

**STROMBERG-CARLSON®**

**Maintenance and  
Adjustment of  
The XY® Universal  
Switch**

**ENGINEERING BULLETIN NO. T-145R**

The switch has been precision made to assure long and repeated accuracy throughout its life. Normally the only maintenance required on the switch is lubrication every six months. No attempt should be made to re-adjust the switch when it is performing normally. If the switch is not performing properly, *then and only then* should it be checked and readjusted in accordance with this manual. Switch with Stock No. 209067 is described herein.

## TABLE OF CONTENTS

	PAGE		PAGE
GENERAL .....	3	3. "SHORT PAWL ACTION" .....	10
LOCKSPRINGS .....	3	4. Y-ARMATURE BACKSTOP .....	10
X-STEPPING MECHANISM—UNOPERATED		5. Y-MOTOR MAGNET .....	11
(NORMAL) POSITION .....	4	6. INTERRUPTER .....	11
1. X-GEAR CLUSTER .....	4	COG ROLLER SUPPORT .....	11
2. X-RETAINING PAWL .....	4	XX-X INSULATED PILLAR .....	11
3. X-RETURN SPRING .....	4	XX-X RACK ASSEMBLY .....	11
4. X-ARMATURE BACKSTOP .....	4	X-CARRIAGE .....	11
X-STEPPING MECHANISM—OPERATED		1. CLEARANCE .....	11
(OFF-NORMAL) POSITION .....	5	2. INSULATED PILLAR .....	12
1. X-MOTOR MAGNET .....	5	Y-PINION ASSEMBLY .....	12
2. DRIVING ACTION .....	5	GUIDE RULE .....	12
3. STOPPING ACTION .....	6	Y-CARRIAGE .....	12
4. "SHORT PAWL ACTION" .....	6	WIPER ADJUSTMENTS .....	14
5. INTERRUPTER .....	6	RELEASING MECHANISM .....	14
Y-STEPPING MECHANISM—UNOPERATED		1. THE ARMATURE CAMMING SURFACE .....	14
(NORMAL) POSITION .....	7	2. X-RELEASE REQUIREMENTS .....	14
1. Y-RETURN SPRING .....	7	3. CLEARANCE .....	15
2. DIGIT DRUM .....	7	4. Y-RELEASE REQUIREMENTS .....	15
3. Y-STOP BAR .....	8	5. RELEASE SEQUENCE .....	15
4. Y-STOP .....	8	6. THE RELEASE SPRING PILE-UP .....	15
5. Y-RETAINING PAWL .....	9	SPRING PILE-UPS (OFF NORMAL	
Y-STEPPING MECHANISM—OPERATED		AND OVERFLOW) .....	16
(OFF-NORMAL) POSITION .....	9	CABLE AND PLUG ASSEMBLY .....	17
1. DRIVING ACTION .....	9	ELECTRICAL REQUIREMENTS .....	17
2. STOPPING ACTION .....	10		

# STROMBERG-CARLSON SERVICE AND MAINTENANCE OF THE XY\* UNIVERSAL SWITCH

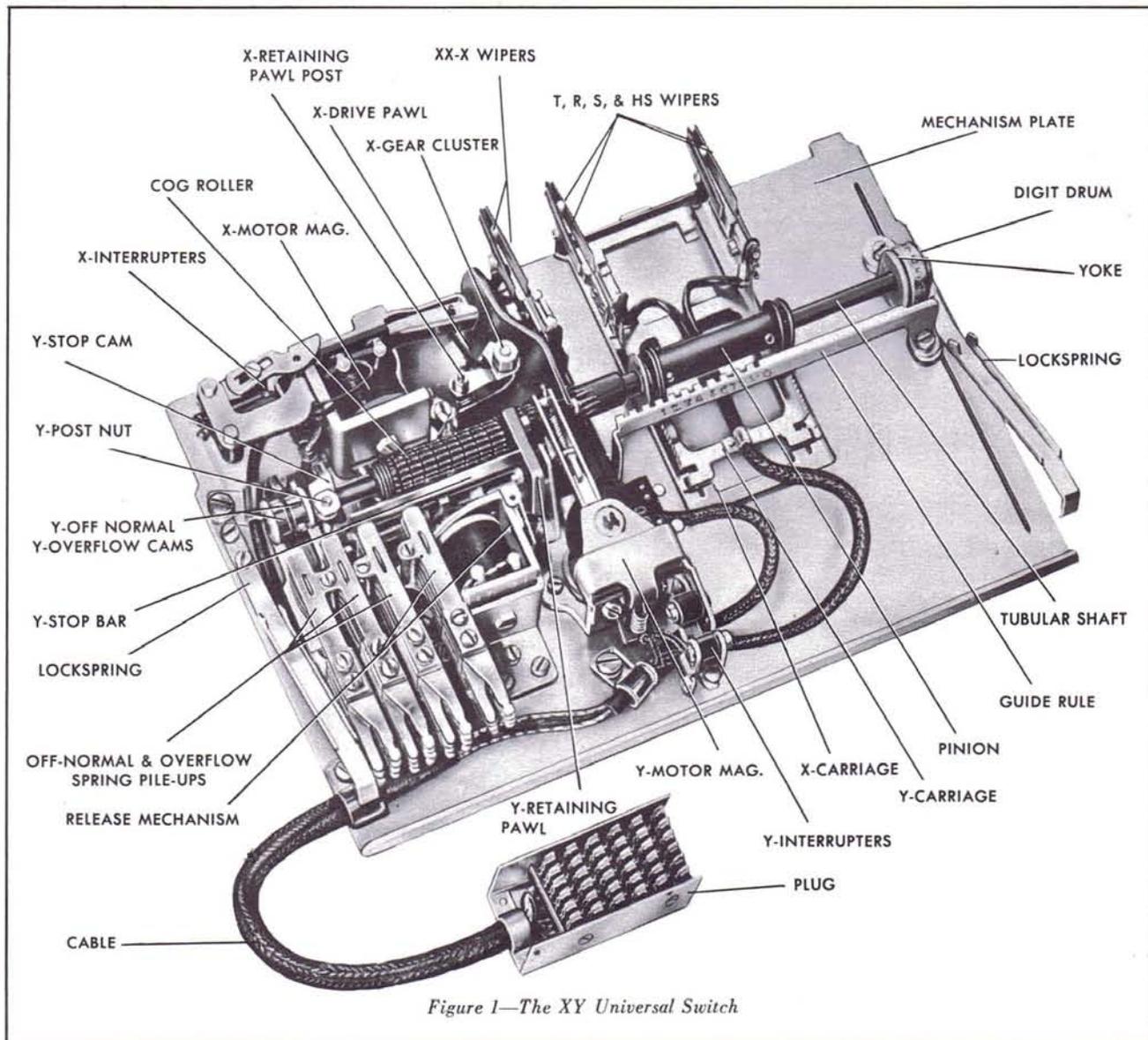


Figure 1—The XY Universal Switch

## GENERAL

All adjustments should be made to that side of the tolerance which would give a closer fit unless otherwise specified.

