of the card with the card against the first feed rolls. This provides the proper buckle of the card to insure good feeding (Figure 35A).

Hopper Guide Posts

The hopper guide posts are positioned by means of shims so that there is at least .010" clearance over the width of the card. Also check to see that at their extreme left position, the feed knives travel at least .030" beyond the edge of a card held against the guide posts.

Throat

With the throat knife and block only snug under their holding screws, place a .010" feeler gauge into the throat opening. This gauge must be separated from all other gauges. Adjust the throat block and throat knife until the .010" gauge between the knife and the roller is parallel with the card feed knife slides. This can be determined

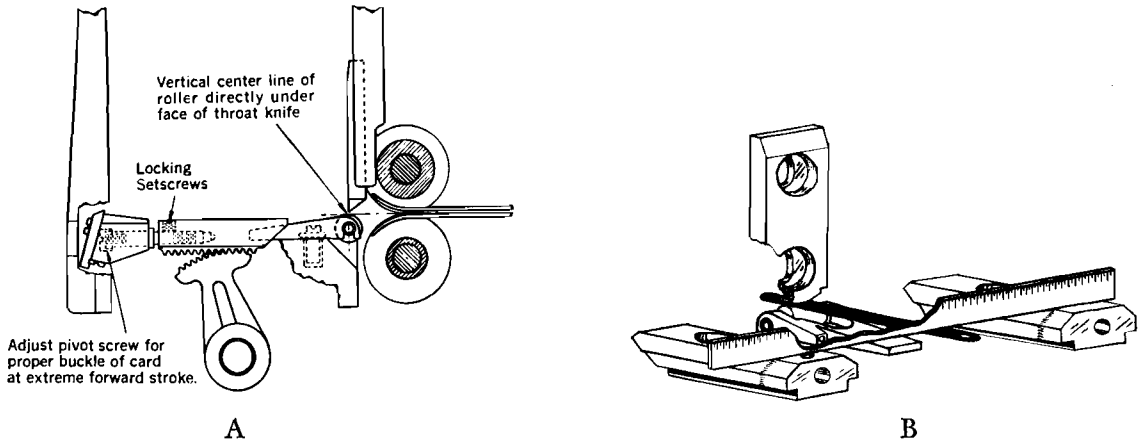

Figure 35. Feed Adjustments

by laying a straight edge across the feed knife slides. The .010″ gauge should just touch the under edge of the straight edge, which can be a IBM card on edge or a scale (Figure 35B).

This will insure that the face of the throat knife is in the correct relationship with the roller, which is important if the throat adjustment is to be realized. Secure the throat block in this position, keeping it to one side in its locating channel. This will keep the axis of the roller parallel with the face of the throat knife. Adjust the throat knife so that the .010″ gauge enters the throat opening freely when held parallel to the card line. Tighten the throat knife and check to see that a .010″ gauge will not enter the throat from any angle other than the horizontal card line. Under no condition should the .011″ gauge enter the throat.

Die

The stop studs in the stripper must be maintained snugly against the die. These studs provide minimum clearance between the die and the stripper. Adjust this by positioning the left end of the magnet unit assembly up or down by means of the adjusting screws, one beside each of the two clamping screws at the left end of the unit. Remove and replace the die several times to be sure that the latching bars have a slight drag as they enter and leave the castings.

The two angle guides, one on each end of the die assembly used on high-speed punches, are for the purpose of keeping the die level when placing it in position in the machine. The following method should be used to adjust these guides correctly. If these guides are properly adjusted, it will be easier to remove and replace the die in the machine.

Install the die assembly in the machine with the angle guide loose, and lock the die in place. Each angle should then be pressed lightly toward the side frame and tightened in this position. An excessive amount of pressure must not be placed on these guides, or they will bind and make it difficult to remove the die.

Punch Bail Tongue

The punch bail tongue should be adjusted so that it is 2-17/32″ from the front edge of the tongue to the back of the punch bail pivot shaft (Figure 36). Loosen the four holding screws. Then position the tongue in relation to the bail by means of the two adjusting screws. This should not require adjustment unless a punch bail or punch bail tongue is replaced.

