

REPRODUCING PUNCH  
Type 513

DOCUMENT-ORIGINATING MACHINE  
Type 519

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# Reproducing Punch, Type 513

## Document-Originating Machine, Type 519

### CURRENT REQUIREMENTS—WEIGHT

#### TYPE 513

##### COMPARING REPRODUCER (80 columns)

Volts	Start Amps	Run Amps
110 AC	35.0	9.2
110 DC	15.0	7.5
220 AC	17.0	4.6
220 DC	10.0	3.8

Weight 945 lbs. packed; weight 735 lbs. unpacked. Dimensions: length 47", width 21", height 48".

#### TYPE 519

Current values given are running currents.

##### CURRENT REQUIREMENTS

Voltage	Phase	Frequency	Current
115 AC	1	60	13.0 amp.
		50	15.6 "
		25	11.8 "
115 AC	3	60	7.5 "
		50	9.0 "
		25	6.8 "
230 AC	1	60	6.5 "
		50	7.8 "
		25	5.9 "
230 AC	3	60	3.7 "
		50	4.5 "
		25	3.4 "
115 DC			10.5 "
230 DC			5.2 "

##### WEIGHT

Unpacked 1341 pounds  
Packed 1561 pounds

##### DIMENSIONS

Length 53"  
Width 24½"  
Height 49½"

##### HEAT DISSIPATED IN BTU'S PER HOUR

AC 4090  
DC 4110

## ADJUSTMENTS

### FEED ADJUSTMENTS

THE FOLLOWING adjustments apply to both the Type 513 and Type 519 Reproducing Punches unless otherwise specified.

#### Read Magazine Side Plates

Adjust forward or backward so punched holes line up with grooves in first feed roll and provide .005" to .008" clearance over length of cards.

#### Punch Magazine Side Plates

Adjust punch magazine front and rear side plates through elongated holes so cards are punched in proper horizontal alignment on card registration gauge. This should result in punched holes lining up with grooves in first upper feed rolls and proper tracking of X brushes. X brush holder may be filed or shimmed to allow for aligning X brush to card. Set magazine side plates for .005" to .008" clearance over length of cards.

#### Feed Roll Tension

Adjust feed roll pressure bracket for even tension across length of roll. Springs for the first and second feed rolls of punch feed are heavier than others.

#### Feed Knife Guides

Position for a minimum of play of the racks between the guides, without causing any binds.

#### Feed Knives

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 position of the knife holder adjusting screw if it is held with a 1/4" open end wrench while the knife block holding screw is removed.

Adjust the screw that holds the feed knife holder to the feed rack so that the feeding edge of the knives travels .020" to .040" beyond the left edge of the card in the magazine.

Check to see that both are adjusted evenly so that the card is fed parallel to the first feed roll.

## BRUSH ADJUSTMENTS

### Reproducing and Comparing Brush Alignment and Timing

Adjust the reproducing brush holder and separator to front or rear by loosening the three holding screws in the slide assembly, so brushes align with holes in card. Check tracking with soft substance such as carpenter's chalk. Adjust, comparing brushes in like manner for proper tracking.

Adjust both sets of brushes for 1/8" projection. Align reproducing brushes to scribed line on brush separators. Adjust feed knives so brushes make at 2 teeth before line of index and remain made until 5 teeth past the line. Shift comparing brushes right or left in holder to make at the same time.

### Punch Brush Alignment and Timing

Punch brushes should project 1/8" above separators which require a measurement of 2 7/8" from brush block to toe of brush. Adjust knives for even feeding so that brushes make 3/4 to 1/2 tooth before line of index. Align as indicated under *Reproducing and Comparing Brush Alignment*.

### X Brush Timing

Move X brushes in holders so X brushes in punch unit make contact through an X hole 3/4 to 1/2 a tooth before 13 and not break before 3/4 tooth after D. X brushes in read unit should make contact at 1 tooth before 13 and should not break before 2 teeth after D. Brushes may be stoned to provide this duration.

Move X brush holder up or down on mounting screws to provide .010" to .012" clearance between the X brush holder and X contact bar.

### Common Brushes

Remove burrs by drawing across fine oil stone before installing. Adjust for good tension.

### Summary Punch Emitter

1. Center emitter with respect to shaft on which brush is mounted. The radius is approximately 1 inch.
2. Using beveled brush, part 109339, time brushes to make 1 tooth before line of index and break not before 4 1/2 to 5 teeth after index line.

## 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.

## MOTOR ADJUSTMENTS

### Drive Motor Belt Tension

Adjust by moving motor pedestal up or down for enough tension to prevent slippage; excessive tension will cause motor bearings to overheat. After adjusting, be sure to secure motor support binding screw so that motor pedestal will not slip due to vibration.

Speed of the machine is varied by the adjustable pulley on drive motor. To increase speed move flanges together; to decrease, move flanges apart.

Adjust belt tension on generator drive motor by adding or removing open shims beneath motor mount.

### Motor and Generator Mounting Bracket

This mounting bracket is supported by rubber mounts. Check at intervals to be sure that rubber is preventing support bracket from contacting frame and causing vibration and noise.

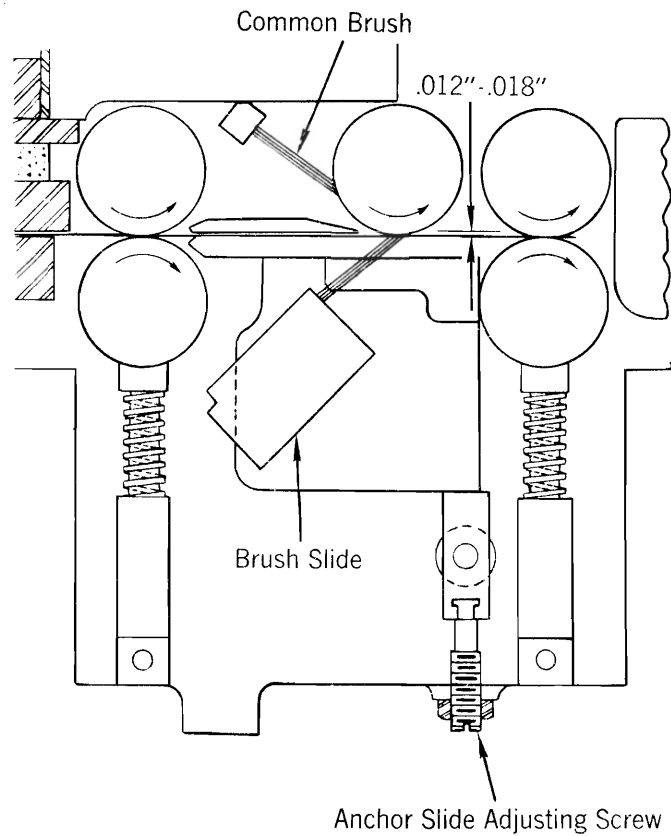
## CAM CONTACTS

### Cam Contacts and Stacker Roll Contact

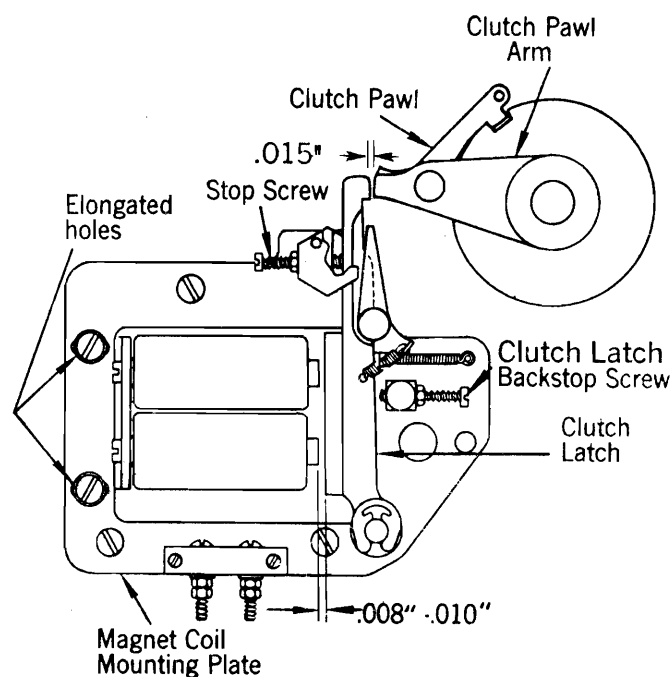
1. Clean points; stone pitted points; check all contacts for loose points.
2. Align points by shifting straps, so full area of points makes contact.
3. Bend non-operating strap of make contact for  $\frac{1}{32}$ " air gap and for sufficient tension to assure good contact when closed.

### TO TIME DYNAMIC CONTACT TIMING DEVICE ON 519

1. Turn machine index to D.
2. Turn inner disc so slot in bulb shield is at top and mesh the drive gear. Tighten holding nut.
3. Turn outer plastic disc so D lines up with slot.



*Anchor slide adjustment*



*Clutch adjustment*

## CLUTCH ADJUSTMENTS

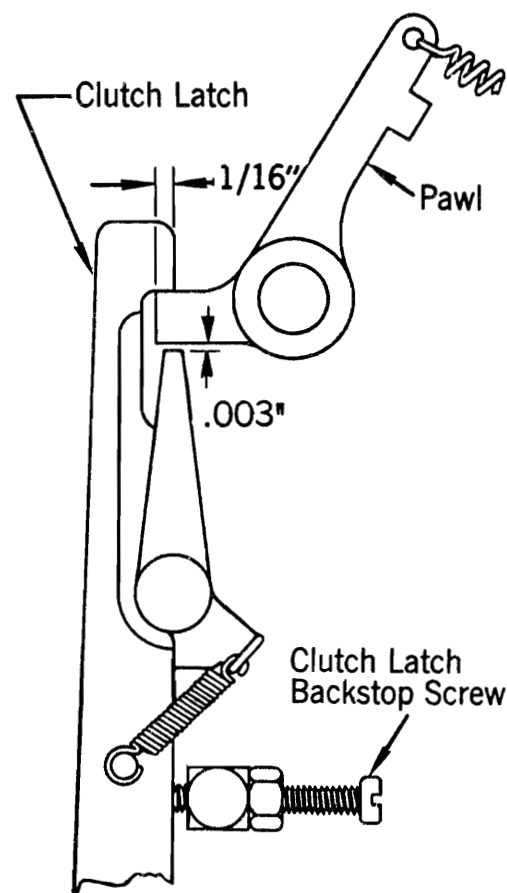
### Punch, Read and Mark Sensing Clutches

Set the 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 the magnets if necessary.

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.

Set the clutch latch backstop screw for approximately  $\frac{1}{16}$ " overlap of the latch over the tail of the pawl when latched up.

There should be .003" clearance between keeper and clutch pawl arm when pawl is latched.



*Clutch adjustment*

## PUNCH UNIT ADJUSTMENTS

### Single Revolution Timing Cam Bracket

Move bracket up or down until cam holds pawl disengaging roller in position to prevent pawl from nipping ratchet when punch clutch is latched at D and machine is operated by hand. On earlier machines the pawl disengaging roller was also adjustable up or down to cause the Geneva pawl to engage and disengage at 14.1 or slightly before.

When the punch clutch is latched, the single revolution timing cam should be timed so that flat side of cam is up and in a horizontal position.

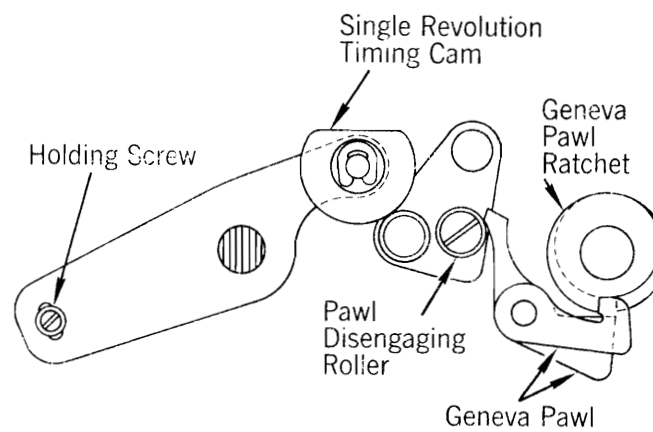
### Punch Bail Tongue Adjustment

Loosen the four holding screws; then position the tongue in relation to the bail by means of the two adjusting screws so that it is  $2\frac{17}{32}$ " from the front edge of the tongue to the back of the punch bail pivot shaft. This should not require adjustment unless a punch bail or punch bail tongue is replaced.

### Punch Bail Connecting Links Adjustment

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. Adjust as follows:

1. Remove the front punch bail connecting link pin.



*Single revolution timing cam and bracket*

2. Turn the machine until the punch bail is in the extreme upward position (eccentric up).
3. Adjust the rear punch bail connecting link adjusting screw for a perceptible movement (.003") between the punch bail tongue and the interposers. 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 links. This assures an even adjustment on both links and eliminates strain on the punch bail.

After adjusting the connecting link adjusting screws, check to see that the punches are not driven down against the punch at its extreme downward limit of travel. Press on the top of the interposer with a screwdriver and check for a slight additional downward movement.

The punch stop bar should be set as near the punch as possible but should not interfere with the movement of the punch.

### Interposer Spring Bail

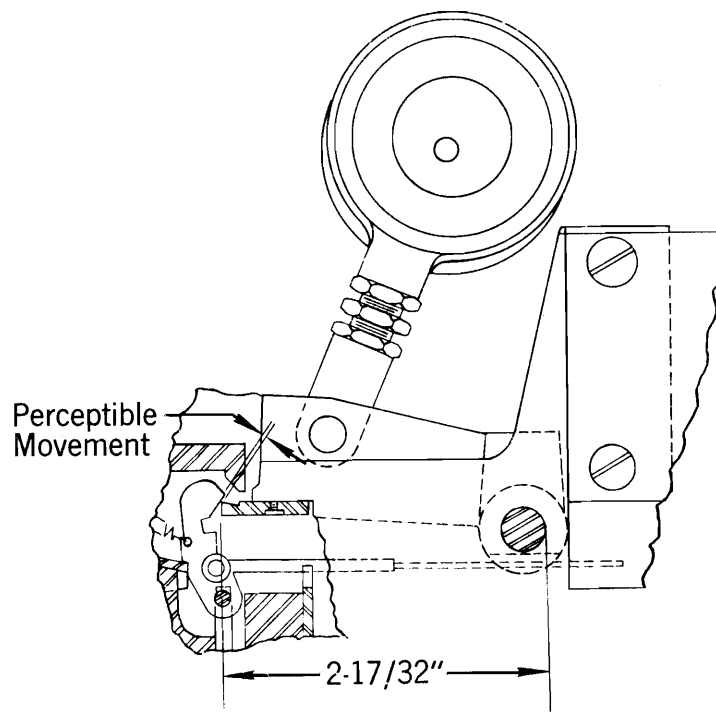
The interposer spring bail should be positioned so that there is a slight clearance between the interposers and the punch bail tongue when the punches are driven to their extreme downward limit by the punch bail. Check several on each end.

### Punch Magnet Armatures

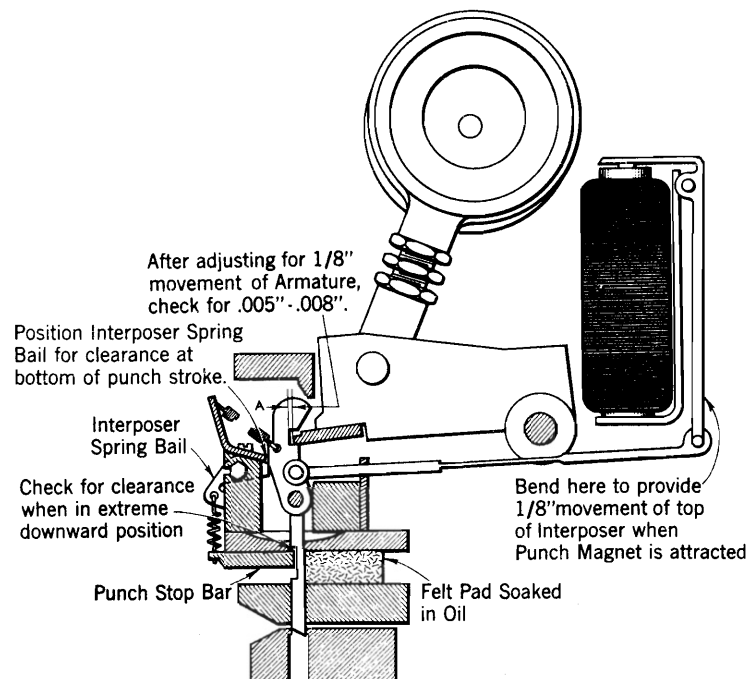
The magnet armatures should be adjusted so that the interposers will move  $\frac{1}{8}$ " toward the magnets when the armatures are attracted. This may be checked with the bail in position to engage the interposer but may be more accurately checked with the bail removed. The  $\frac{1}{8}$ " travel is obtained by increasing or decreasing the armature-core air gap by bending the armature just above the point where the pull wire connects. The interposers should line up when in a normal position and should move freely.