No adjustments are to be made by bending the various pawls. All pawls are hardened and attempts to bend them will only result in breakage.

The Bearing Support and Yoke have been accurately and positively located on the mechanism plate by a fixture during manufacture and should *never be disturbed*. The location of these parts determines the base line for all subsequent adjustments.

## LOCKSPRINGS

The Locksprings located at the extreme left and right hand sides of the switch must lock the switch securely in its cell so that there is no movement of the mechanism plate during operation. These springs should be visually parallel but must not interfere with either the sides of the cell or adjacent parts on the switch.

The mounting holes in the Locksprings are sufficiently large to allow for the above adjustment. Mounting screws should be tightened securely. These springs may be bent upwards or downwards as necessary to insure positive locking in its cell.

\*"XY" is a registered United States trademark. Whenever it appears in this bulletin, the term is used in the trademark sense.

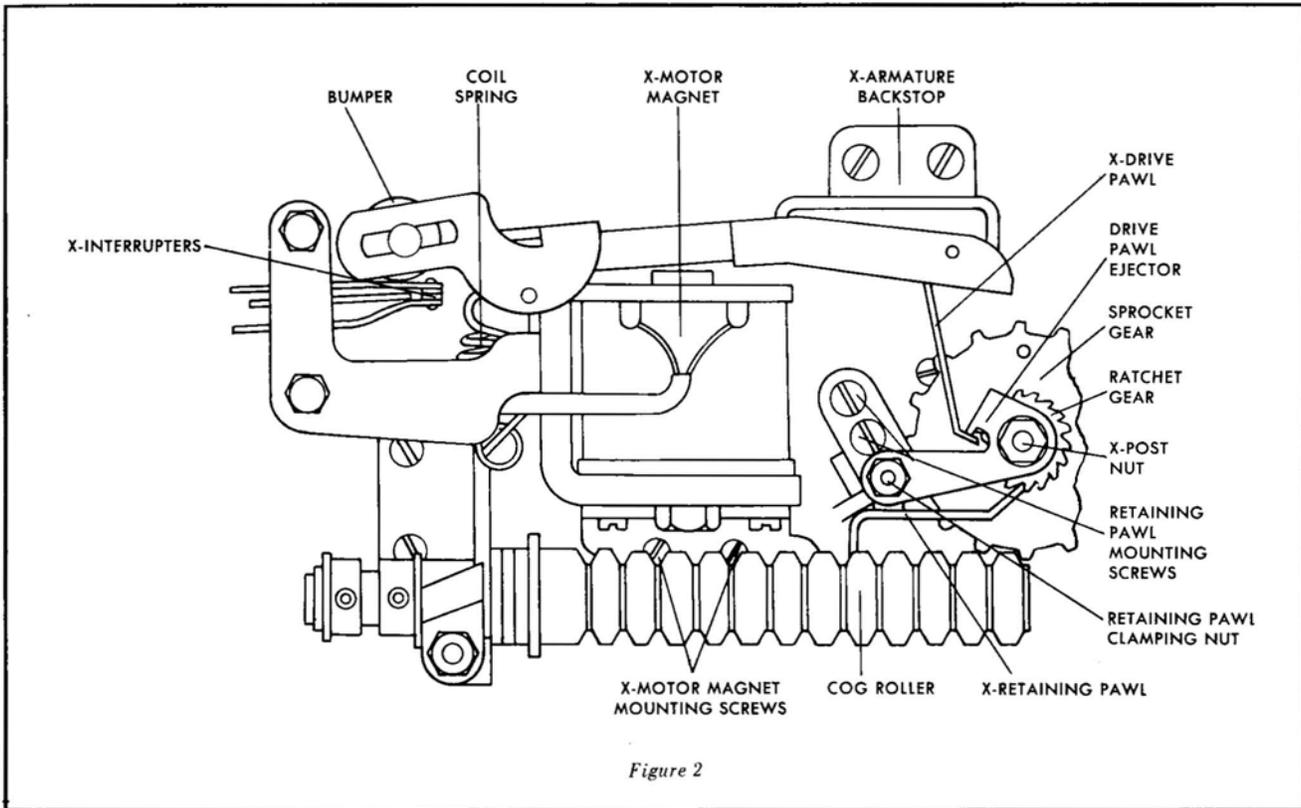


Figure 2

## X-STEPPING MECHANISM

Unoperated (normal) position (See Fig. 2)

The following requirements must be met with the switch in this position. Adjustments 1, 2, 3 should be done together, for they are interrelated.

### 1. X-GEAR CLUSTER—Line-up and Backlash (See Fig. 3)

The index hole in the sprocket gear of the X-Gear Cluster must be diametrically opposite the gear tooth which is in engagement with the Cog Roller. The center lines of the index hole, gear cluster and engaging tooth must be perpendicular to the axis of the Cog Roller.

The amount of backlash permissible between the X-Gear Cluster and the Cog Roller is between .000" and .010"; this should be held to the minimum side. After the setting is made in the home position, it should be checked for binds in all other positions, including the Y-direction. These requirements can be met by carefully loosening the X-Post Nut and moving the gear cluster to the proper position. Care should be taken not to disturb the pawl ejection bracket setting. Retighten the X-Post Nut securely.

### 2. X-RETAINING PAWL SETTING (See Fig. 3)

With the Cog Roller at normal, resting against the Bearing Support, the X-Retaining Pawl shall be adjusted so that this pawl may move into and out of en-

gagement with its mating ratchet face with a very slight drag.

Usually, loosening the clamp nut on the retaining pawl post will permit proper adjustment of the pawl. However, should more adjustment be required, it will be necessary to loosen the two mounting screws holding the mounting bracket. After adjustment has been made, tighten the mounting screws, the clamp nut on the retaining pawl post, and recheck the line-up requirements on the X-Gear Cluster.