Interposer Pawl Lock Bar and Spring Bail

The interposer pawl lock bar is positioned and pinned at the factory so there is a minimum clearance between the interposers and the punch bail tongue when the interposers are engaged with the

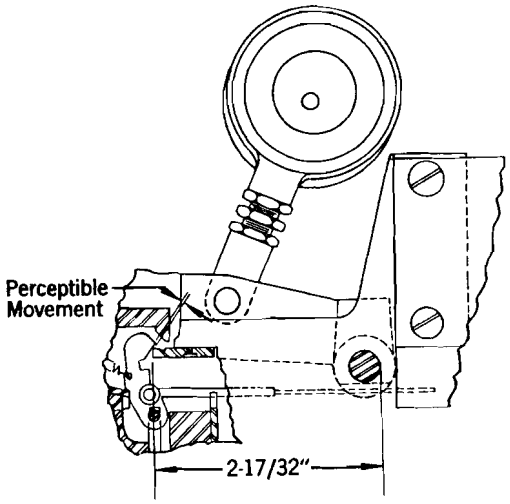

Figure 36. Punch Bail Tongue Adjustment

punch bail tongue and are driven to their extreme downward limit by the punch bail.

The interposer spring bail should be positioned so that it does not touch the interposers when the interposers are engaged with the punch bail tongue and are driven to their extreme downward limit. Check several interposers at each end.

Punch Magnet Armatures

The magnet armatures should be adjusted so that the interposers will move 1/8" toward the magnets when the armatures are attracted. The 1/8" travel is obtained by increasing or decreasing the armature air gap by bending the armature just above the point where the pull rod connects (Figure 37). The interposers should line up when in a normal position and should move freely.

Punch Bail Connecting Links

There must be a perceptible movement between the punch bail tongue and the interposers when the bail is in its uppermost position. This condition prevents binds and also provides for a minimum travel of the punches into the die. Proceed as follows:

1. Remove the front punch bail connecting link pin.

2. Turn the machine until the punch bail is in the extreme upward position (eccentric up).

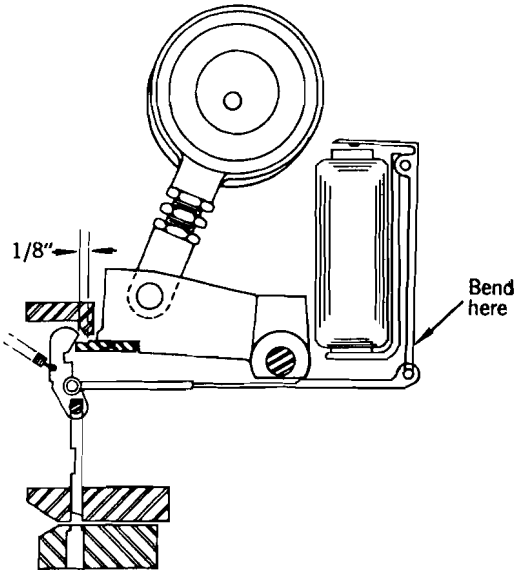

Figure 37. Punch Magnet Armature Adjustment

3. Adjust the rear punch bail connecting link adjusting screw for a slight clearance (.003") between the punch bail tongue and the interposers. (Figure 36). If there is any variation in the clearance from one end to the other, the .003" clearance should apply to the closest end. This may be checked with a leaf gauge or by moving the interposers.

4. Adjust the front connecting link adjusting screw so that the front punch bail connecting pin will slide freely into position in the punch bail and punch bail connecting link. This assures an even adjustment on both connecting links and eliminates strain on the punch bail.

After adjusting the connecting link adjusting screws, check to see that the punches are not jammed down against the punch stop bar. Check in the following manner:

1. Engage the interposer at each end of the punch bail and turn the machine until the punch bail is at its extreme downward limit of travel.

2. Press on the top of the interposer with a screwdriver and check for a slight movement.

The punch stop bar should be set as near the punch as possible without interfering with the movement of the punch.

Punch Hopper Side Plates

The punch hopper front and rear side plates are adjustable forward or backward so that cards are punched in proper horizontal alignment on the card registration gauge. Adjustment is provided by means of an elongation of the holes provided for the mounting screws. Shifting the side plates should result in the punched holes lining up with the grooves in the first upper feed roll. The hopper side plates should then be located for a minimum clearance over the length of the cards.

Punch Brush Lateral Alignment

The punch brushes should be positioned so that the brush strands will track through the center of the holes in the card. This may be visually checked if a deposit of some soft substance, such as wax crayon or carpenter's chalk, is placed across the 0 and 9 edges of the printed surface of a card punched 9, 0, 9, 0, etc., and the card is run through the machine. The brush tracks will be plainly visible on the chalked surface of the card. The brush holders and separators can be moved to the front or back if the three locking screws in the slide assembly are loosened (Figure 38).