### Die Adjustment

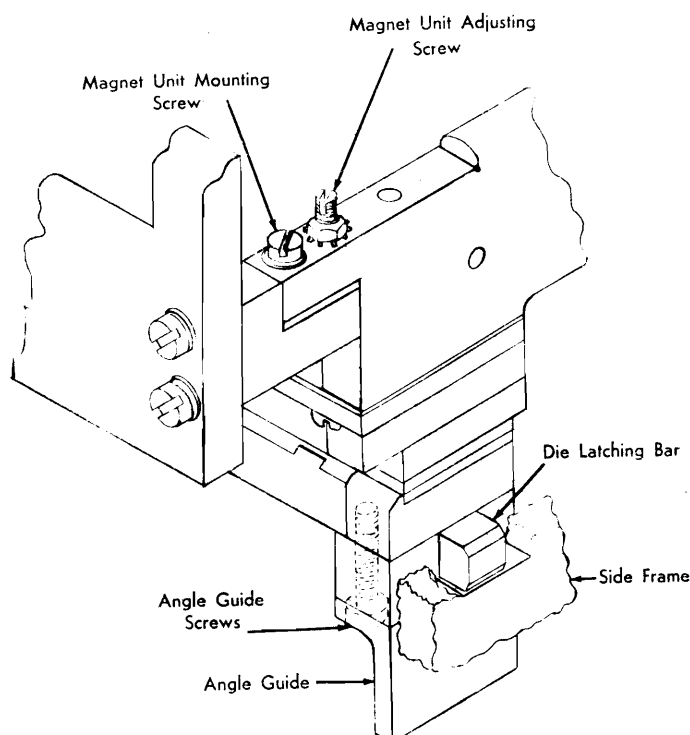
Loosen magnet unit mounting screws before installing die assembly,



**Punch bail tongue and connecting links adjustment**



**Punch magnet armature adjustment**



**Die assembly adjustment**

then adjust magnet unit adjusting screw to provide slight drag between the die latching bars and side of frame, keeping magnet mounting screws just snug while making this adjustment.

Install die with angle guide screws loose, then press the angle guides evenly outward against the frame and tighten screws. This adjustment is made to guide the die assembly properly and make removal and insertion relatively easy without binding.

### Die Lifter — Type 519

Adjust the setscrew in the rear for a .010" clearance between the stop screw and the rear frame when the die is fully in position. This provides a positive stop for the die lifter to prevent springing the magnet unit support blocks with the leverage obtained through the die lifter.

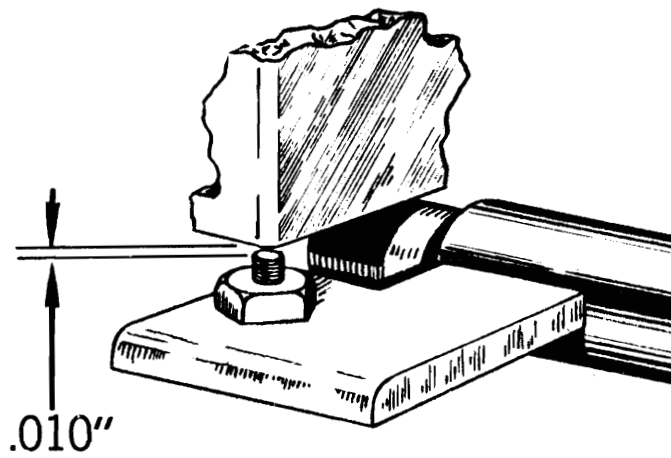
### Vertical Registration

To change the registration, loosen the four magnet unit mounting screws and adjust the two 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 aligning screws evenly and only when the magnet unit mounting screws are loosened, otherwise the unit may be strained and incorrect horizontal registration may result.) Be sure the aligning screws and mounting screws are tight after making this adjustment. The vertical registration should be set with the magazine half full of cards. With a full magazine a slight variation may be noted in one direction, and with a nearly empty magazine a slight variation in the other direction may be noted.

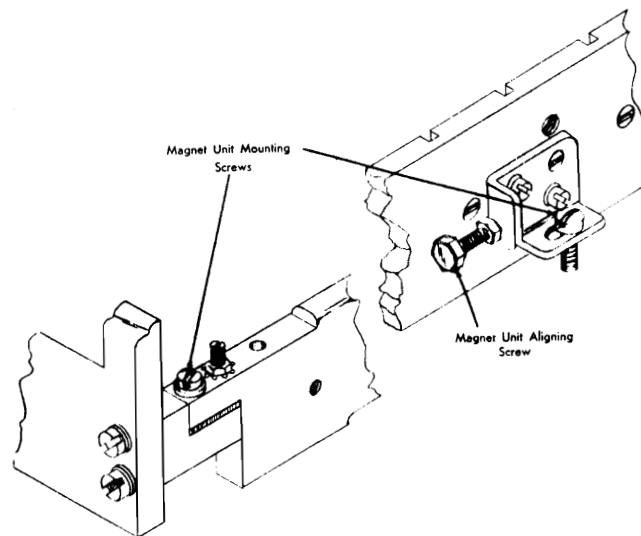
After repositioning the magnet unit for the proper vertical alignment as in the above adjustment, recheck for the slight clearance between the punch bail tongue and interposers when the punch bail is at its upward limit, because repositioning the magnet unit will affect that adjustment.

### COMPARING UNIT ADJUSTMENTS

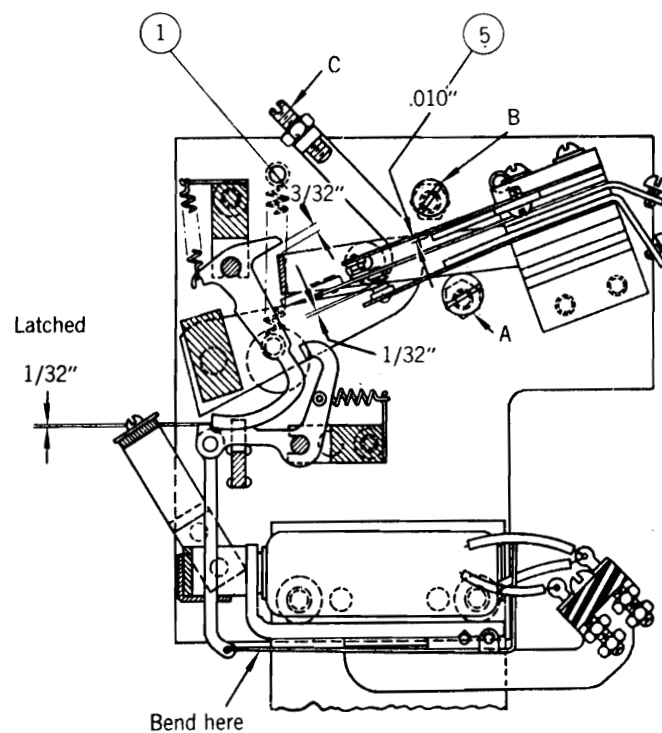
1. Adjust the eccentric screw A so that with the bail in normal position there will be  $\frac{3}{32}$ " between the top edge of the bail and the end of the pawl.



Die lifter

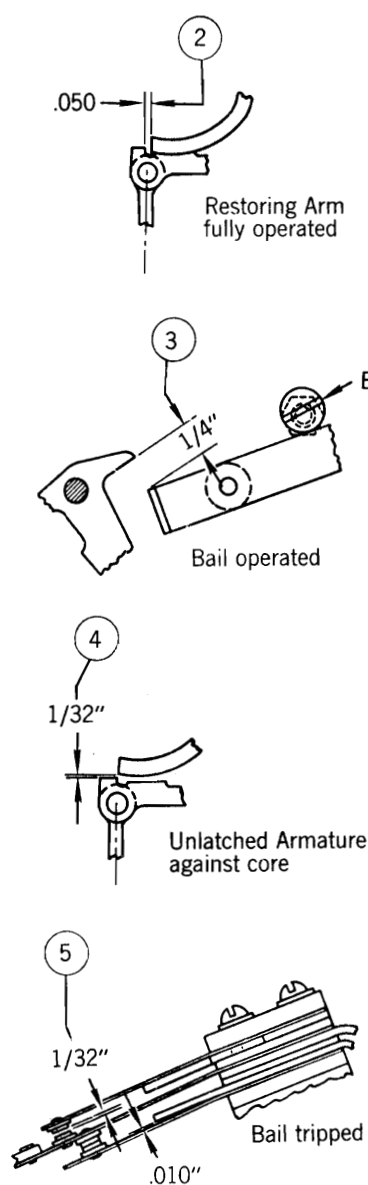


Vertical registration adjustment



Comparing unit adjustment

2. Screw C is adjusted to give .050" clearance between the pawl and the pawl latch when the restoring arm is fully operated and the solenoid plunger is at its limit of travel.
3. With the bail in the operated position (tripped) adjust the eccentric screw B so there will be  $\frac{1}{4}$ " between the top edge of the bail and the end of the pawl.
4. With the comparing magnet armature in a de-energized position, the pawl latch should overlap the pawl by  $\frac{1}{32}$ ". With the comparing magnet armature held against the core, there should be  $\frac{1}{32}$ " unlatched clearance between the pawl and the pawl latch. Bend the armature at a point near the pull wire.
5. With the bail in normal position, the transfer contacts should be adjusted by bending the support straps and the center strap so that there is .010" rise of the top strap off the support and  $\frac{1}{32}$ " air gap between the center and bottom contact points. The same adjustments apply when the bail is operated and the center strap is transferred as shown.

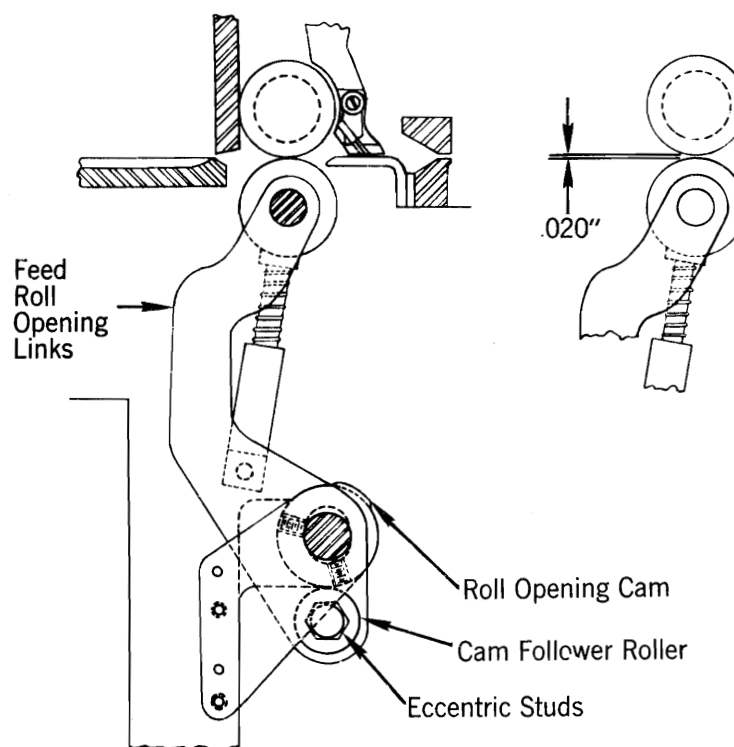


**Comparing unit adjustments**

## FEED ROLL OPENING DEVICE

1. Adjust eccentric studs to provide for feed rolls opening .020" at both ends, and a minimum of .015" clearance at the center of the rolls when on high dwell of opening cams at 1 tooth past 4.
2. To time roll opening cam, loosen cams on shaft and turn machine to 4 teeth past 5. Turn roll opening cams back against cam follower rollers and tighten cam set screws. Check that rolls do not start to open until 1 tooth past 3, are fully open at 1 tooth past 4, and just close at 4 teeth past 5.

The card friction finger springs should be adjusted for even tension.



**Feed roll opening device**

## STACKER

### Stacker Plate Adjustments

Turn the adjusting sleeve on the stacker rod in the bottom of the stacker tube to provide .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. Tighten lock nut.



To increase the braking action of the felt washer use  $\frac{1}{4}$ " end wrench on the bottom of the adjusting sleeve to keep it from turning and tighten the compression nut.

**Stacker Timing**

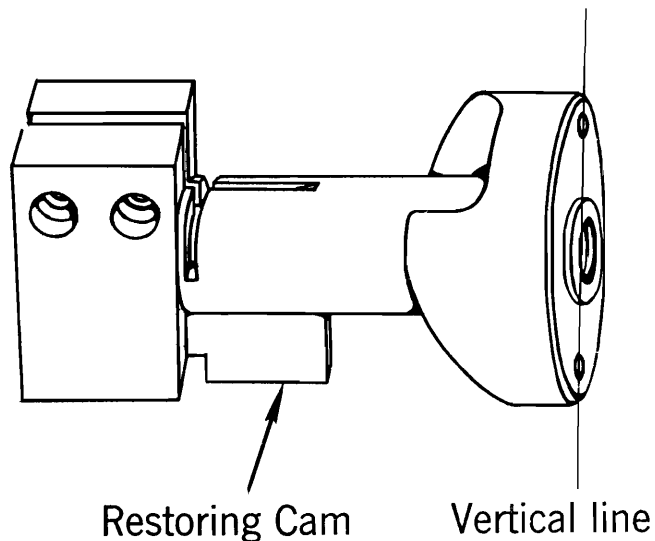
To time the punch stacker roll:

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 8.2 on the index.
4. Turn the stacker roll so that the high side is down and remesh the idler gear. (The read stacker roll is timed for the same condition at 4 on the index.) This timing should result in the card being carried completely into the stacker. The roller should be above the stacker top lining when the punch clutch is latched.