### 3. X-RETURN SPRING

A notched windup washer holds tension on the X-Return Spring. This washer should be taken up approximately 10 to 14 notches. This should create sufficient tension on the spring to return the carriage positively, even from step X-1/2. Adjustment is made by loosening the lock screw on the periphery of the washer and winding up the spring by turning the washer ten to fourteen notches in a clockwise direction. Then lock the washer in place by tightening the screw.

### 4. X-ARMATURE BACKSTOP

Set the Armature Backstop so that only the left end limits the armature travel. The location of the stop should be such that the drive pawl has a .002" minimum radial clearance from the outside diameter of the ratchet. For optimum operation of the switch, this clearance should be held as close as possible to the minimum.

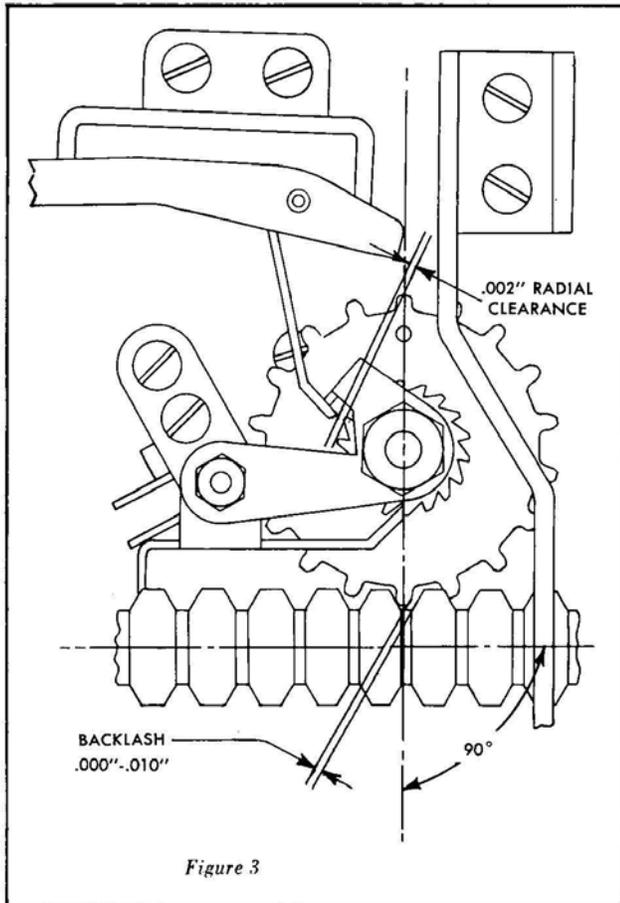


Figure 3

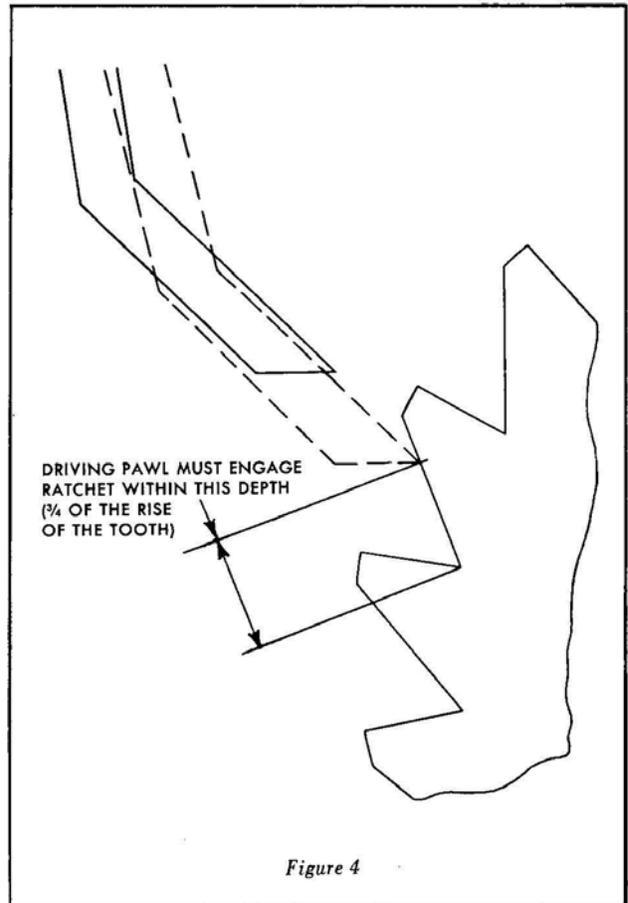


Figure 4

## X-STEPPING MECHANISMS

### Operated (off-normal) Position

The following requirements should be checked with the coil energized. Use 24 volt direct current so as not to overheat the winding.

The requirements for "Driving Action," "Stopping Action," and "Short Pawl Action" are interrelated. Whenever it is necessary to change the setting of one, then the adjustment of the other two should also be checked.

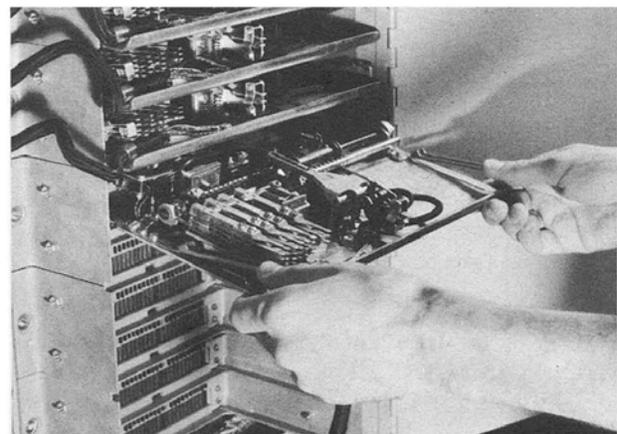
#### 1. THE X-MOTOR MAGNET

The clearance between the armature and the frame (known as "Air Line") should be held to a minimum and should not exceed .0015" as determined visually. The "Air Line" can be adjusted by loosening the two screws near the coil spring and allowing the armature to seat itself in the correct position. Re-tighten these screws securely.