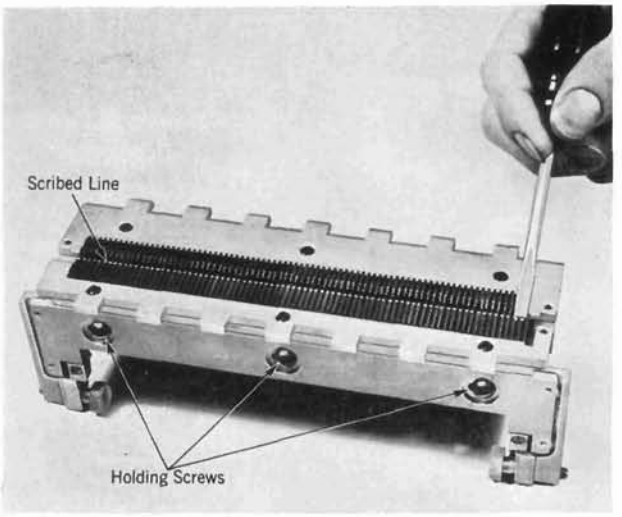

Figure 38. Brush Slide Assembly

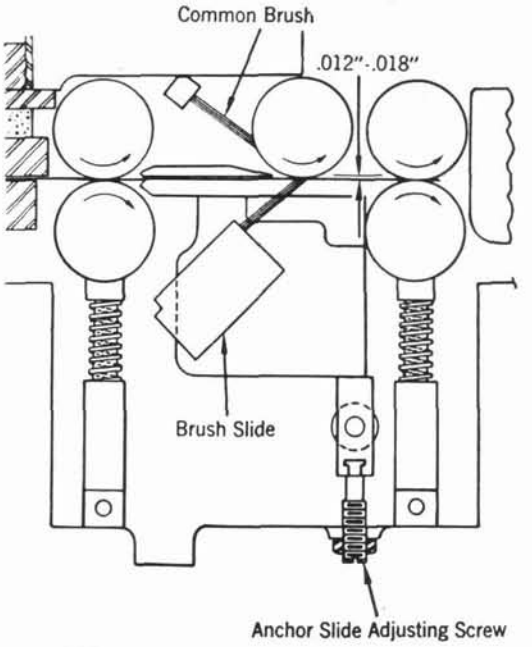

Figure 39. Anchor Slide Adjustment

Anchor Slide Adjustment

The clearance between the contact roll and the brush separators must be .012" to .018". Adjust the brush slide unit up or down by means of the anchor slide adjusting screws in the front and rear support castings (Figure 39) for gang punch and check brushes.

The entry and control brushes are not provided with an anchor slide adjustment. In order to obtain the proper clearance between contact roll and brush separators of the first set of brushes, it is necessary to shim the card guide plate or to grind away the card guide support. Because of the design of the original punch, the location of the read for entry and control brushes require a special brush block assembly.

Brush Timing

Both sets of brushes are set in their holder so that the heels of the brushes are aligned with the scribed line (Figure 38). The brush projection should be $\frac{1}{8}$" above the separators (Figure 40) which requires a measurement of $\frac{27}{32}$" from the brush block

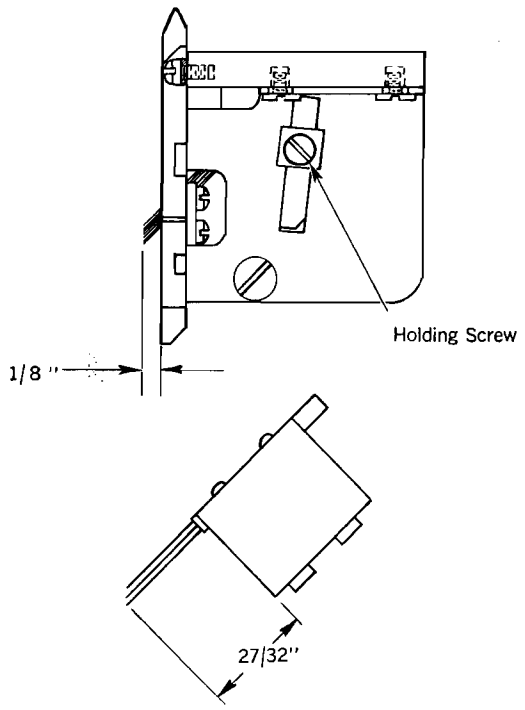

Figure 40. Brush Projection

to the toe of the brush. Adjust the brush holders in their assembly by loosening the holding screws shown in Figure 40 so that the brushes make through the holes in the card ¾ to ½ tooth before the line of index (check with a test light).