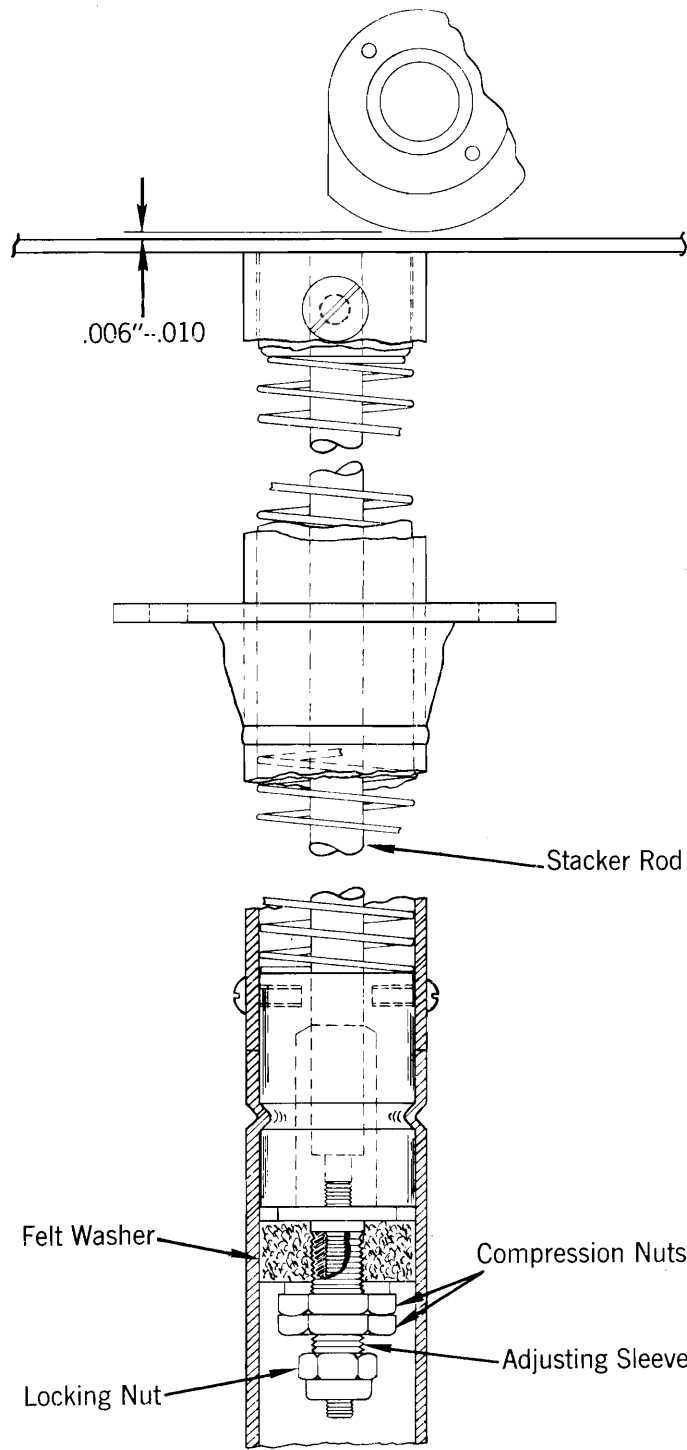
**Offset Stacker Adjustments**

The following adjustments apply to the offset stacker mechanism in both the read and punch feeds. The stacker roll in the punch feed is not split but is driven by a wide gear.

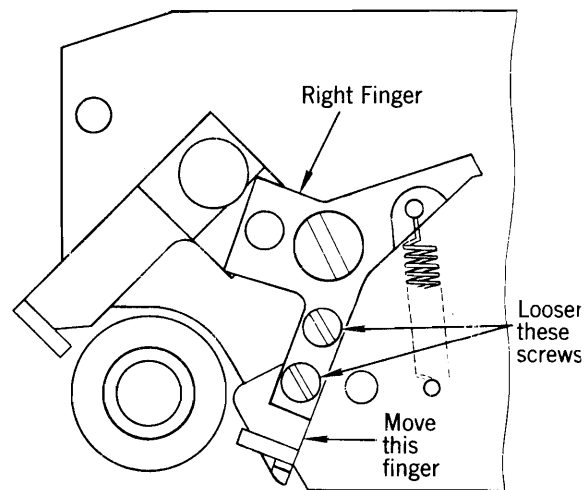
1. Time stacker so that the high side of the stacker roll is down at 4 on the index for the read feed, and at 8.2 for the punch feed. The high side should be up at D for the read feed.
2. Set cam stacker shaft so that the restoring cam is down, and the center lines of the holes in the cam are in a vertical position at 6.3 for the read feed and at 13.9 on the index for the punch feed.
3. Loosen the two screws in the right cam finger and adjust the finger so that it strikes the cam surface at the same time as the left finger to insure an even pull on the stacker shaft.



*Offset stacker adjustment*



*Stacker plate*



*Offset stacker adjustment*

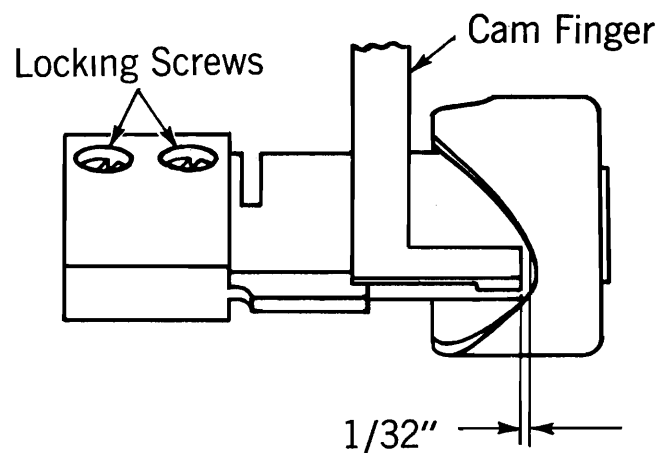
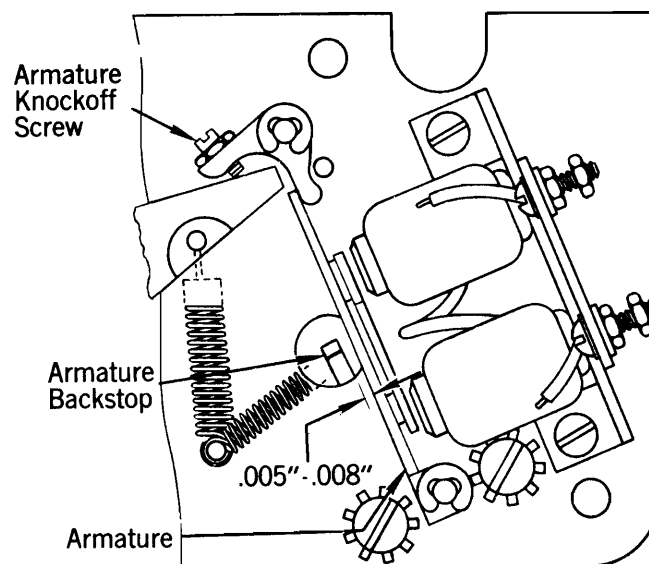
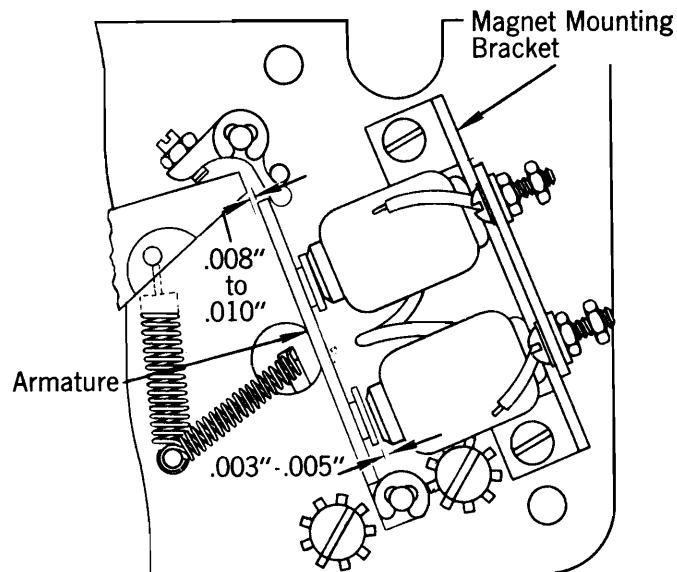
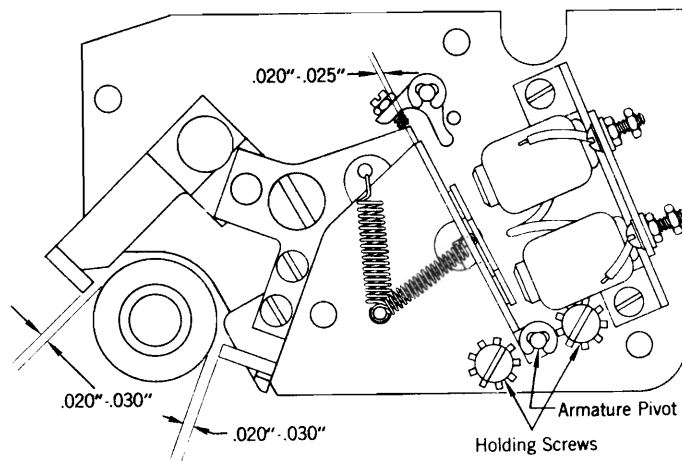
4. The armature pivot and back-stop are one assembly. Loosen holding screws and adjust horizontally so that the latch overlaps the armature .020" to .025" with the armature against its backstop. At the same time adjust the armature pivot vertically so that the cam fingers clear the periphery of the cam by .020" to .030" when latched upon the armature.
5. Adjust the magnet mounting bracket to provide an unlatching clearance of .008" to .010" with the armature touching the upper core and clearing the lower core by .003" to .005".
6. Turn the machine until the right finger is on the high point of the restoring cam. At this time adjust the armature knockoff screw to provide .005" to .008" clearance between the armature and the armature backstop. When the left finger is on the high point of the restoring cam, there should be sufficient clearance between the latching arm of the right cam finger and the armature to allow attraction of the armature without pressure on the latching surfaces.
7. With the spline on the stacker shaft fully engaged, loosen the locking screws in the cam and position it laterally so that the cam fingers, when tripped, clear the low dwell of the cam by  $\frac{1}{32}$ ".

## MARK SENSING ADJUSTMENTS

### Mark Sensing Brush Timing

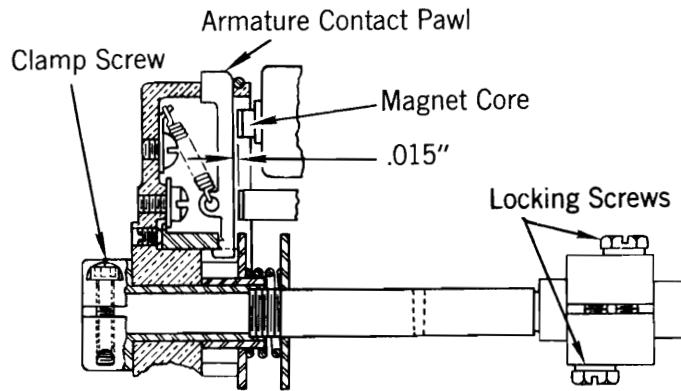
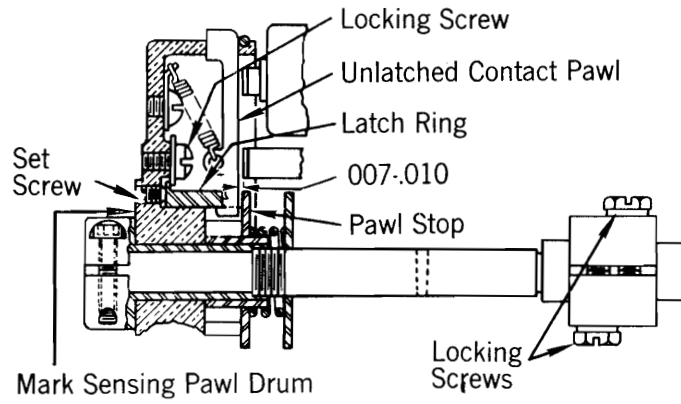
When studying the limits of the mark sensing brush, it must be remembered that the cards in the punch unit move intermittently. All motion takes place between  $2\frac{1}{2}$  teeth before a line of index and 1 tooth past a line of index, or a total of  $3\frac{1}{2}$  teeth on the index. The cards are stationary for  $6\frac{1}{2}$  teeth of each cycle point. Therefore, a mark on a card which makes contact with a brush by 1 tooth past the line of index will remain in contact position until  $2\frac{1}{2}$  teeth before the next line of index.

1. Set latch ring for .007" to .010" clearance of unlatched contact pawls to the mark sensing pawl stop. This is obtained by moving the magnet pawl latch ring in or out by means of opposing set of screws and locking screws in the mark sensing pawl drum assembly.

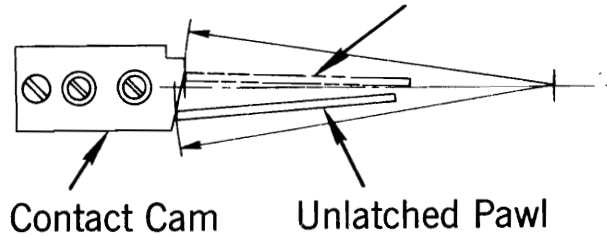


*Offset stacker adjustments*

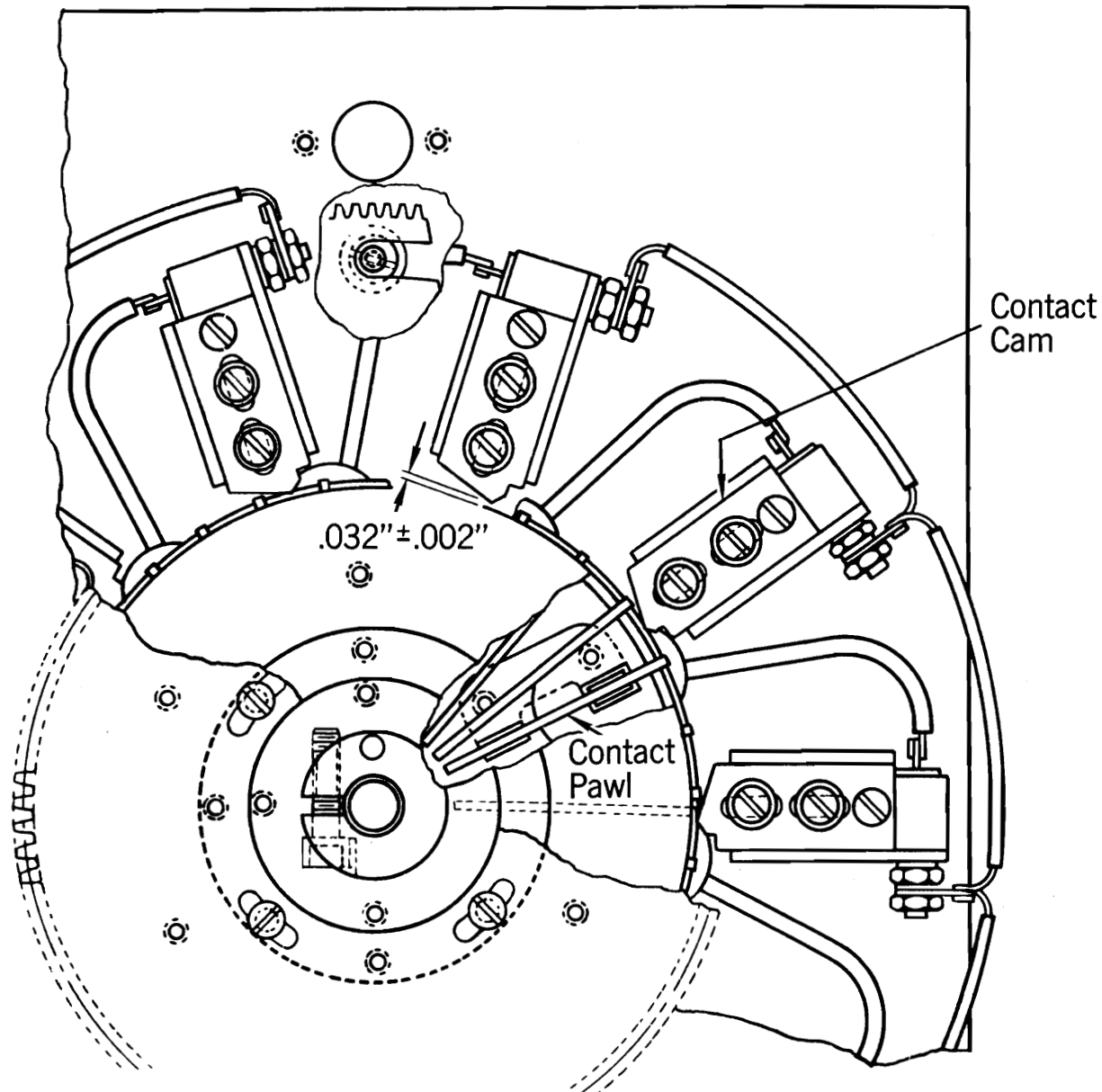
2. Loosen the clamp screw on the rear end of the drum mounting hub. With all pawls latched, turn in the contact drum until there is no clearance between the pawls and magnet cores; then back off the contact drum  $\frac{3}{10}$  of a turn. This provides  $.015''$  clearance between the unlatched pawls and the magnet cores. Lock the clamp screw.
3. With the unit on the machine, loosen the locking screws at the clutch end of the drum shaft and time the drum so that latched pawls make contact at 4 teeth after the line of index. Tighten the locking screws.
4. Adjust each contact cam for  $.032''$  plus or minus  $.002''$  clearance to the outer surface of the contact drum. This provides for proper relatching clearance.
5. To time the pawls on unit 2 and 3, move the drum in elongated holes in the drive gears.