#### 2. DRIVING ACTION (See Fig. 4)

The X-Drive Pawl must engage the flank of the ratchet before coming in contact with the radial face. This point of engagement is limited to a section from the root to  $\frac{3}{4}$  the length of the flank. If the factory

setting of the ejector has not been disturbed, this requirement can be met by loosening the two mounting screws holding the magnet assembly to the mechanism plate and shifting the magnet assembly to the proper position. If the ejector has been disturbed, it may be necessary to loosen the gear cluster clamping nut and the retaining pawl nut so that the ejector can be moved to give the proper pawl action. All nuts and screws should be re-tightened securely.



Proper Method of Inserting XY Universal Switch into its Cell

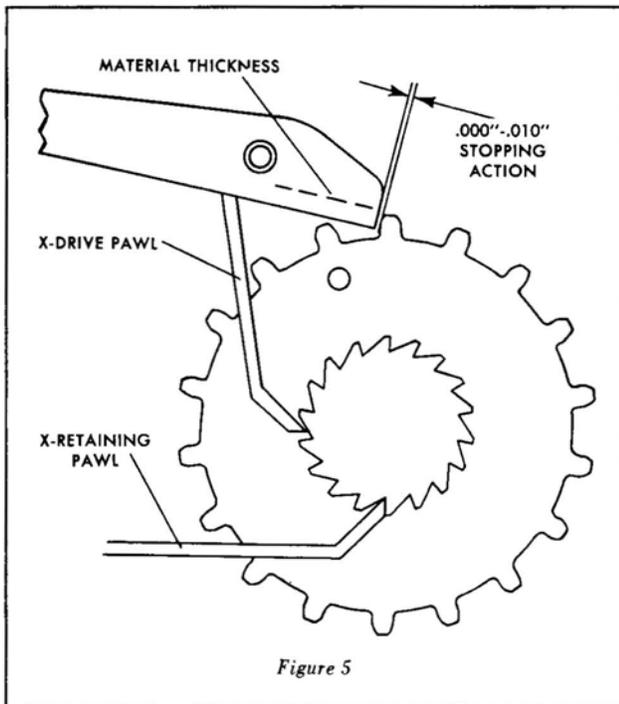


Figure 5

### 3. STOPPING ACTION (See Fig. 5)

With the retaining pawl in full engagement and the magnet energized, the distance between the tip of the armature and its mating tooth must be between .000" and .010".

To assure a more positive stopping action, at least  $\frac{3}{4}$  of the material thickness of the armature channel must engage the gear teeth as measured in Fig. 5. Both adjustments are made by re-positioning the X-Motor Magnet. Check to make sure that the armature does not interfere with the preceding sprocket tooth during the stepping operation.

### 4. "SHORT-PAWL ACTION" (See Fig. 6)

The X-Drive Pawl does not engage the Ratchet Gear throughout a full step. After the drive pawl reaches the end of its stroke, the X-Gear Cluster continues to rotate, due to momentum, until it is stopped by the sprocket gear engaging the X-Armature Channel. This movement is known as "X-Short Pawl Action."

To measure the amount of "Short Pawl Action," pull the X-Retaining Pawl out of engagement with the ratchet gear. The gear cluster and carriages will then drop back a certain distance. Fig. 6 illustrates where to measure "Short Pawl Action" and specifies the amount that should take place.

### 5. INTERRUPTER

To check the Interrupter, release the power from the switch, insert a .003" feeler gage between the armature and the coil core, and re-energize the switch. This should cause the interrupter contacts to just break. When a .006" gage is used, the contacts should remain

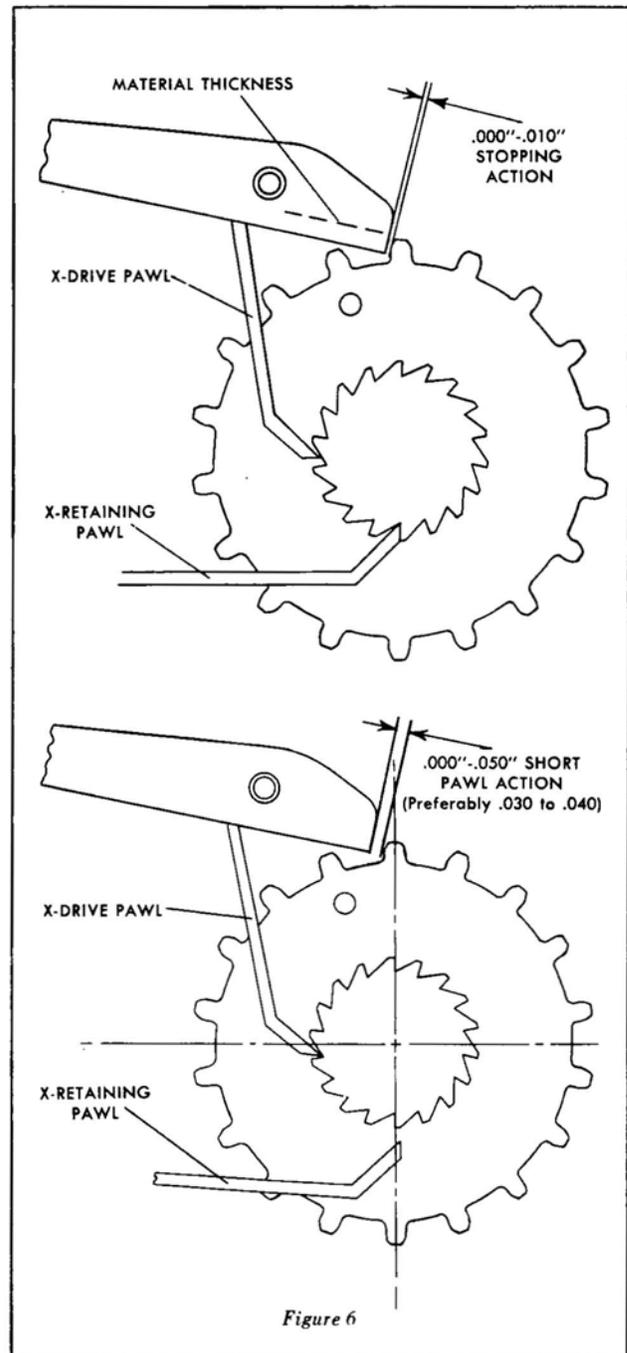
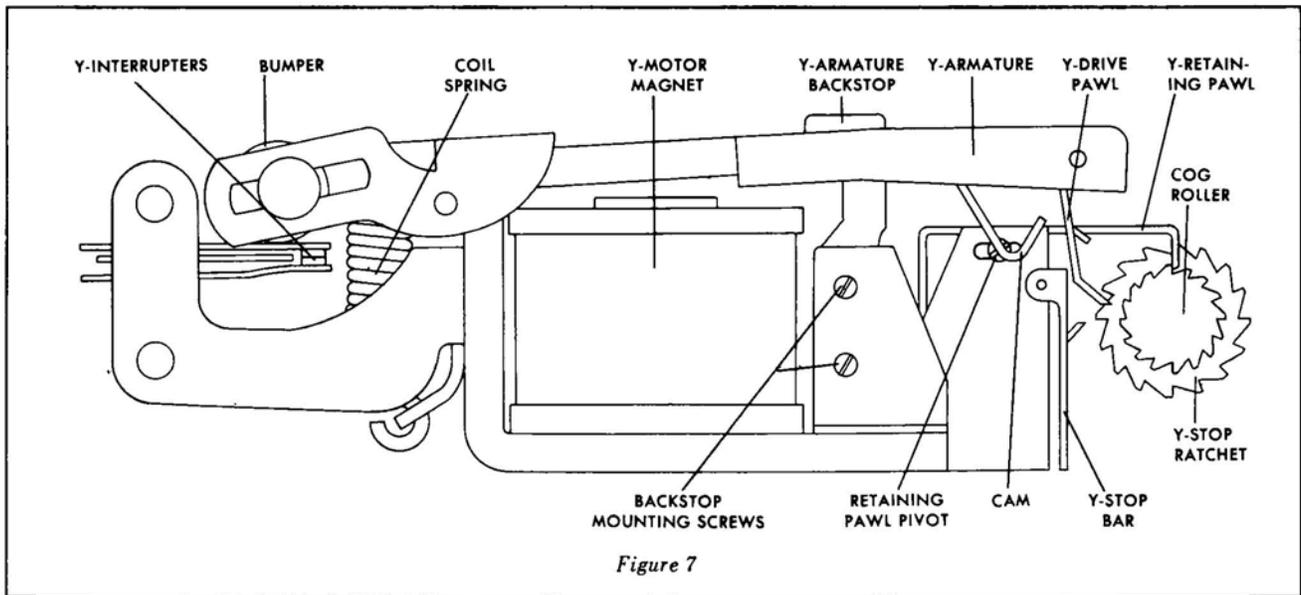