Vertical Registration

Cards must be punched in proper vertical alignment. Registration should be checked with a card gauge. To change the registration, loosen the 4 magnet unit mounting screws and adjust the 2 magnet unit aligning screws to position the magnet unit assembly toward the right or left, for proper vertical registration of the holes punched in the card. (Move the vertical registration aligning screws evenly and only when the magnet unit holding screws are loosened; otherwise, the unit may be strained and incorrect horizontal registration may result.) Be sure the aligning screws and holding screws are tight after making this adjustment.

After repositioning the magnet unit for the proper vertical alignment as in the above adjustment, recheck for the slight clearance between the punch bail tongue and the interposers when the punch bail is at the top of its stroke, because repositioning the magnet unit will affect that adjustment.

Stacker Plate

If the stacker has a flat plate (no indentations under rubber rollers), adjust the stop nut on the rod in the bottom of the stacker tube so that there is .006" to .010" clearance from the stacker plate to the face of the rubber rollers when the rubber rollers are in the extreme downward position. The felt washer serves as a brake to prevent the stacker from returning to its upper position too fast when cards are removed. The braking action is adjusted by compressing the felt washer by means of an adjusting nut.

Stacker Timing

To time the stacker roll:

1. Remove the blue steel clip from the stud of the idler gear.
2. Disengage the idler gear.
3. Engage the punch clutch and turn the machine to 3 on the index.
4. Turn the stacker roll so that the high side is down and remesh the idler gear. This timing should cause the card to be carried to within $\frac{1}{32}$" of the right side of the stacker.

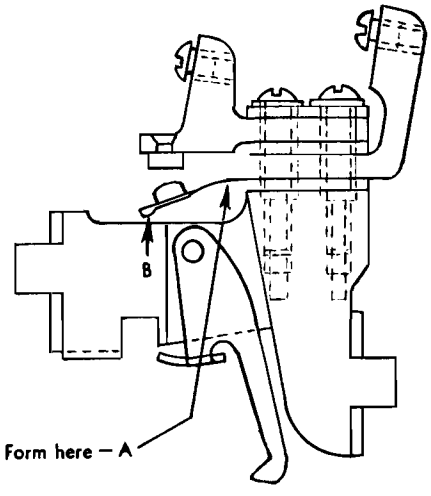

Figure 41. Circuit Breaker Adjustment

CONTACTS

Adjustment of Cam Contacts

1. The lower contact strap should be formed at point *A* (Figure 41) to provide proper tension. At the factory these straps are adjusted so that a force of 160 plus or minus 10 grams (approximately 6 oz.) applied at the tip of the lower strap, point *B*, will just close the points. This tension must be maintained accurately to avoid a bouncing condition.

2. Place shims beneath the plunger stop plate as required to obtain .040" to .050" travel of the plunger before latching up occurs. If the contact plunger is overlapped by the latch by an amount equal to the thickness of the latch metal, this should provide the .040" to .050" travel (Figure 42).

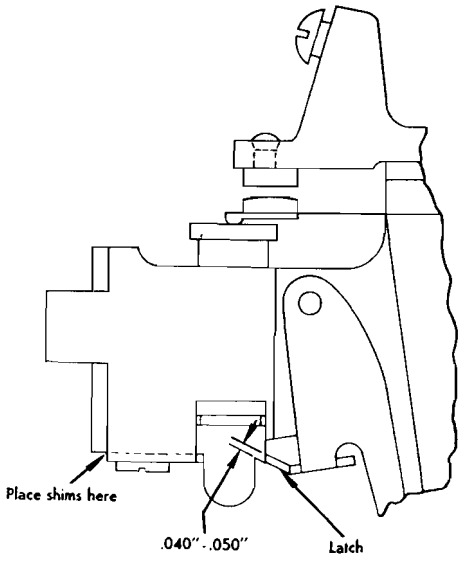

Figure 42. Circuit Breaker Adjustment

3. Place shims between the lower contact terminal block and the contact strap to provide .015" to .018" air gap between the contact points (Figure 43).