Latched Pawl makes contact at 4 teeth past line of index.



**Mark sensing adjustments**



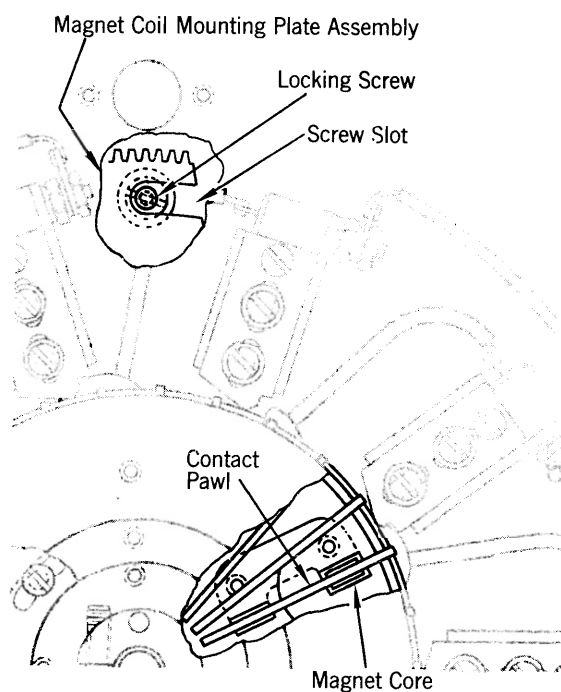
**Mark sensing adjustment**

- Adjust the position of the magnet coil mounting plate assembly by moving the assembly in the screw slot so that the center line of the pawls coincides with the center line of the magnet cores between any numbered index point and  $3-3\frac{1}{4}$  teeth past that point. Check carefully.

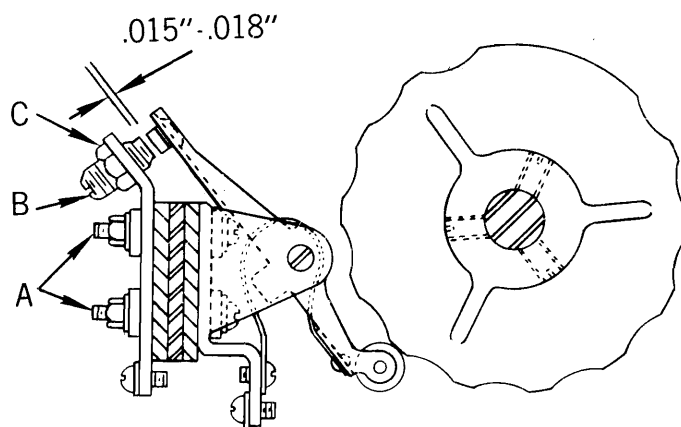
## CIRCUIT BREAKER ADJUSTMENTS

### Circuit Breakers — Type 513

- Clean points.
- Loosen screws A and align the contact points so that the full contact area is used.
- Loosen the locknut C and adjust screw B for correct air gap. There are 40 threads per inch on the contact screw, giving .025" movement for each turn. Air gap on circuit breakers should be .015" to .018".
- Form at D so that contact surfaces meet squarely.
- Loosen screws E and turn cam to obtain proper timing as given on the electrical timing chart supplied with each machine.

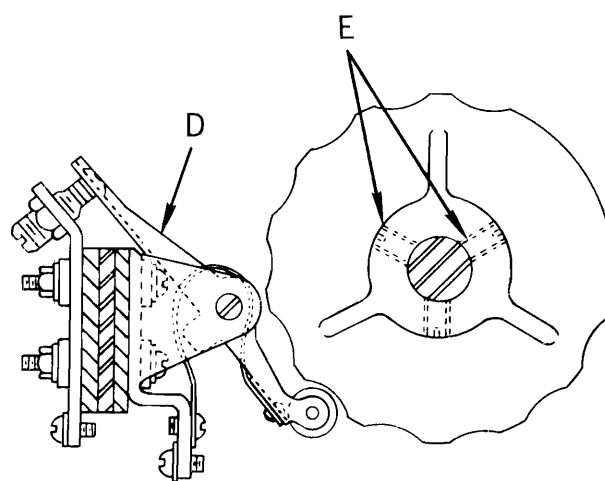


*Mark sensing adjustment*

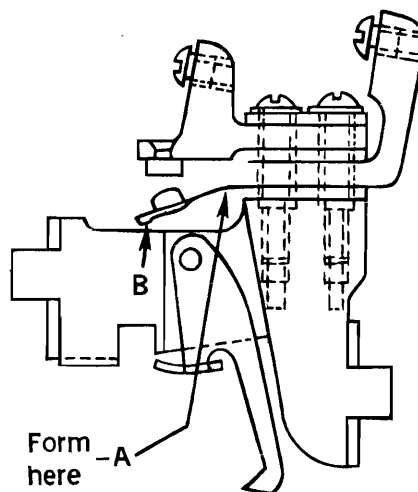


### Circuit Breakers, Latch Type — Type 519

- The lower contact strap should be formed at point A, so that a force of 160 grams plus or minus 10 grams applied at tip of lower strap B will just close the points. This must be maintained accurately to avoid a bouncing condition.
- 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.
- Place shims between the lower contact terminal block and the contact strap to provide .015" to .018" air gap between the contact point.
- 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



*Circuit breaker assembly*



*Circuit breaker adjustment*

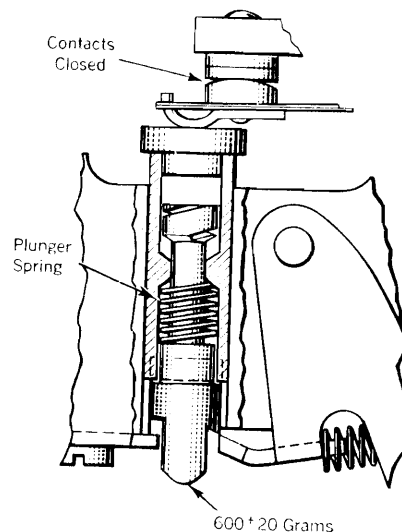
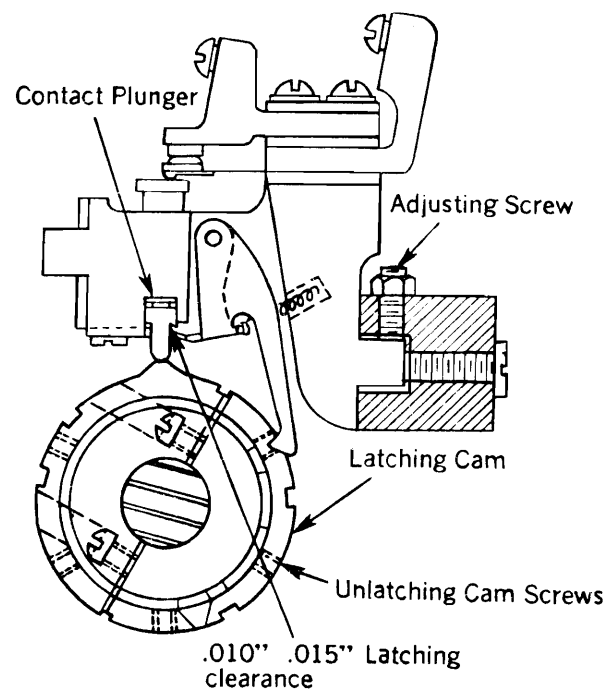
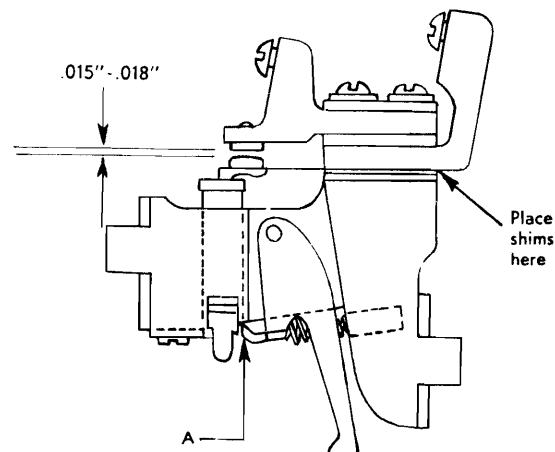
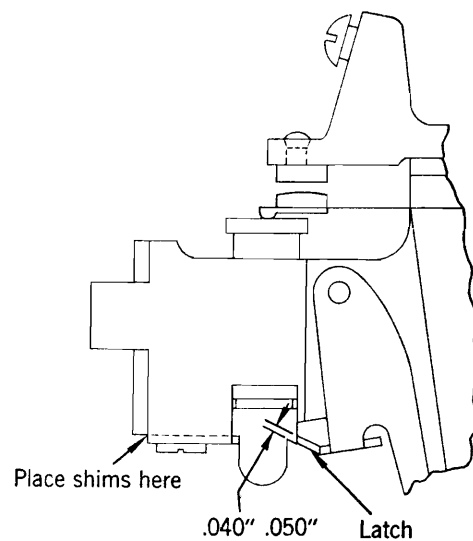
which increases the pressure required to close the contact from 160 grams (pressure required to compress the spring) to 225 grams (approximately 8 oz.). This friction is used to dampen the rebound when the contact closes. Check to be sure that a maximum of 240 grams applied to the plunger should close the contact.

5. 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. 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.

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 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.

6. To adjust the break time of the contact, loosen the contact unlatching cam screws. 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.

7. 600 grams plus or minus 20 grams (approximately 21 oz.) pressure on the contact plunger should be required to compress the plunger spring to the latching point. These values have been tested and found to provide a good operating condition.

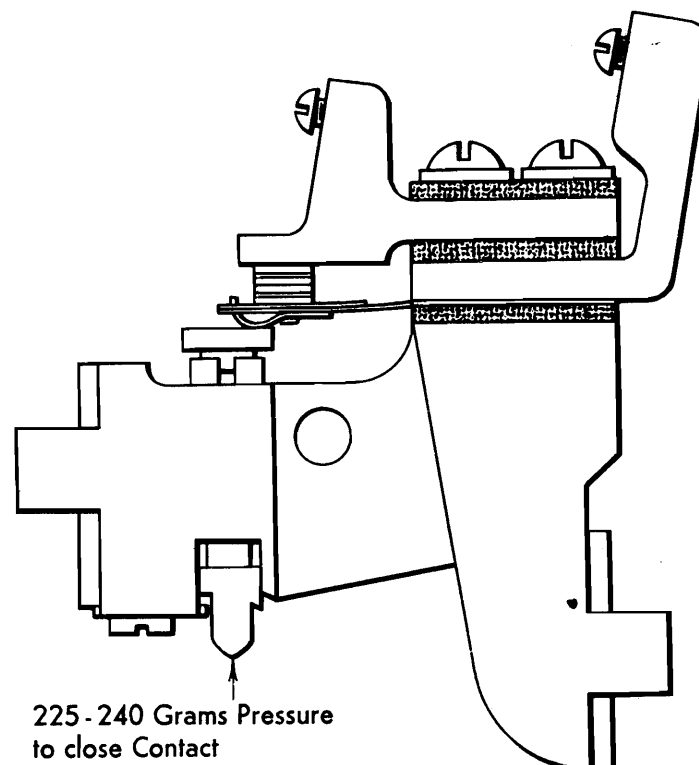
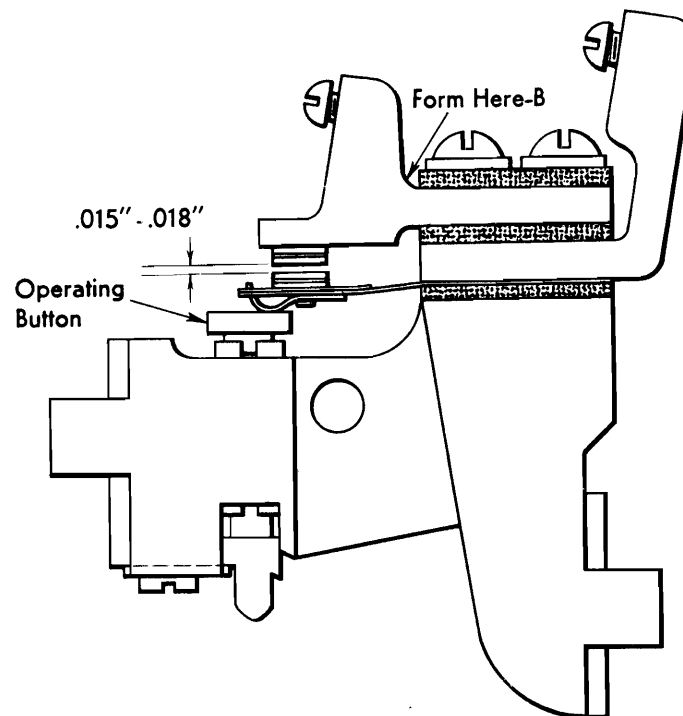
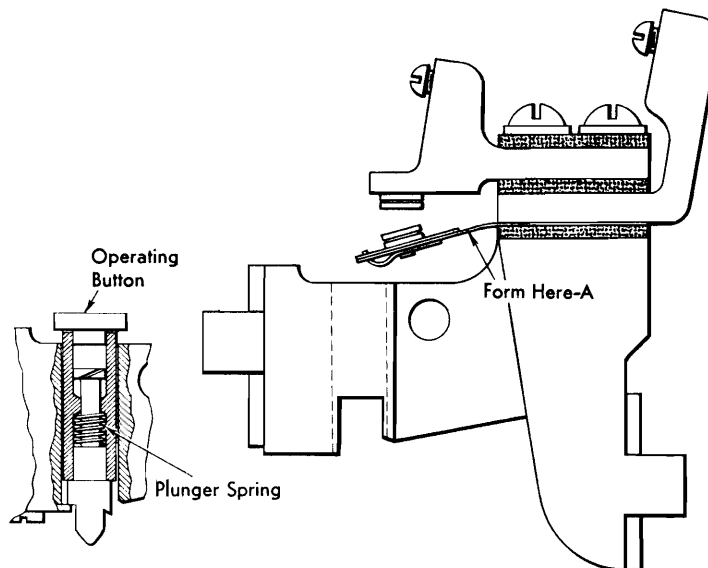


Circuit breaker adjustments

## Circuit Breakers Non-Latch Type Type 519

### Normally Open Circuit Breaker Adjustments

1. The lower strap should be formed at point A 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 will just close the points. This tension must be maintained accurately to prevent a bouncing condition.
2. The upper contact support should be formed at point B to provide .015"-.018" clearance between the upper contact and the lower contact when in its normal position resting on the plunger. Before bending the upper contact, the operating button is installed which gives the closest starting clearance. White button 205740 standard; red 186862 .005" shorter.
3. 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 close the contact) 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 closes the contact.
4. 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  $\frac{1}{2}$  turn to obtain .010"-.015" additional movement to the plunger.
5. 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 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.