Figure 6

closed. A buzzer attached to the terminals of the interrupter springs will help to determine whether or not contacts are open. *Caution: Keep feeler gages away from the coil terminals to prevent shorting.*

Adjustments are made by loosening the nut on the bumper assembly only slightly and rotating the bumper with a special pair of adjusting pliers. Care should be taken not to shift the position of the bumper. Make sure the bumper contacts the interrupter spring just behind the rivet head when magnet is fully energized. Then tighten the clamp nut.



### Y-STEPPING MECHANISMS

Unoperated (Normal) Position (See Fig. 7)

The following requirements must be met with the switch in the normal position.

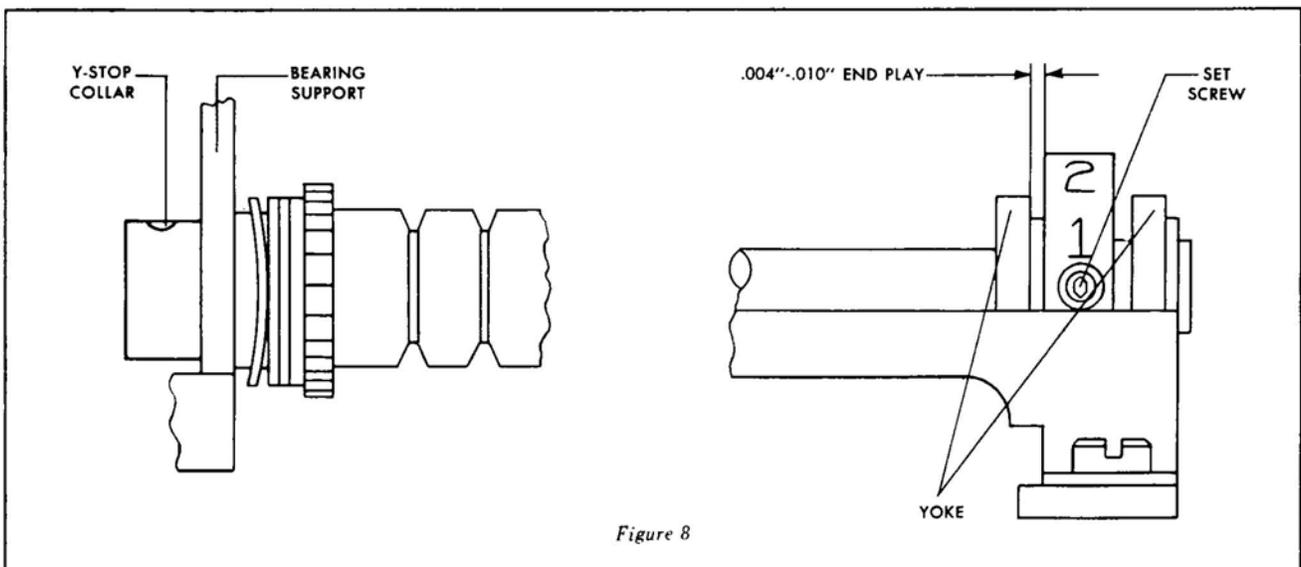
#### 1. THE Y-RETURN SPRING TENSION

The Y-Return Spring should have only sufficient tension wound into it to return the Y-Carriage to its normal position positively. If it is suspected that the Y-Return Spring has insufficient tension, loosen the lock screw at the right end of the Tubular Shaft to permit the spring to unwind completely. Then turn the return spring winder in a clockwise direction between 8 to 9½ turns and retighten the lockscrew. Check it to

see that the carriages return to normal from the Y-½ and Y-Overflow positions at all X levels.

#### 2. DIGIT DRUM (See Fig. 8)

The Digit Drum is located and locked into position so that the Tubular Shaft has .004" to .010" end play. This requirement is checked by butting the Y-Stop Collar against the Bearing Support and then measuring the clearance between the left side of the Digit Drum and the Yoke. Adjustment may be made by loosening the two set screws and relocating the Digit Drum. Make sure that the Digit Drum, in this new position, is located so that the individual Y steps are registered slightly above the right end of the Guide Rule without showing the number below.