4. Check to be sure that the plunger does not bind. The design of the split bushing is such that the coil spring spreads the bushing to create a drag between the bushing and frame which increases the pressure required to close the contact from 160 grams (pressure required to compress the spring) to 225 grams (approximately 8 oz.). This friction is used to dampen the rebound when the contact closes. Check to be sure that a maximum of 240 grams applied to the plunger will close the contact (Figure 44).

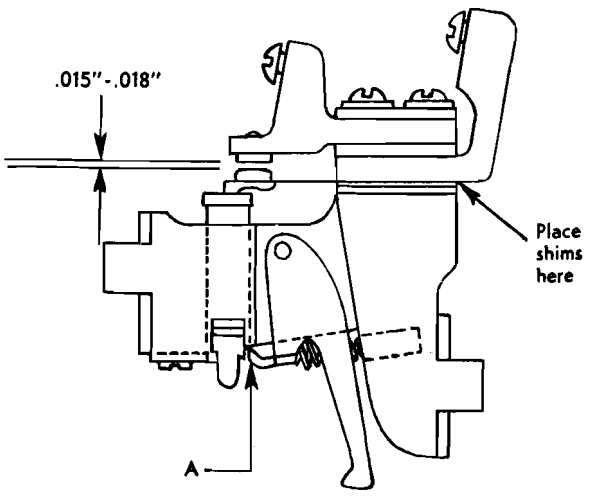

Figure 43. Circuit Breaker Adjustment

5. A pressure of 600 plus or minus 20 grams (approximately 21 oz.) on the contact plunger should be required to compress the plunger spring to the latching point (Figure 45). These values have been tested and found to provide a good operating condition.