*Circuit breaker adjustments*

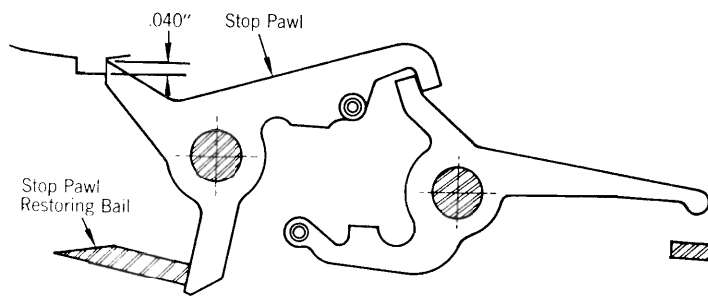


## PRINT UNIT ADJUSTMENTS TYPE 519

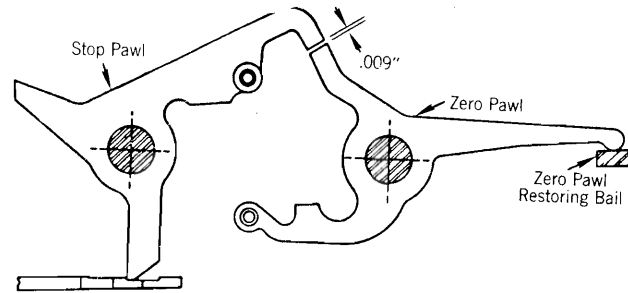
THE FOLLOWING conditions are established at the factory, and no adjustment is provided:

1. With the stop pawl restoring bail in normal position, the stop pawl should overlap the type tooth by  $.040''$  with the stop pawl unlatched and resting on the bail.
2. With the stop pawl latched on the armature and the zero pawl resting on the bail with the bail positioned by the low dwell of the cam, there should be  $.009''$  between the zero pawl and the stop pawl, as shown.
3. With the stop pawl unlatched and the zero pawl held by the bail on the normal dwell of the cam, there should be  $.012''$  clearance between the stop pawl and the zero pawl, as shown.
4. With the stop pawls tripped and resting on the zero pawl, there should be  $.012''$  clearance between the tip of the stop pawl and the end of the type wheel tooth. Adjustments should be made as follows:

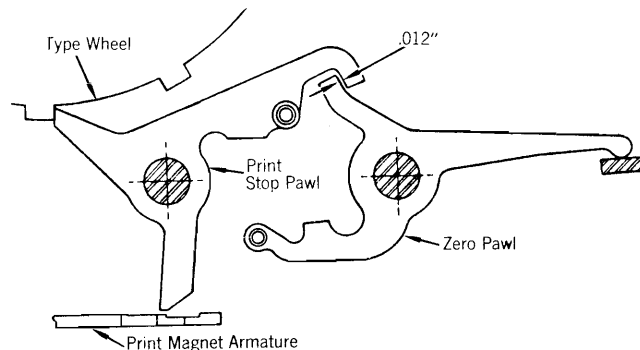
1. The eccentric screws A are adjusted to meet two conditions:
  - a. To secure  $.015''$  between the end of the stop pawl and armature with the armature attracted.
  - b. With the magnet de-energized and the stop pawl latched on the armature, there should be  $.024''$  air gap at the point farther from the pivot and  $.010''$  air gap at the point nearer the pivot of the armature. The eccentrics on both sides of the unit should be set for the same conditions.
2. Adjust the eccentric screws B to provide  $.020''$  clearance between the tip of the stop pawl and the teeth of the type wheel.
3. Loosen the locking screw and adjust the restoring bail to obtain  $.003''$  clearance between the armature latch surface and the latch point of the stop pawl with the latch restoring bail at its extreme limit of travel.



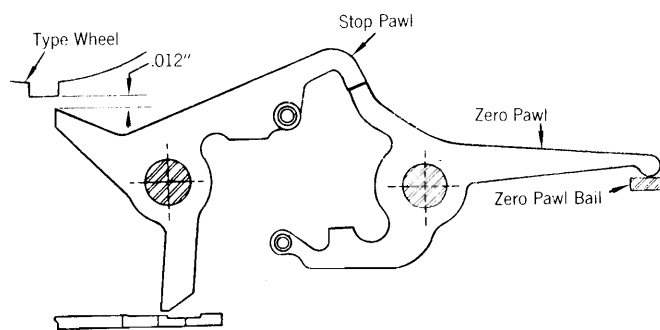
*Print stop pawl—operating position*



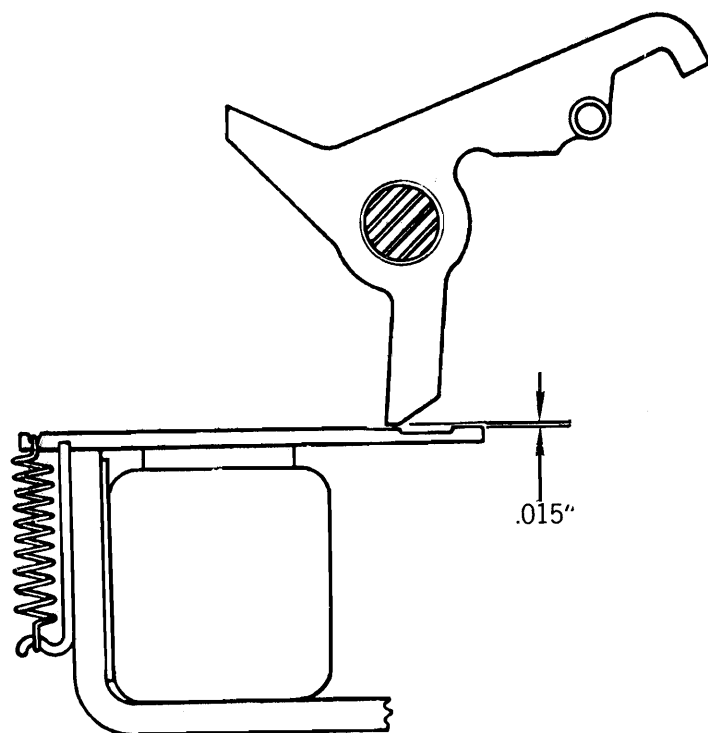
*Zero pawl—operating position*



*Print stop pawl—armature attracted*

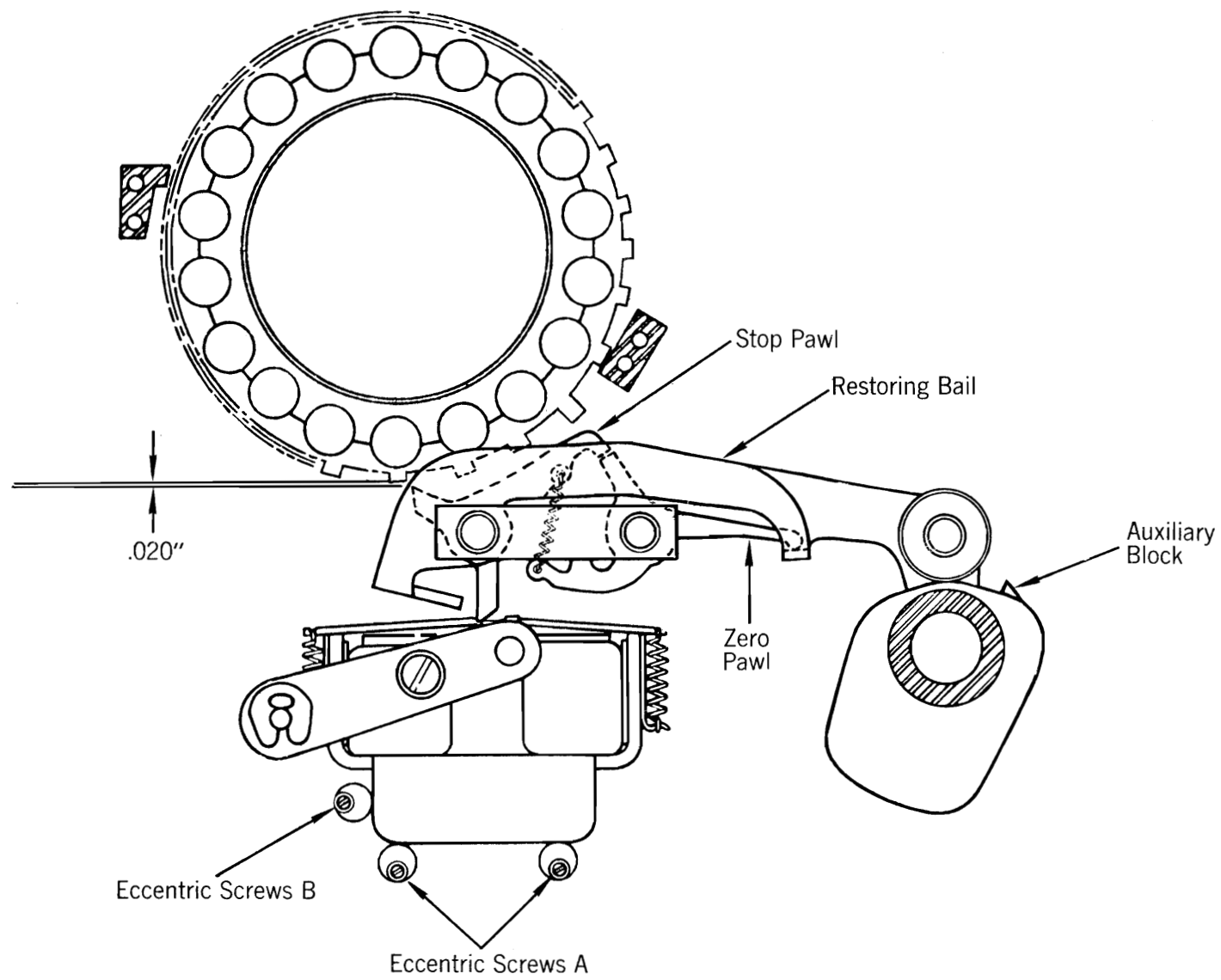


*Zero pawl—supporting print stop pawl*

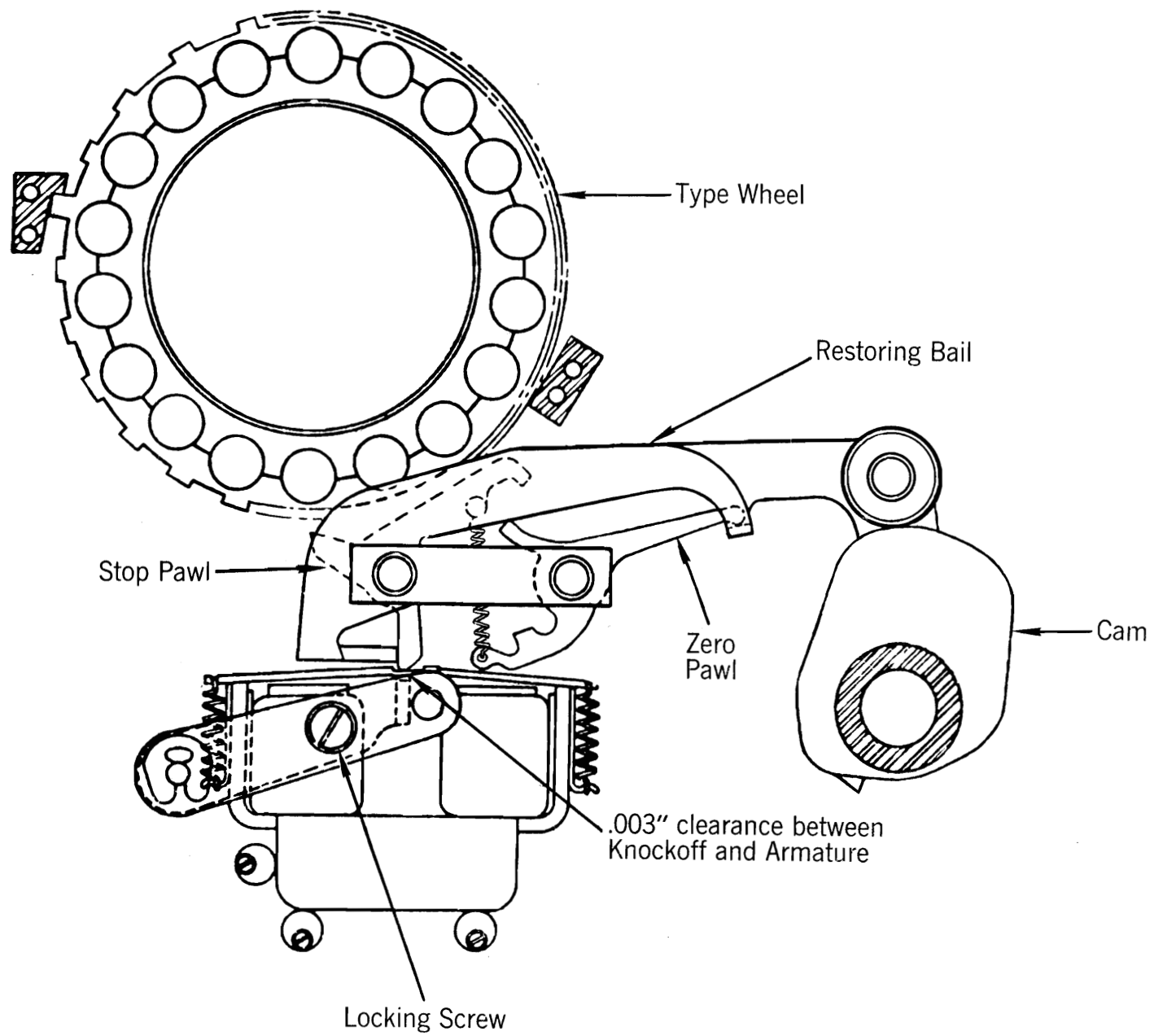


*Selection mechanism—zero time*





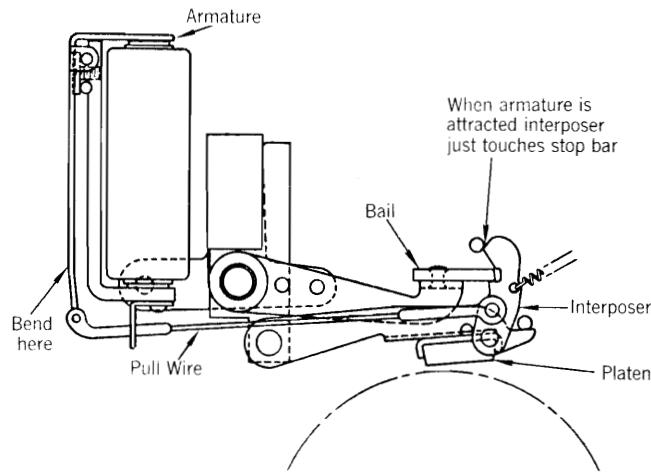
*Selection mechanism—zero time*



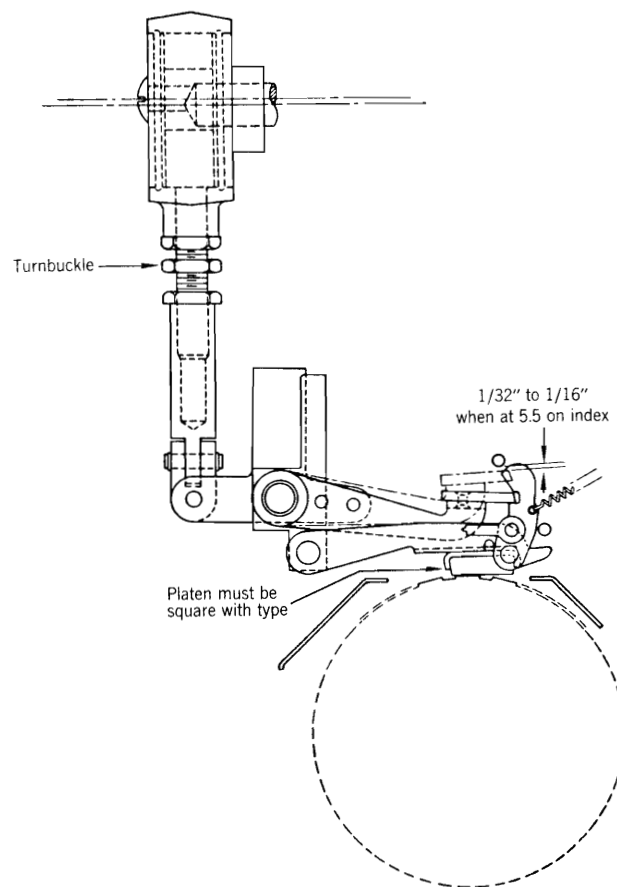
*Selection mechanism—restored position*

### PLATEN OPERATING MECHANISM ADJUSTMENTS TYPE 519

1. Bend the armature at a point near the pull wire so that the interposer just touches the stop rod with the armature attracted to the core.
2. Adjust the turnbuckle so that when the armatures are attracted and the bail is at its lower extreme limit of travel, the platen just touches the type wheels at  $4\frac{1}{2}$  teeth after 11. This adjustment should be slightly less for units using only four type wheels. The adjustment may be varied to obtain the proper degree of impression. The platen should meet the face of the type squarely. It may be necessary to sand or shim the platen block for this condition.
3. At  $1\frac{1}{2}$  teeth before 4 on the index, there should be approximately  $\frac{1}{32}$ " clearance between the bail and the stop rod when the bail is at its upward limit of travel. When the bail is at the lower limit of travel there should also be a  $\frac{1}{32}$ " clearance between the bail and the head of the rivet on the interposer. Adjust the interposer knockoff bail up or down by means of the elongated holes in the mounting to obtain this clearance.