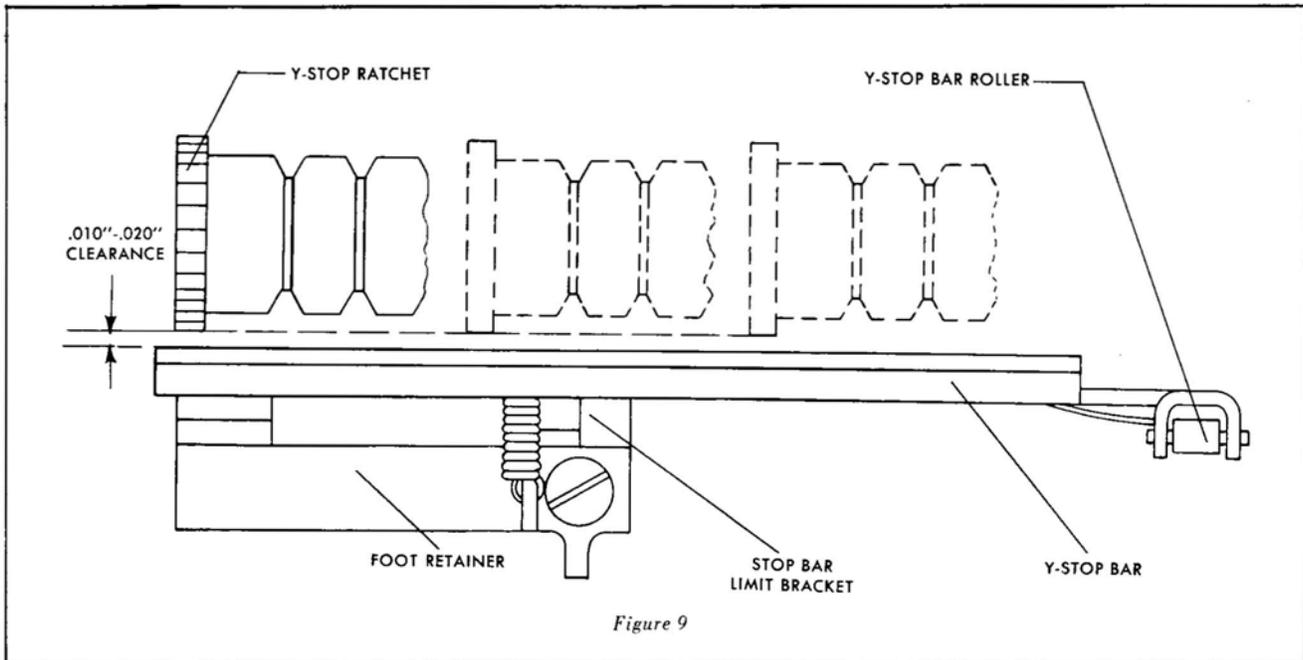


Figure 9

3. Y-STOP BAR (See Fig. 9)

The Foot Retainer shall be located so that it exerts only enough force against the left foot of the Y-Stop Bar assembly to keep it against the back edge of the associated mechanism plate opening during operation. The force should not be so great as to prevent the Y-Stop Bar from returning properly to the Y-Stop Bar Limit Bracket.

The Y-Stop Bar shall clear the periphery of the Y-Stop Ratchet by .010" to .020" in all positions. The stop bar limit bracket may be bent to maintain this requirement.

4. Y-STOP (See Fig. 10)

The Y-Stop limits the travel of the Y-Carriage in its return to the normal position.

When the Cog Roller is at normal and with the play taken out of the keys (see Figure 11) by lightly turning the Cog Roller toward the Stop Bar, the Y-Normal Adjusting screw, which limits the travel of the Y-Stop, should be set so that the Y-Stop Bar may be moved into and out of engagement with Y-Stop Ratchet with a clearance of .000" to .010" between the engaging faces. The above should be repeated throughout the action length of the Y-Stop Bar. Never allow more than .010" at the most open X-level.

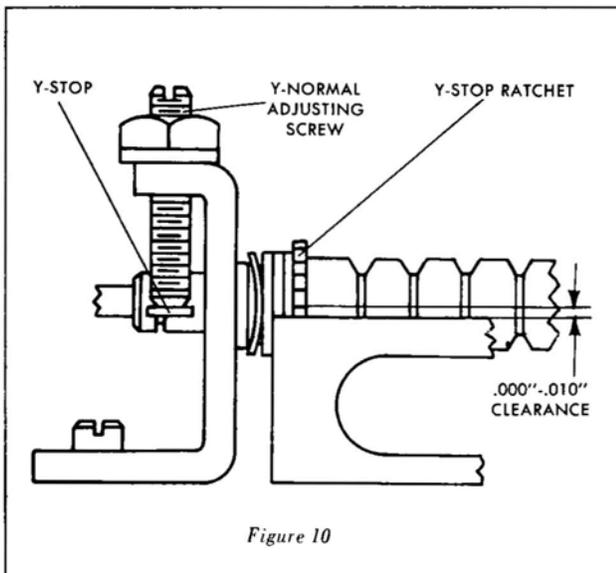


Figure 10

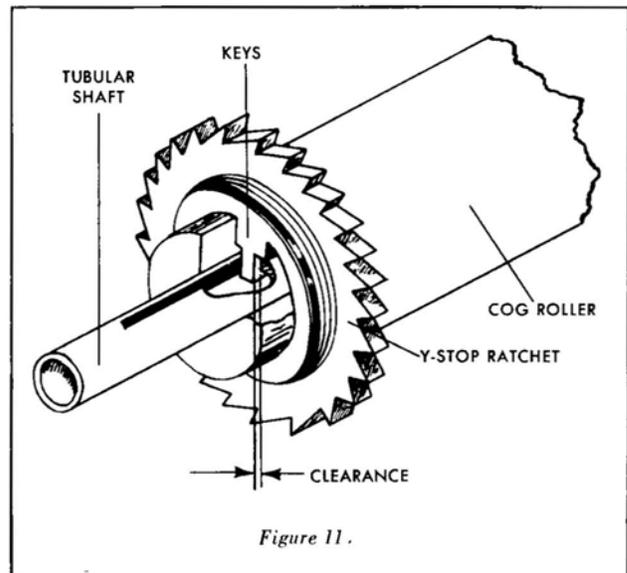


Figure 11.