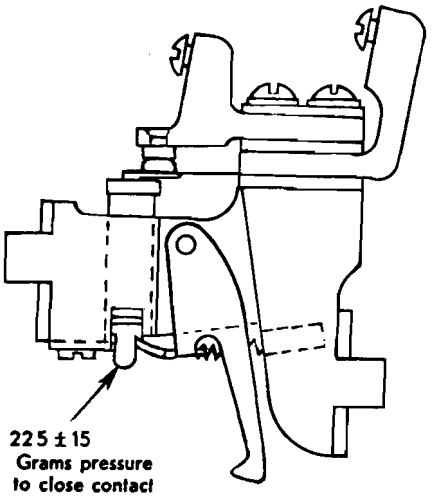

Figure 44. Circuit Breaker Adjustment

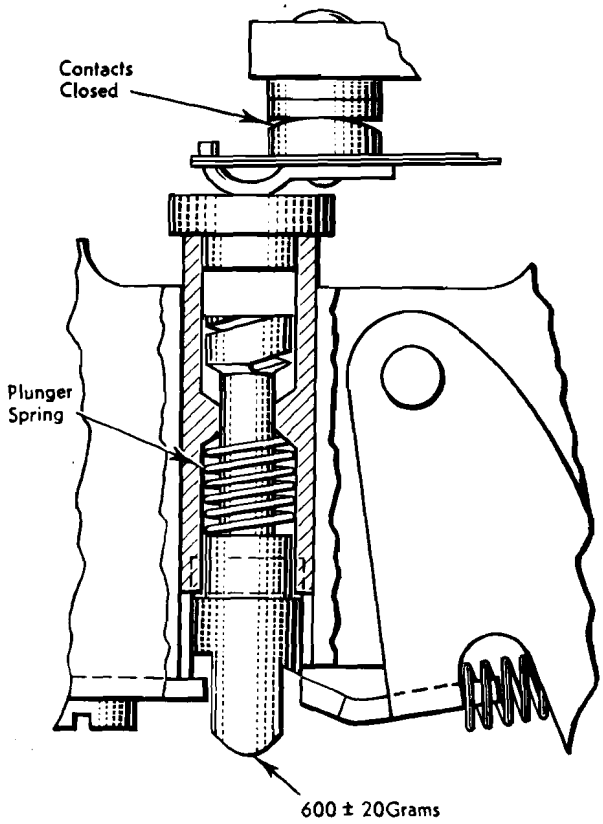

Figure 45. Circuit Breaker Adjustment

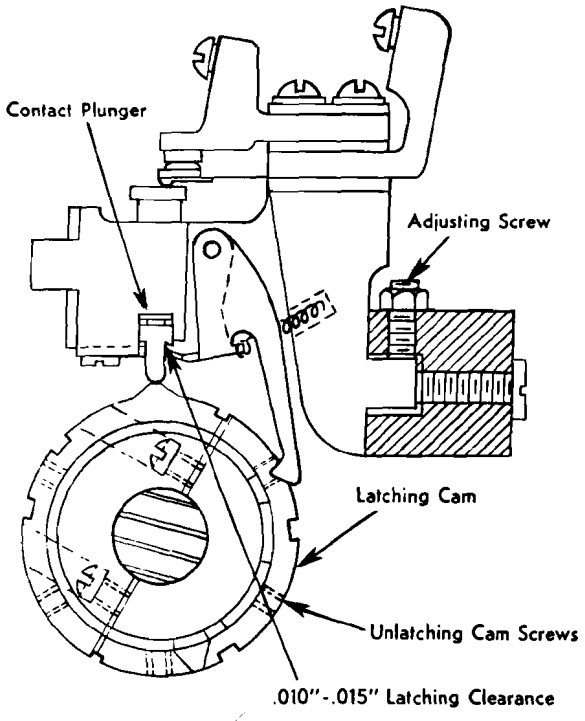

Figure 46. Circuit Breaker Adjustment

6. Locate the cam contact unit on the mounting bar at its extreme limit of travel away from the cam, and with the plunger on the highest point of the cam lobe, advance the adjusting screw until the plunger latches; then advance the screw one-half turn additional to obtain .010″ to .015″ movement of the plunger beyond the latch point (Figure 46). This will provide clearance between the low dwell of the cam and the plunger. On the non-latch type there should be a .003″ minimum clearance between the low dwell of the cam and the contact plunger when the plunger is against its stop (Figure 47). If a latching cam contact does not latch, it may be recognized by the fact that the contact points will close for 11°, or approximately 4 teeth on the index.

7. To adjust the make time of the contact, loosen the screws holding the cam to the shaft until the cam is just snug on the shaft. Turn the machine to the index point corresponding with the

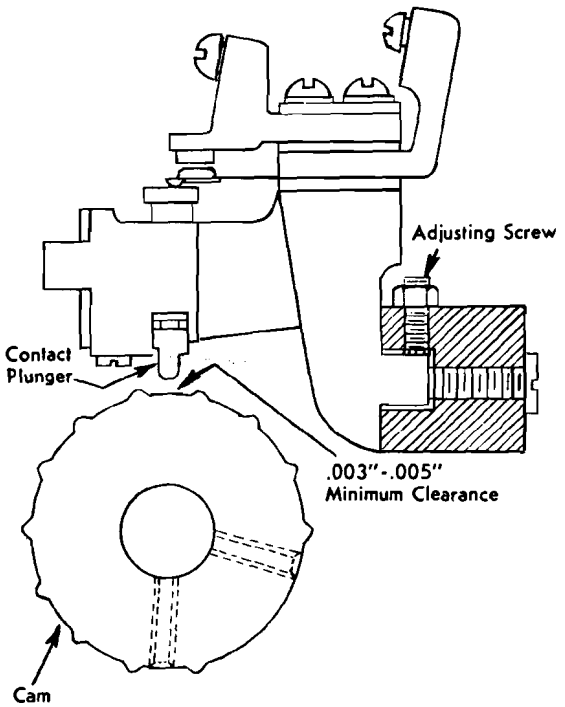

Figure 47. Circuit Breaker Adjustment

make time of the cam. Move the cam on the shaft in the direction of rotation until the contact just closes. The machine may now be turned to a point where the cam holding screws can be tightened. An accurate adjustment may be obtained by inserting a screwdriver in the slots provided on the periphery of the cam for moving it on the shaft.

8. To adjust the break time of the contact, loosen the contact unlatching cam screws (Figure 46). Turn the machine to the proper index point and move the unlatching cam in its slot until the contact opens. Tighten the holding screws. There are six possible positions for holding screws, only two of which will be used at any one time.

Adjustment of Card Lever Contacts

All card lever contacts should have at least $\frac{1}{32}$" air gap when open, and at least $\frac{1}{32}$" rise off the support strap when closed. Adjust by bending the brass support, or by shifting the entire contact assembly. The operating lever must be positioned on the shaft so that the lever is just against the operating strap when the contact is open.