*Platen operating mechanism*



*Printing platen adjustment*

### AUTOMATIC BIJUR — TYPE 519

*Before starting new machine, fill lubricator with IBM 9.*

Place pin punch through cross hole in instant feed rod and operate pump manually. Check that oil has reached all bearings before machine is put into service.

To increase volume of flow, remove locking screw from instant feed rod and turn stroke adjustment screw; clockwise increases, counterclockwise decreases volume. Measure stroke from top of instant feed rod to top of stroke adjusting screw. On Type 519 this distance is  $\frac{1}{2}$ ".

If conditions indicate all bearings receiving insufficient supply of oil, check for following:

1. Low oil level, broken, cracked or flattened oil tubes, loose connections, or dirty filter disc. Check filter disc by disconnecting main discharge line and operating pump manually. If a

replacement filter disc is not available, the part may be cleaned with carbon tetrachloride.

If only one bearing is being insufficiently supplied with oil:

1. Inspect tail tube to determine that the nut is properly tightened, that no leakage is present, that end of tube is in bearing, and that tube is not flattened or broken.
2. Remove tail tube from bearing and operate pump manually. A drop of oil should appear at the end of tube. Keep opening the line and checking for oil flow at each point working back to junction bar. If meter unit is cause of oil stoppage, replace it.

Meter units cannot be tested by blowing through them. Direction of flow indicated by arrow; flow rate indicated by numbers.

### VACUUM SEPARATOR UNIT — TYPE 519

To check quickly for leaks in system between base and outlet from vacuum separator, remove each hose and cover inlet in base with cards, empty chip receptacle of all but a few chips, and turn on main line switch. If there is any disturbance in receptacle, it indicates a leak in the system either at the intake into separator or at the gasket for the chip receptacle; either or both may be replaced. Butterfly valve in top of separator should be fully closed (in a horizontal position) when the chip receptacle bail is against the stop screw. A mark on the end of the shaft indicates the direction of the plane of the butterfly. The bail arm is clamped to the valve shaft by a screw through a split collar. To change position of butterfly, loosen screw and turn shaft to proper position. When bail is in normal position, butterfly valve should be open (mark on shaft vertical).

#### Vacuum Unit Microswitch

Adjust thumb screw on diaphragm to open contact at  $3\frac{1}{4}$ " vacuum (measured with respect to water) and to close at  $3\frac{3}{4}$ ". Check: With one tube off either set of brushes, the machine should not run; with all hoses properly positioned, sufficient vacuum should be produced to just close the switch and permit the machine to run.

#### Separator Microswitch

Set spring to allow microswitch to close when chip receptacle is  $\frac{3}{4}$  full. Adjust stop nuts to provide .010" overthrow of switch in OFF and ON positions.

## REMOVAL AND REPLACEMENT PROCEDURE

### To Remove a Die and Stripper

1. Remove the magnet unit from the machine.
2. Remove the punch interposer knockoff bar.

3. Remove the punch bail assembly. Replace the pivot bar and tighten screws to prevent spreading side frames.
4. Remove extreme left pull wire guide comb.
5. Unhook all magnet pull wires from the interposers. This may be done by moving the interposers toward the magnets and spreading the interposers slightly with a small screwdriver.
6. Remove the four screws which hold the punch and stripper assembly to the magnet unit side frames.
7. Remove the punch and stripper assembly.

### To Install a New Die and Stripper Assembly

1. Place the stripper assembly in position on magnet unit for assembling of magnet pull wires, but do not screw to unit. This permits more flexibility of the unit and the stripper when assembling pull wires.
2. Assemble pull wires to pawls. It is necessary only to move the pawls forward to assemble the pull wires. Check wire for proper fit to pawl stud.
3. Screw stripper assembly to magnet unit.
4. Replace guide comb.
5. Check all interposers and pull wires for binds.
6. Assemble bail and tongue, and check for .015" to .020" movement of top of interposer when engaged in its extreme lower position.
7. Assemble unit to machine and make all necessary adjustments.

### To Remove Feed Roll

The first upper feed roll in the punch unit will be considered, for it requires the most disassembly and care.

1. Remove the magnet unit.
2. Remove punch X brush mounting bar.
3. Remove drive housing and Geneva mechanism.
4. Pull the picket knife cam shaft from the side frame.
5. Drive the taper pin from the feed roll rear drive gear and remove the gear from the shaft.
6. Remove the oil pump—2 screws hold it.
7. Remove screws from bearing plate.

8. Remove dowel screws from punch feed back plate which supports the punch X brushes and center bearing for the feed roll. There are two screws in front and two in back.
9. Remove front gear cover.
10. Relieve the pressure from the lower feed roll.
11. Drive pin from the front drive gear of the feed roll.
12. Tap the front end of the upper feed roll shaft to loosen the bearing plate. Use a hammer and brass rod. When the bearing plate is loose, it may be turned to clear the latch cam roller arm, and the shaft may be removed from the machine. Take care in passing the feed roll through the hole in the casting to prevent chipping the linen dielecto.

The first lower feed roll in the punch feed is heavier than the others. This is to minimize bowing of the shaft when the feed roll opening device operates. The feed roll pressure shoes for this roll are cut with a greater radius because the diameter of the feed roll shaft is greater than that of the other feed rolls in the machine.

The feed roll pressure springs in the first and second feed roll pressure shoes are heavier than on the other feed rolls of the machine. Take care that these pressure shoes and springs are not interchanged if more than one feed roll is removed.

To replace the feed roll, reverse the above procedure.

13. The second and third upper feed rolls may be removed, after removing the drive gear pin, without removing the drive housing. If the front bearings are loosened so that the feed roll shaft may be driven forward far enough, the rear drive gear can be removed from the shaft.

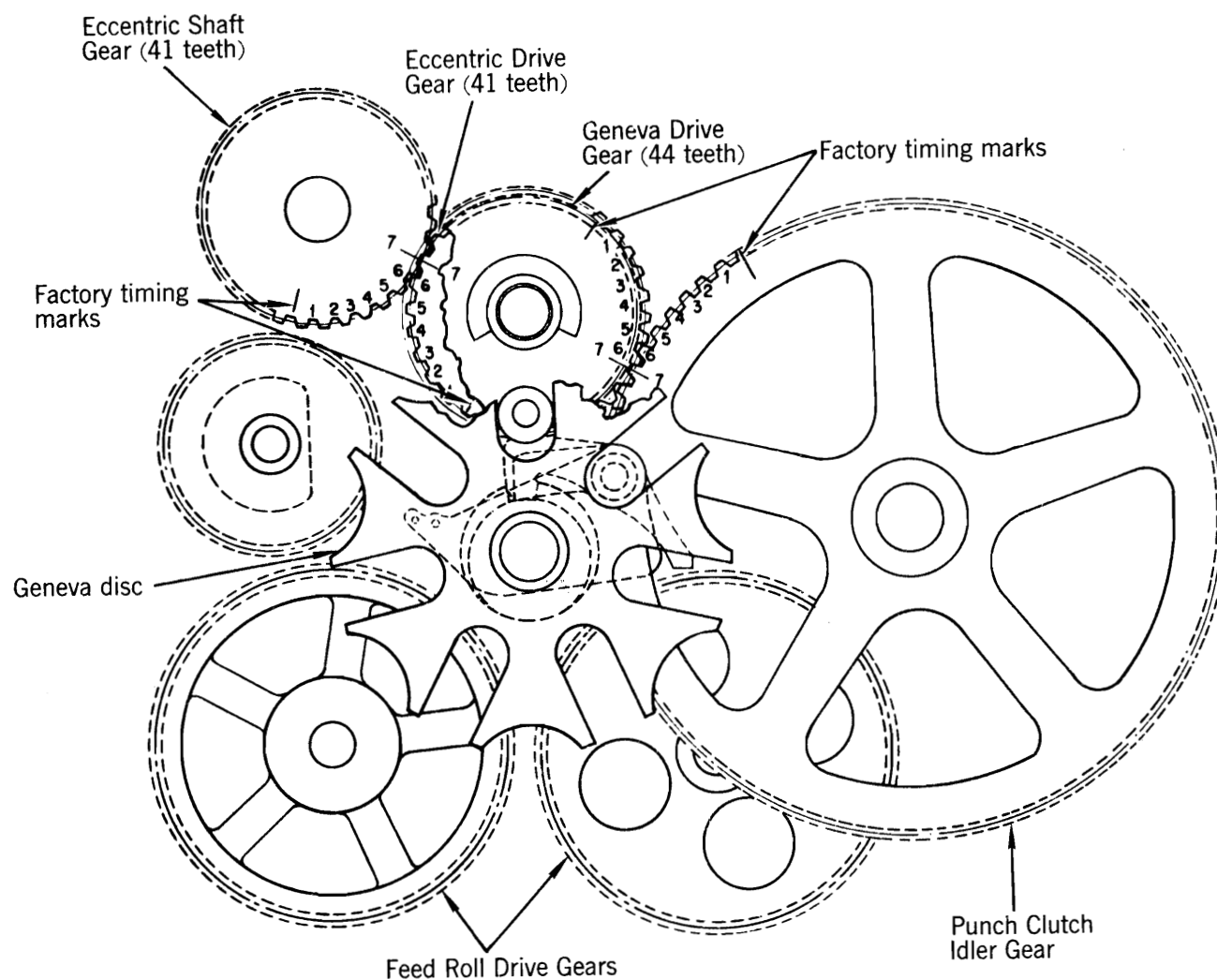
### To Replace the Geneva Mechanism

In order that the Geneva clutch pawl may clear the two upper feed roll drive gears, it is necessary to turn the gears so that the factory-scribed marks do not line up. However, if the following reference marks are made, these may be lined up to assure that the Geneva mechanism is properly timed when it is replaced in the machine:

1. On the eccentric shaft gear (41 teeth) pencil mark the 7th tooth

space in a counter-clockwise direction from the tooth space already marked. (A red pencil is recommended.)

2. Mark the 7th tooth in a clockwise direction from the present marked tooth of the eccentric drive gear (41 teeth). Also, mark the 7th tooth space in a clockwise direction from the present marked tooth space of Geneva disc drive gear (44 teeth). Both of these gears are pinned to the drive pulley shaft.
3. Mark the 7th tooth in a counter-clockwise direction from the present marked tooth of the punch clutch idler gear (110 teeth).
4. Turn the feed roll shafts until the flat side of the single revolution timing cam is on the right in a vertical position.
5. Turn the eccentric shaft and the punch clutch idler shaft until the new marks point toward the drive pulley shaft center.
6. Turn the key slot in the oil pump so that it lines up with the key tongue on the hub of the punch clutch idler gear.
7. Be sure the Geneva pawl is engaged in its ratchet.
8. Place the roller in the slot of the Geneva drive gear that lines up with the one-tooth ratchet (the one to the left of the pawl pivot).
9. Work the three gears forward into position while matching the pencil marks, and position the three shafts into their respective bearings in the side frame. The punch clutch idler gear shaft, being the longest, should enter the hole in the rotor of the pump first. Next, the Geneva disc shaft should enter its bearing, and then the pulley shaft bearing should enter its housing. After the punch clutch idler gear shaft is in the rotor of the pump, the shaft should be raised vertically about  $\frac{1}{4}$ " so that it will line up with the bearing in the side frame. If the Geneva disc shaft seems to bind just after it enters the bearing, check to see that it meshes properly with the two upper feed roll drive gears. It may be necessary to turn either one or both of these gears a part of a tooth to mesh with the gear on the shaft of the Geneva disc. Note: These shafts must not be forced in place. If any of the



*Timing the geneva mechanism*

mechanism does not properly seat, check to see that all gears are properly meshed, that all shafts are aligned with their bearings and that the key is aligned with the oil pump rotor.

10. Insert the crank stud and turn the machine over until the factory marks (scribed lines) line up. At this time the Geneva drive gear roller should be half way out of its slot and the tail of the pawl should strike the pawl disengaging roller.
11. Replace the drive housing.
12. If the drive pulley oil seal is removed, the outer discs should be replaced with the concave surface facing out.

## PURPOSES OF CAMS AND CONTACTS

### TYPE 513

**R1AL** operates with **R4AL** to control circuits to clutches to keep the feeds in step in the event of feed failure in either unit; that unit in which the failure occurred will operate.

**R1AU** is a die interlock contact which allows continuous operation only if a card is under the die C.L.

**R1BL** completes circuit to punch **X** common and **R2** when cards are feeding; when cards are not feeding, it opens to prevent circuits to **X** control relays.

**R1BU** completes circuit to **R10** for first cycle when summary punching, reproducing, and comparing to permit feeding without restoring comparing unit. This permits cards to be run out of summary punch, replaced in proper order and run in again without restoring comparing unit.

**R2AL** provides circuit to **O** and **X** hubs when card is in punching position on the second and each succeeding punching cycle.

**R2AU** holds **R2H** coil through die card lever after **R2** is energized at end of first punch feed cycle.

**R2BL** N/C (summary punching) causes punch to take two feed cycles when cards are first placed in machine and start key closed.

**R2BU** prevents accounting machine auto start when summary punching unless a card is at the die station.

**R3AL** N/C operates with **R7AL** N/C to shunt out punch card lever contacts and permit operation of read feed only. **R3AL** N/O, with other card lever contacts, holds **R10**,

- opening the circuit when last card leaves punch magazine. It also enters into the accounting machine auto start circuit when summary punching.
- R3AU** with **R4BL** and **R6AL N/C** shunts out read unit card levers and permits operation of punch unit alone.
- R3BL** with **R6BL** makes it necessary to have cards in both feeds in order to start machine when reproducing.
- R3BU** prevents accounting machine auto start when summary punching unless there is a card in the punch magazine.
- R4AL**—refer to **R1AL**.
- R4AU** completes circuit to read clutch for first feed cycles when starting a run when reproducing and gang punching with interspersed master cards in punch feed and using an **X** detail setup.
- R4BL N/C**, with **R3AU** and **R6AL N/C**, shunts out read card lever contacts to hold **R10** when punch unit only is operated. **R4BL N/O** enters **R10** hold circuit when cards are in read feed.
- R4BU** completes circuit to **R-X** common when cards are feeding. When cards are not feeding, it opens to prevent completion of circuits to **X** control relays.
- R5B** with other card lever contacts, provides an automatic start circuit to the accounting machine when summary punching. It prevents an accounting machine auto start unless there is a card under read card lever No. 1 when performing a combination reproducing and summary punching operation.
- R6AL N/C**, with **3AU** and **4BL N/C**, shunts out reading card lever contacts to hold **R10** when punch unit only operates. **R6AL N/O**, with **4BL N/O**, opens circuit to **R10** when last card leaves read magazine. It operates with other card lever contacts to provide an auto start impulse to the accounting machine when summary punching.
- R6AU**, when reproducing and comparing, permits machine to be cleared of cards after an error without restoring the comparing unit if cards are removed from both magazines.
- R6BL** operates with **3BL** so that when reproducing it is necessary to have cards in or out of both feeds in order to start the machine.
- R6BU** prevents an accounting machine auto start when summary punching and reproducing unless there is a card in the read magazine.
- R7AL N/C** with **R3AL** shunts punch card lever contacts to permit operation of read feed only. **R7AL N/O**, with other card lever contacts, opens holding circuit for **R10** in event of feed failure at die station.
- R7AU** prevents auto start of accounting machine if jam occurs at punching station.
- R7BL** eliminates back circuits on second card feed cycle when performing a reproducing and interspersed master card gang punching operation in conjunction with comparing and increasing the card field by wiring from the **O** and **X** hubs. Control panel wiring for this operation has the effect of shorting around **R7BU** points so that when the punch magnet common is broken by master card **X** impulse, a back circuit would be completed through the comparing unit magnets and common, to the fuse if **R7BL N/O** were not in the line.
- R7BU** completes circuit to punch brush contact roll when cards are at brush station; when open, it prevents energization of magnets connected to punch brushes.
- R8AL** provides hold circuit for **R8** long enough so **R8B** may prevent a second start impulse from reaching **R10** when summary punching.
- R8BL** opens punch auto start from accounting machine to eliminate the possibility of more than one punching cycle for each summary punch operation.
- R9AL** holds **R9** after **R10** drops.
- R9AU** holds **R9** during time **R10** is energized and **C3** is open.
- R9BL** picks **R8** after **R10** is energized to assure only one cycle of operation for each summary punch operation.
- R9BU** operates in conjunction with **R10BL** to control circuits to punch and read clutches. The pick time of **R9** under the control of **R13B** is such as to prevent the clutch magnets from receiving a short impulse when restarting in case the machine had stopped during the time **C1** or **C2** had already closed.
- R10AL** picks **HD1** and **R9**.
- R10AU** has two separate points to prevent a back circuit which would permit starting machine with comparing contact open.
- R10BL**, with **R9BU**, opens circuit to clutches (at time **C1** and **C2** are open) when machine stops for any reason.