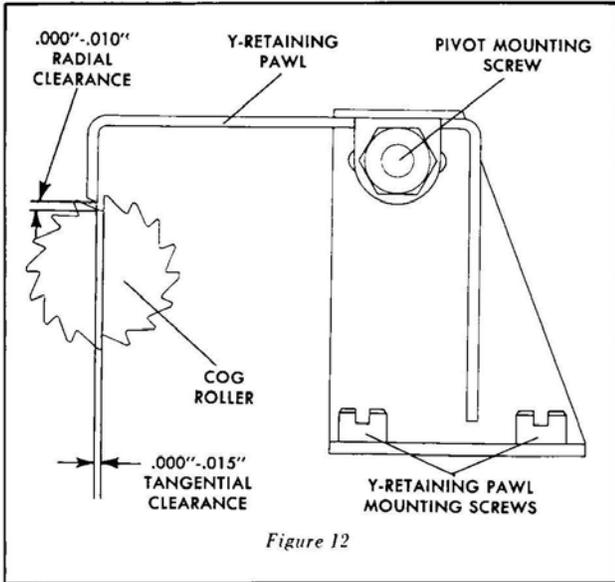


Figure 12

### 5. Y-RETAINING PAWL (See Fig. 12)

At Y-normal, the tangential clearance between the Y-Retaining Pawl and its mating tooth on the Cog Roller shall be .000" to .015" at its most open position with the play of the Cog Roller Keys eliminated. It should be noted that the above adjustment permits the Y-Retaining Pawl to rest on top of the Cog Roller Ratchet at X and Y-normal. However the pawl should fall into engagement when the play in the keys is taken up. These requirements can be met by loosening the pivot nut and shifting the pawl to the proper position.

At Y-normal, the radial clearance between the Y-Retaining Pawl and the root of the ratchet tooth should be .000" to .010". Some clearance is preferred, for if the Y-Retaining Pawl should ride in the root of the ratchet teeth, the X speed is retarded. This adjustment can be made by bending the actuating arm from the release magnet.

The final requirement is that the Y-Retaining Pawl latches into engagement with its associated cog roller ratchet tooth with little or no drop-back of the cog roller when the switch is stepped in the Y direction electrically. This adjustment is made by moving the pawl along its elongated pivot mounting hole.

## Y-STEPPING MECHANISM

### Operated (off-normal) Position

If the motor magnet is to be held operated for a period of time longer than that required for normal stepping, use a 24 volt direct current so as not to over-heat the winding.

### 1. DRIVING ACTION (See Fig. 13)

The Y-Drive Pawl must engage the flank of the cog roller tooth before coming in contact with the radial face. This point of engagement is limited to a section

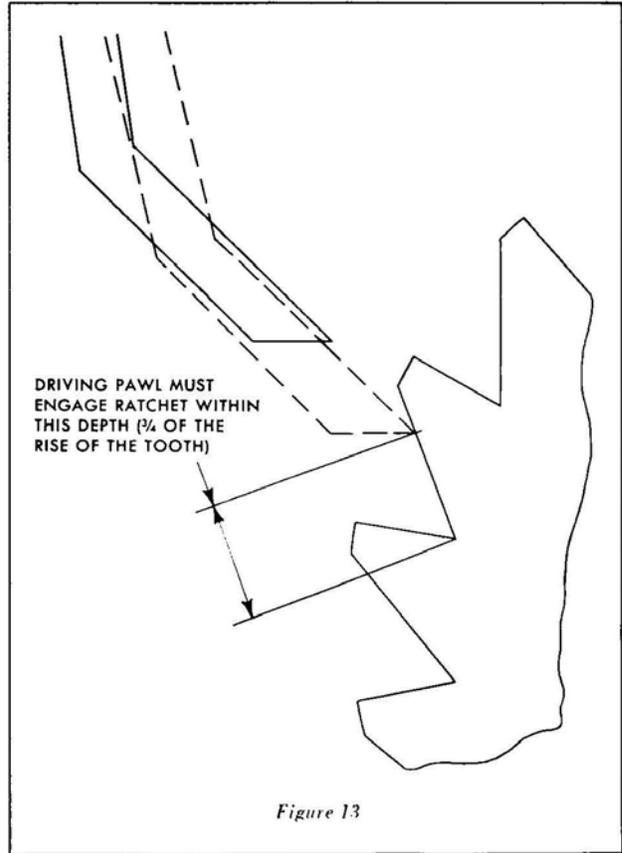


Figure 13

extending from the root to  $\frac{3}{4}$  the length of the flank. To meet this requirement loosen the two mounting screws holding the magnet assembly to the mechanism plate and shift the magnet assembly to the proper position.



Inspection of Spring Pile-Ups Used in XY Universal Switch

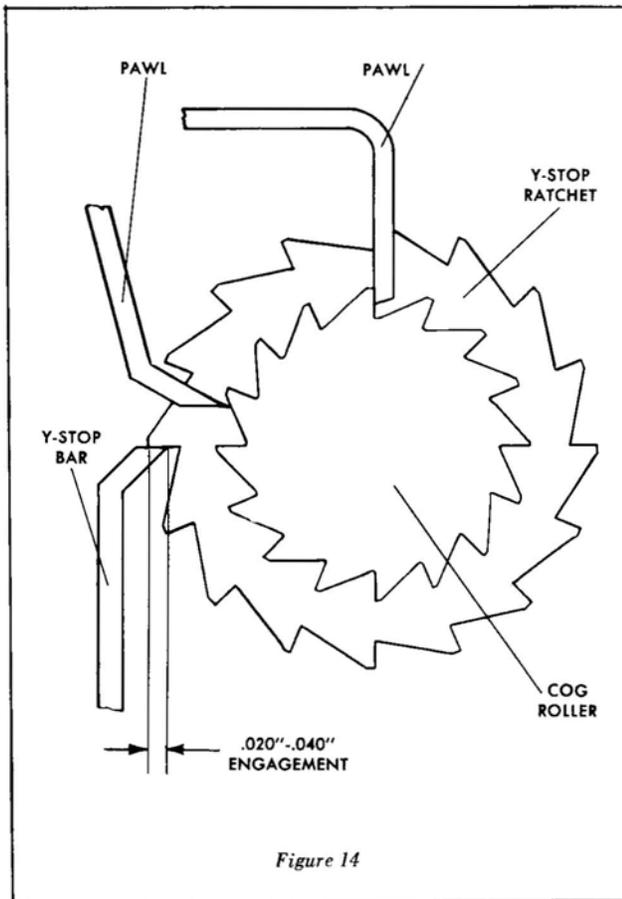


Figure 14

2. STOPPING ACTION (See Fig. 14)

The switch overtravel is limited by the stop bar engaging with the Y-Stop Ratchet. The cam on the underside of the Y-Armature (See Fig. 7) is adjusted to drive the stop bar forward while the drive pawl is advancing the switch in the Y-direction. The stop bar should not bottom on the Y-Stop Ratchet, yet must have a .020" to .040" engagement. Another requirement is that the drive pawl should start rotating the Cog Roller before the cam starts driving the stop bar. These adjustments are made by bending the cam to the required position.