*R10BU* prevents pick of *R25* until end of cycle to prevent opening *R25BL* until after the card has been punched.

*R11* and *12* points function as column splits.

*R13A* maintains *R10* hold to permit machine to complete its cycle in case either stacker switch opens.

*R13B* prevents *R9* from picking between 9.6 and 13.9 so clutch magnets may not receive short impulse when restarting in case machine had stopped when *C1* or *C2* had closed.

*R14AL* N/O provides pick circuit for *R15* when switch is set to master *X* and *PX* hub has been impulsed by hole in card under *PX* brushes for purpose of preventing punching or comparing master cards. The N/C side provides the same operation when switch is set to detail *X*, and no impulse is received at *PX* hub.

*R14AU* holds *R14*.

*R14BL* controls read clutch on *X* or no *X* cards, depending upon the setting of the master *X*, detail *X* switch.

*R15AL* on machines with punch magnet relays, prevents their pick when *R15* is impulsed; on machines without punch magnet relays, it opens the punch magnet circuit directly.

*R15AU* holds *R15*.

*R15BL* opens summary punch end circuit to allow another punch cycle when master card passes die.

*R15BU* permits an extra cycle on summary punching to get master card past die.

*R16A* holds *R16*.

*R16B* completes circuit to *P D* Out hub.

*R17A* holds *R17*.

*R17B* completes circuit to *R D* Out hub.

*R18A* holds *R18*.

*R18B* N/C, with reproduce switch 1 OFF and switch set to master *X*, opens common to comparing magnet when *X* card is sensed; the N/O point, when switch is set to detail *X*, closes the circuit to comparing magnets when an *X* card is sensed.

*R19A* holds *R19*.

*R19B* opens circuit to comparing magnets when master card is passing comparing brushes.

*R21AL* and *AU* operate in pick circuit through *T* hub for selectors 1 and 2, respectively, so this circuit can be completed only on a control change in the accounting machine.

*R21BL* opens clutch circuits until after counters have been tested for negative balance on balance selection machines.

*R21BU* N/C permits the 9 impulse from the summary punch emitter to be transmitted to counter mouldings for summary punching. The N/O point transmits a circuit to the 9 mouldings for balance control sensing on a control change to pick the selector relays if so wired.

*R22AU* shunts *R6AU* and comparing contact left to permit running cards in after checking a comparing error on a combination summary punching and reproducing operation before the comparing unit is restored to prevent getting an auto start circuit to the accounting machine on the run in cycles.

*R23AL* permits energization of cycle interlock *R8* when summary punching to assure punching only one summary card for each control change.

*R23AU* permits the summary punch emitter to send impulses through the counters of the accounting machine only on summary punching operations.

*R23BL* permits summary punch start circuit to be completed only after *R60* in the accounting machine is energized.

*R24B* has the effect of an *R* cam in the circuit. It functions to prevent the machine from continuing in operation under the following conditions: When a jam occurs in the read feed, *R4* and *R6* drop back to normal. The operator remakes the card or straightens it, replaces it in the read magazine, and depresses the start key to pick *R10*. The read feed only will feed. If it should happen that this first card again jams at the throat, *R10* would continue to hold through *P6* because the punch feed does not operate on this cycle. However, *R24B* in the *R10* hold circuit opens and stops the feed.

*R25AL* holds *R25* when *R10* is energized to permit feeding cards without restoring the comparing unit.

*R25AU* permits cards to be run from machine when comparing unit is tripped, thus eliminating the necessity for relatching the comparing unit and thereby maintaining the error indication until after feed is cleared so that it may be checked against the cards. It also permits clearing the feed without punching additional errors.

*R25BL* eliminates punching while error cards are cleared from the machine provided the comparing unit is not restored.

*R25BU* opens start circuit on combination reproducing, comparing and summary punching operation, when a comparing error is sensed. *R25BU* works with *R1BU* to permit proper handling of cards on a summary punch comparing error. It forces the operator to remove cards from both feed hoppers before running out cards. Then the die *CL* opens *R1BU* N/C and permits feed-in before comparing unit is restored.

*R28B* same as *R25BL*, added to reduce arcing.

*R33* and *R34BU* and *BL* are so arranged that either will be effective to transfer the class selector *C* hub in the two left hand positions from *NX* to *X* depending upon whether the *R* or *P* hub of the selector is impulsed.

*R33AL* and *R34AL* provide a pick and hold for class selector 1, relays 35, 36 and 37.

*R33AU* and *R34AU* hold *R33* through *P2* and *R2*, respectively, for the card reading portion of the cycle.

*R35* through *R41* points are class selector transfer points.

*R37AL* and *R42AL* points provide + and - punching control for indicating positive and negative totals when balance selecting or net balancing.

Points of Relays 43-56 eliminate back circuits at punching time on summary punching machines.

### MARK SENSING RELAYS

*R88B* N/C point provides a pick circuit to number 1 delay unit magnet. The N/O point picks *R89* for *MX* operation.

*R89AL* holds *R89*.

*R89AU* provides an impulse to the *MX EXIT* hub 1 to punch an *X* hole for a marked 12.

*R89B* provides a circuit to the *MX OUTLET* hub and with *P3* provides an impulse for operation of relays normally controlled by a punched *X*.

*R90A* holds *R90*.

*R90B* permits energization of *R89* in parallel with *R11*, *12* and *13* in the standard circuits to provide a hold circuit for *R89* through *X* time on the index.

Relays 91-107 points transfer the circuits from those used on com-

paring or summary punching to those used for the mark sensing application.

### OFFSET STACKER RELAYS

*SR1AL* holds *SR1*.

*SR1B* picks *SR2* to delay the circuit to the stacker magnet.

*SR2A* holds *SR2* through *P2* until the end of the cycle in which the card is stacked.

*SR2B* picks the offset stacker magnet when the stacker roll contact makes.

### DOUBLE PUNCH AND BLANK COLUMN DETECTION RELAYS

*R87AL* holds *R87* and the double punch error light until the double punch reset switch is depressed.

*R87B* N/C drops *R10* when double punch or blank column occurs.

*R109A* points provide a pick circuit for *R110* in the first position and a hold circuit for *R109* in the same position. The A points of relays 65-77 and 109-149 serve the same function for other positions.

*R109B* permits an impulse to *R87P2* and the error lamp if relay 109 has not been previously energized. This indicates a blank column.

*R110A* N/C provides a pick circuit for *R109* in the first position. This circuit is completed by the first impulse read into this position. It opens to prevent a second impulse read into this position from de-energizing *R110*. The A points of relays 110-150 and 66-78 serve the same function for other positions.

The N/O points of *R110* provide a circuit to pick *R87P1* if a second impulse reaches the entry hub. The N/O points of the other relays mentioned previously serve the same purpose for other positions.

*R110B* N/C same as *R110A* N/C.

*R19AL* N/C permits a shunt circuit around the master card punching switch right in the OFF position. *R19AL* opens to prevent blank column check for master cards. The N/O point permits a blank column check for *X* detail cards.

### C-CAMS

1. Controls the punch clutch timing and eliminates arcing of the relay points in the circuit by making the circuit after the relay points are closed and breaking the circuit before the relay points are opened.



2. Controls read clutch timing and eliminates arcing of relay points in that circuit.
3. Controls the drop out time of motor hold relay 9. It should be timed to cause the machine to coast to a point between 6 and 9.
4. Controls the pick and drop out time of column split relays and R13.
5. Provides proper timing hold for delay circuit relays.
6. Controls impulses to the read and punch delay OUT hubs and to delay circuits for other devices.
7. Controls impulse to O and X hubs and emits impulse to the MS EXIT hub 1 to punch an X hole.
8. C8 in conjunction with the stacker roll contact assures that the movement of the card is synchronized with the punch emitter. If the Geneva pawl failed to engage on the first cycle, the card and the punch emitter would be out of step. If the two are in step, the accounting machine auto start will be completed.
9. Provides a circuit to energize the zone control transfer relays for alphabetic summary punching.

#### P-CAMS

1. Controls the circuit to the circuit breakers so that the reading brush and emitter circuits are completed only when the punch unit operates. It also controls the pick of the punch magnet relays.
2. Controls the holding circuit for relays which must be held during the punching period and X control relay for double punch and blank column detection.
3. Completes a circuit to the punch X brush at X time only and to the MX outlet for mark sensing.
4. Provides a pickup for PX delay R16.
6. Provides a hold circuit for R10. It opens once during each cycle to test the condition of the card lever relays to determine if the machine should stop.

#### R-CAMS

1. Controls the circuit to the reproducing brushes to complete circuits to them only when the read feed operates.

2. Controls the holding circuit to the relays which must be held throughout the reading portion of the cycle under the control of read feed.
3. Completes circuit to the read X brushes at X time only.
4. Pickup for RX master delay R18.

#### STANDARD MACHINE RELAYS

*R1AL* operates in conjunction with *R4AL* to control circuits to clutches to keep feeds in step in event of a feed failure in either unit; that unit in which the failure occurred will operate.

*R1AU*, when closed, holds R19 in conjunction with other card lever contacts to continue machine operation. When open, it breaks circuit to R19 hold coil to stop machine in case it fails to feed a card from punch magazine.

*R1BL* completes circuit to punch X brush common and relay 2 when cards are feeding. When cards are not feeding, it is open to prevent circuits to X control relays.

*R1BU* completes circuit to R19 for first cycle when summary punching, reproducing and comparing to permit feeding without restoring comparing unit. In this manner the cards may be run out of the summary punch, replaced in proper order and run in again without restoring the comparing unit.

*R2AL* provides circuit to O and X hubs when a card is in punching position on the second and each succeeding punching cycle.

*R2AU* holds R2 through the die card lever after R2 has been energized at end of first punch feed cycle.

*R2BL N/C* causes machine to take 2 feed cycles when cards are first placed in machine and start key is depressed, when summary punching. *R2BL N/O*, in conjunction with other card lever contacts, allows auto start circuit to be completed from accounting machine.

*R2BU* prevents accounting machine automatic start when summary punching unless a card is at die station.

*R3AL N/C* operates in conjunction with *R8AL N/C* to shunt punch card lever contacts to permit operation of the read feed only. *R3AL N/O*, in conjunction with other card lever contacts, completes a

holding circuit for R19. It opens the R19 hold circuit when last card leaves punch magazine. It also operates in conjunction with other card lever contacts to complete accounting machine auto start circuit when summary punching.

**R3AU** operates in conjunction with R4BL and R6AL N/C to shunt read unit card levers to permit operation of the punch unit alone.

**R3BL** operates in conjunction with R6BL so that when reproducing, it is necessary to have cards in or out of both feeds in order to start the machine.

**R3BU** prevents an accounting machine auto start when summary punching unless there is a card in punch magazine.

**R4AL**—refer to R1AL.

**R4AU**, when reproducing and gang punching with interspersed master cards in the punch feed and using an X detail setup, this point completes circuit to read clutch for first feed cycle when starting a run.

**R4BL N/C** operates in conjunction with R3AU and R6AL N/C to shunt read card lever contacts to complete holding circuit to R19 when the punch unit only is being operated. R4BL N/O operates in conjunction with R6AL N/O to open circuit to R19 in case it fails to feed a card from read magazine.

**R4BU** completes a circuit to the RX common when cards are feeding. When cards are not feeding, it is open to prevent circuits to X control relays.

**R5A** operates in conjunction with R7A to prevent a circuit to read clutch to prevent operation of read feed when read unit is not being used. It provides a circuit to read clutch for first cycle after cards run out of the read feed magazine.

**R5B** operates in conjunction with other card lever contacts to provide an auto start circuit to accounting machine when summary punching. Prevents an accounting machine auto start unless there is a card under read card lever 1 when performing a combination reproducing and summary punching operation.

**R6AL N/C** operates in conjunction with R3AU and R4BL N/C to shunt reading card lever contacts to complete R19 hold circuit when the punch unit only is being operated. R6AL N/O operates in conjunction with R4BL N/O to open the circuit to R19 when last card

leaves read magazine. Operates in conjunction with other card lever contacts to provide start circuit to accounting machine when summary punching.

**R6AU**. This point, when reproducing and comparing, permits the machine to be cleared of cards after an error without restoring comparing unit, if cards are removed from both magazines.

**R6BL** operates in conjunction with R3BL so that when reproducing, it is necessary to have cards in or out of both feeds in order to start machine.

**R6BU** prevents accounting machine auto start when summary punching and reproducing unless there is a card in read magazine.

**R7A** operates in conjunction with R5A to prevent a circuit to read clutch and prevent operation of read feed when read feed is not being used. It opens when the cards run out of read feed magazine.

**R8AL N/C** operates in conjunction with R3AL to shunt punch card lever contacts to permit operation of read feed only. R8AL N/O in conjunction with other card lever contacts opens R19 hold circuit in event of a feed failure at die station.

**R8AU** prevents an automatic start circuit to accounting machine if a jam occurs at punching station.

**R8BL** eliminates back circuits on second card feed cycle when performing a reproducing and interspersed master card gang punching operation in conjunction with comparing and increasing the card field by wiring from the O and X hubs. Control panel wiring for this operation has the effect of shorting around R8BU points so that when the punch magnet common is broken by master card X impulses, a back circuit would be completed through comparing unit magnets and common, to the fuse if R8BL N/O were not in the circuit.

**R8BU** completes circuit to punch brush contact roll when cards are at that station. When open, it prevents energization of magnets connected to punch brushes.

**R9AL** shunts start interlocks when not reproducing.

**R9AU** allows a circuit to be completed to R26 pick coil only when reproducing. It prevents interruption of punching when an error is sensed while performing a double punch and blank column detection operation without comparing. This

allows following cards to be punched and eliminates the necessity for removing cards from the punch feed and replacing them before continuing the operation.

**R9BL** N/C shunts card lever contact interlock **R1AL** and **R4AL** to permit read clutch to operate on every cycle when gang punching and gang punch checking. The N/O point completes circuits to read clutch through **X** controlled and card lever interlocks when reproducing.

**R9BU** shunts card lever contact interlocks **R1AL** and **R4AL** to permit operation of punch clutch on every cycle when gang punching and gang punch checking.

**R10AU** places the comparing circuit under the control of **R8BL** when reproducing. When gang punch checking, it allows comparing to be independent of punch card lever.

**R10BL** permits running cards out of machine without restoring comparing unit when performing a reproducing operation, provided cards are removed from magazine to prevent further errors.

**R10BU** shunts reading card lever contacts in accounting machine start circuit when performing a summary punch operation without reproducing.

**R11A** controls in conjunction with **R29B**, circuit to common side of punch magnets to complete this circuit on **X** or No **X** cards depending upon position of punch direct control switch.

**R12AU** operates at P4 time. Picks punch offset stacker relay 143.

**R12BU** operates in pick circuit of punch relay 32.

**R13A** controls, in conjunction with **R34B**, circuit to common of comparing magnets; it completes this circuit for an **X** or No **X** card depending upon setup of comparing control.

**R14A** controls, in conjunction with **R27B**, operation of read clutch on **X** or No **X** cards depending upon setting of read feed control.

**R15AL** opens **R19** hold circuit to stop machine when stop key is depressed.

**R15AU** holds stop relay through start key N/C points to eliminate necessity for holding the stop key until **R19** drops.

**R15B** breaks holding circuit for HD1 through summary punch single card motor control points to stop motor when stop key is depressed.

**R16A** operates in conjunction with magazine card lever contacts to complete pick circuit to **R19** to start machine when start key is depressed.

**R17A** holds **R17**.

**R17B** opens the punch automatic start circuit from accounting machine to eliminate possibility of more than one cycle of the punch for each control change.

**R18AL** N/O completes circuit to motor heavy duty relay to hold motor relay energized after **R19AL** opens. C3 is timed to drop **R18** at a time to allow machine to coast to a point between 6 and 9.

**R18AU** holds **R18**.

**R18BL** N/C picks summary punch single card motor control relay 79 when **R18** drops and C10 makes.

**R18BL** N/O picks **R17** to assure a single punch cycle on each control change.

**R18BU** operates in conjunction with **R19BL** to control circuits to clutches. The pick time of **R18** under control of C8 is such as to prevent clutch magnets from receiving a short impulse when restarting in case machine had stopped during time when C1 or 2 had already closed.

**R19AL** N/C completes a circuit to machine idling light. **R19AL** N/O completes circuit to pick heavy duty motor relay.

**R19AU** holds **R19**.

**R19BL** operates in conjunction with **R18BU** to open circuit to the clutches (at time C1 and C2 are open) when machine stops for any reason.

**R19BU** N/C, in conjunction with **R25BL**, completes circuit to pick **R26** after an impulse to stop hub so that cards may be run out of machine without punching or comparing. It delays pick of **R26** until all punching has been completed for that card.

**R20**, **21**, **22**, column split points.

**R24A** opens **R19** hold circuit to stop machine when a discrepancy in comparing or double punch and blank column detecting is sensed if machine is wired to stop.

**R24B** opens accounting machine start interlock circuit to prevent an auto start when a comparing discrepancy is sensed during a summary punching operation.

**R25AL** shunts card lever relay contacts in accounting machine start circuit to provide a means of operating accounting machine without

- cards in punch and without restoring comparing unit when summary punching.
- R25AU** picks HD3 so reset key is operative only when stop hub of comparing unit is wired.
- R25BL**, N/O operates in connection with R19BU to pick comparing stop control relay 26 when "stop" hub is impulsed on a reproducing operation. It also completes circuit to R26 hold until comparing unit is restored.
- R25BU** operates, when open, in conjunction with R1BU to prevent starting machine after comparing unit has been tripped until cards are removed from the magazines.
- R26AL** and **R26BL** open after an impulse to the "stop" hub when reproducing, so cards may be run out of machine without punching or comparing.
- R26AU** holds R26.
- R26BU** permits operation of clutches to run cards out of machine without restoring comparing unit.
- R27A** holds R27.
- R27B** controls, in conjunction with R14A, operation of read clutch on X or No X cards depending upon setting of read feed control.
- R29A** holds R29.
- R29B** controls, in conjunction with R11A, circuit to common side of punch magnets to complete circuit on X or No X cards depending upon position of punch direct control.
- R30A** holds R30.
- R30B** completes circuit to punch magnet control relays under control of an impulse into P Tfr hub.
- R31A** holds R31 and completes pick for R32.
- R32A** holds R32.
- R32B** completes circuit to "PD OUT" hub.
- R33AL** ground interlock—opens circuit to die assembly when machine is stopped to prevent possible shock or injury to operator when removing die assembly.
- R33AU** holds R33 through C5.
- R33B** opens the circuit to cathode when machine stops to prevent lacing card should a marked 12 be on card at die station.
- R34A** holds R34.
- R34B** controls, in conjunction with R13A, circuit to common of comparing magnets; it completes this circuit for an X or No X card depending upon setup of comparing control.
- R35A** holds R35 and picks R36.
- R36A** holds R35.
- R36B** completes circuit to "RD OUT" hub.
- R43** and **44BU** and **BL** are class selection points. R43 and 44 BU and BL points are so arranged that either one will be effective depending upon which of the two pick hubs R or P is used.
- R43AL** provides a hold circuit for 43H coil and a pick and hold circuit for R45 and 46.
- R43AU** holds R43.
- R44AL** provides a hold circuit for R44 H coil and a pick and hold circuit for R45 and 46.
- R44AU** holds R44.
- R45** and **46** are class selection points.
- R47-50** same as R43 through 46 for class selector 2.
- R51-54** same as 43 through 46 for class selector 3.
- R55-58** same as R43 through 46 for class selector 4.
- R59-78** transfer points for NX and GP and during balance test time X and SP hubs. These points eliminate back circuits.
- R79AL** allows circuit to be completed to R80 pick coil when C11 makes. It should be noted that the timing of the pick circuits for relays 79, 80 and 81 is such that they will pick on successive machine cycles.
- R79AU** holds R79.
- R79B** holds, in conjunction with R80 and R81B, heavy duty motor relay energized for 4 or 5 cycles after a card has been summary punched so that the punch drive motor does not stop between single card groups.
- R80-81** function in the same manner as described for R79.
- R83A** operates in pick circuit from "B" hub for selector 4 so that this circuit can be completed only on a control change in the accounting machine.
- R84AL**, **AU**, **BL** operates in pick circuits through "B" hubs for selectors 1, 2, and 3, respectively, so that these groups can be picked only through B hubs on a control change in the accounting machine.
- R84BU**, N/C allows the 9 impulse from summary punch emitter to be transmitted to counter mouldings for summary punching. R84BU N/O transmits an impulse to the 9 mouldings for balance control sensing on a control change to pick selector relays if so wired.
- R85AL** makes summary punch single card motor control circuit to heavy duty motor relay operative when summary punching.

*R85AU* shunts *R24AL* to provide circuit to *R19*, in conjunction with *R1BU*, when summary punching, reproducing, and comparing to permit feeding without restoring comparing unit.

*R85BL* causes *R19* hold circuit to be controlled by *R2BL* so that when summary punching, the machine takes two cycles on initial depression of start key to carry a card to punch brush station.

*R85BU* provides a pick circuit for *R79* to initiate operation of relays 79 through 82 for summary punch single card motor control.

*R87AL* operates in conjunction with *R18BL* to pick one cycle control relay 17 on a summary punching operation.

*R87BL* allows start circuit to be completed to punch when summary punch cycle is required. Prevents extraneous impulses from accounting machine when performing operations other than summary punching.

*R87BU* provides a circuit to energize punch magnet control relays when summary punching.

### MARK SENSING RELAYS

*R89B* N/C provides pick circuit to number 1 delay unit magnet. *R89* N/O provides a circuit to pick *R90* for *MX* operation.

*R90AL* provides a hold for *R90*.

*R90AU* provides an impulse to the *MS EXIT* hub 1 to punch *X* hole for a marked 12.

*R90B* provides a circuit to the *MX OUTLET* hub and, in conjunction with *P3*, provides an impulse for operation of relays normally controlled by a punched *X*.

*R91AL* provides a circuit for the *MS* clutch.

*R91BL* prevents the completion of a circuit to *R19* until the thermal delay relay *BU* points close.

### Thermal Delay Relay

*BL*, the N/C points provide a circuit to the heater coil. The N/O points provide a hold circuit for the relay.

*BU* prevents energization of *R19* until there is sufficient time for the tubes to "warm up".

### OFFSET STACKER RELAYS

*R139A* provides a hold circuit for *R139*. This relay is picked if the comparing contact bail is tripped.

*R139AU* picks *R-141* and *HD3* to allow the comparing unit to be reset.

*R139B* prevents a circuit to the punch and read clutches for one cycle to provide time for the comparing unit to be restored.

*R140A* provides a hold circuit for *R140* and a pick circuit for *R142*.

*R140B* provides a pick circuit for *R141* to restore comparing unit when the punch offset stacker is impulsed to instigate offset stacking in the punch unit.

*R141B* opens the circuit to the double punch blank column light and the *R98* hold coil after an impulse has been emitted from the *DPBC* hub to the offset stacker pick hub.

*R142A* provides a hold circuit for *R142* and a pick for *R143*.

*R143A* holds *R143*.

*R143B* provides, in conjunction with *C6* pick circuit for *R144* at the proper time to cause punch offset stacker to be impulsed on the correct cycle.

*R144A* holds *R144*.

*R144B* allows the punch offset stacker magnet to be impulsed by *P11* at correct time on the correct cycle.

*R145A* provides a hold circuit for *R145* and a pick circuit for *R147*.

*R145B* provides a pick circuit for *HD3* when read offset stacker is impulsed to cause the comparing unit to be reset.

*R147A* holds *R147*.

*R147B* allows the read offset stacker to be impulsed by *P10* at correct time on correct cycle.

*R148A*—all points on *R148* operate at *P13* time to pick relays in conjunction with offset stacker delay circuits. Provides a pick circuit for *R142*.

*R148B* picks *R147*.

### DOUBLE PUNCH AND BLANK COLUMN DETECTION RELAYS

*R92A* prevents pick of *R98* on run-in before card is under punch brush station.

*R93AL* picks *R96* delay setup.

*R94A*, in conjunction with *R97B*, provides *X—No X* control over blank column detection.

*R95A* holds *R95*; picks *R96*.

*R96A* holds *R96*.

*R96B* picks *R97*, with *C6*, at the proper time in the cycle to delay the operation of the *X* control to the proper cycle.

*R97A* holds *R97*.

*R97B* provides, in conjunction with *R94A*, X—No X control over blank column detection.

*R98A* holds *R98*; provides circuit to error lamp.

*R98B* provides a circuit to the DPBC outlet hub in case either a blank or double punched column has been sensed. Prevents *R98* from being energized by a comparing error when both comparing and DPBC hubs are wired to the stop or same offset stacker hub.

*R99A* provides a pick circuit for relay 100 for the first position. This circuit is completed by the first impulse read into this position. It opens to prevent a second impulse read into this position from de-energizing *R99*.

*R99B*—the N/C points provide a circuit to the exit hub so that the information may also be gang punched. The N/O point provides a circuit to pick *R98* if a second impulse reaches the entry hub. This separates each position to prevent a second impulse in any position from being fed to all wired columns.

*R100A* provides a path for the blank column detection test impulse for position 1 in case no impulse was entered into the number 1 entry hub.

*R100B* picks *R99*; holds *R100*.

*R101*, 103 to 137, and *R170* to 188.

A points operate in the same manner as *R99A* for positions 2-30, respectively. B points operate in same manner as *R99B*. For positions 2-30, respectively.

*R102*, 104 to 138, and *R171*, 173 to 189. A points operate in the same manner as *R100A* for positions 2-30, respectively.

### PRINTING DEVICE RELAYS

*R12AL* operates in the pick circuit of the print device 2nd cycle X delay relay 165.

*R12BL* operates in the pick circuit of the print device 3rd cycle X delay relay 167.

*R163A* operates in conjunction with *R168B* to provide X—No X control over printing.

*R164A* holds *R164* and picks *R165* at the proper time in the cycle to delay the operation of the X control for the 2nd cycle.

*R165A* holds *R165*.

*R165B* provides, in conjunction with C6, a pick circuit for *R166* at the proper time in the cycle to transfer

the delay circuit to *R166* for the second cycle.

*R166A* holds *R166* and picks *R167* for third cycle delay transfer.

*R167A* holds 167.

*R167B*—picks, in conjunction with C6, *R168* at the proper time in the cycle to transfer the delay circuit to *R168* for the third cycle.

*R168B* operates in conjunction with *R163A* to provide X—No X control over printing.

*R244* 1-4 and *R245* 1-4 allow card impulses 5 through 9 to be directed to the print magnets. When open, they prevent energization of print magnets during restoring time while storage relays are being set up.

*R246* 1-4 and *R247* 1-4 provide circuits to the 0 storage relays at 0 time on the card.

*R248* 1-4 and *R249* 1-4 provide circuits to the 1 storage relays at 1 time on the card.

*R250* 1-4 and *R251* 1-4 provide circuits to the 2 storage relays at 2 time on the card.

*R252* 1-4, *R253* 1-4, *R254* 1-4, and *R255* 1-4 provide circuits to both the 0 and 1 storage relays.

*R256* 1-4, *R257* 1-4, *R258* 1-4, and *R259* 1-4 provide circuits to both 0 and 2 storage relays.

*R260-1* through *R283-1* provide hold circuits for storage relays 260 through 283.

*R260-3* and 4 through *R283-3* and 4, the N/C points in combination provide a circuit from the entry hubs to the print magnets in the event the storage relay has not been picked. One N/O point, in combination with other N/C points, for each position provides a circuit for read out impulses from the emitter to the print magnets.

### C — CAMS

1. Controls punch and mark sensing clutch timing and eliminates arcing of the relay points in the circuit by making the circuits after the relay points are closed and breaking the circuits before the relay points are opened.
2. Controls read clutch timing and eliminates arcing of the relay points in the circuit by making the circuit after the relay points are closed and breaking the circuit before the relay points are opened.
3. Controls the drop out time of motor control relay 18. Should

- be timed to cause machine to coast to a point between 6 and 9.
4. Controls pick and drop out time of column split relays.
  5. Provides properly timed hold for delay circuit relays.
  6. Controls impulses to read and punch delay "out" hubs and to delay circuits for other devices.
  7. Controls impulse to O and X hubs and emits impulse to the MS EXIT hub 1 to punch X hole.
  8. Times pick of motor control relay 18 at time when it cannot energize one clutch without the other.
  9. In conjunction with the punch interlock contact assures that the movement of the card is synchronized with the punch emitter. If the Geneva pawl failed to engage on the first cycle, the card and the punch emitter would be out of step. If the two are in step, the accounting machine auto start circuit will be completed.
  - 10, 11, and 12. Time pickup of summary punch single card motor control.
 

C10 impulses R79. C11 impulses R80 before R79 drops. C12 impulses R81 before R80 drops.

This sequence provides a motor running circuit for at least four machine cycles to eliminate starting and stopping of the punch motor for single card totals.
  13. Controls pickup of R148 which works in conjunction with offset stacker delay circuits.
 

23, 24, 25, 26 supply timed impulses to the card brushes.

#### P — CAMS

1. Controls the circuit to the circuit breakers so that reading brush and emitter circuits are completed only when the punch unit operates. Controls the pick of the punch magnet relays.
2. Controls the holding circuit for relays which must be held during the punching period and X control relays for double punch and blank detection as well as cycle delay relays for printing.
3. Completes circuit to the punch X brush at X time only and to the MX outlet for mark sensing.
4. Controls R12 to expand the number of circuits which can operate at P4 time.
5. Allows the machine to take one cycle if the start key is depressed. It opens once each cycle to test the R19 hold circuit through the card lever contacts to determine that cards are at each card lever station. In the event that one of the card lever contacts opens, R19 is held until the cycle is completed.
6. Permits R19 to be held to cause the machine to complete a cycle when R24AL is opened regardless of the time R24 is energized.
10. Provides an impulse to the read offset stacker magnet at the proper time.
11. Provides an impulse to the punch offset stacker magnet at the proper time.
12. Provides an impulse to the offset stacker holding relays.
13. Provides a pick circuit to the double punch detection relays through the N/O B points of the blank column detection relays.
14. Provides a blank column detection test impulse.
15. Provides a hold circuit for the double punch detection relays.
16. Provides timed impulses to the mark sensing brushes.
17. Provides a hold circuit for mark sensing relay 90 to hold it long enough to allow an X hole to be punched from the first position of the mark sensing unit.
- 20, 21. Provides timed impulses to the print unit read-in and read-out emitters.
22. Provides an impulse to the platen magnets.
23. Provides a hold circuit for the storage relay hold coils.
24. Provides an impulse to relays 244 and 245 so that the 5-9 holes may be read directly from the card into the print magnets.

#### R — CAMS

1. Controls the circuit to reproducing brushes to complete circuits to them only when the read feed operates.
3. Completes circuit to read X brushes at X time only.
4. Controls drop time of R19 motor hold circuit when the reading unit is operating alone. It provides a dropout of R19 and eliminates continued operation after a jam in the read feed.
5. Picks R36 in read delay circuit.