3. "SHORT PAWL ACTION" (See Fig. 15)

The Y-Drive Pawl does not engage the Cog Roller throughout a full step. After the drive pawl reaches the end of its stroke, the Cog Roller continues to rotate due to momentum until it is stopped by the Y-Stop Bar engaging the ratchet gear. This movement is known as the "Y-Short Pawl Action."

Figure 15 illustrates how to measure "Y-Short Pawl Action" and specifies the amount permissible. The amount of "Short Pawl Action" can be varied by loosening the screws holding the Y-Magnet assembly to the mechanism plate and moving the assembly toward or away from the Cog Roller as required. Retighten the mounting screws securely.

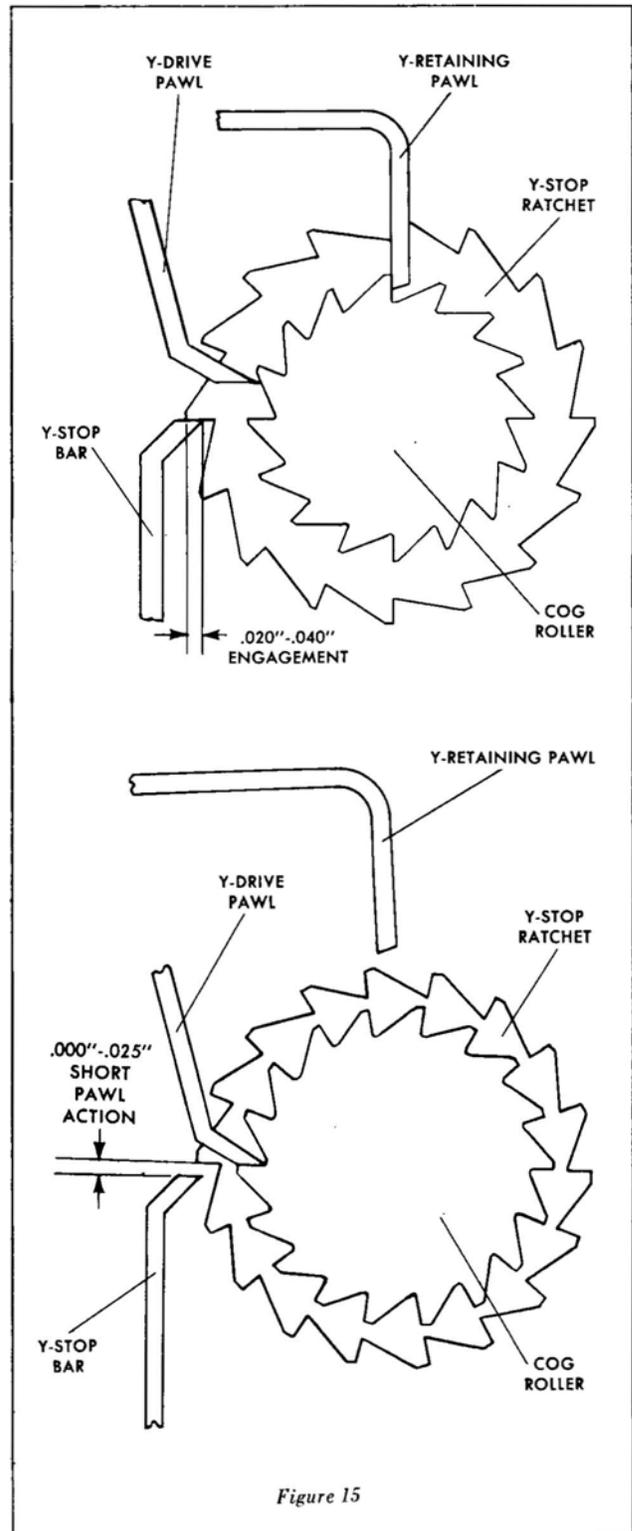


Figure 15

4. Y-ARMATURE BACKSTOP (See Fig. 7)

The clearance between the drive pawl and the outer extremities of the Cog Roller should be at least .002" as judged visually. Adjustment for clearance is made by loosening the two screws on the Y-Limit Backstop and shifting the stop upward or downward.

### 5. Y-MOTOR MAGNET

The clearance (known as "Air Line") between the armature and the frame should be held to a minimum and should not exceed .0015 as determined visually. The "Air Line" can be adjusted by loosening the two screws near the coil spring and allowing the armature to seat itself in the correct position. Retighten these screws securely.

### 6. INTERRUPTER

To check the Interrupter, release the power from the switch, insert a .003" feeler gage between the armature and the coil core, and re-energize the switch. This should cause the interrupter contacts to just break. When a .006" gage is used, the contacts should remain closed. A buzzer attached to the terminals of the interrupter springs will help to determine whether or not contacts are open. *Caution: Keep feeler gages away from the coil terminals to prevent shorting.*

Adjustments are made by loosening the nut on the bumper assembly only slightly and rotating the bumper with a No. 99 Tool. Care should be taken not to shift the position of the bumper. Make sure the bumper contacts the interrupter spring just behind the rivet head when the magnet is fully energized. Then tighten the clamp nut.

### COG ROLLER SUPPORT

(See Fig. 1)

The Cog Roller Support limits the deflections of the Cog Roller and the Tubular Shaft Assemblies during stepping. The support should be adjusted to prevent binds and drags from occurring as the Cog Roller is stepped in both X and Y directions. A slight rubbing is permissible.

The Cog Roller Support has a rocker-type mounting base with elongated holes to permit centering of the support opening with the Cog Roller. To raise the support, slightly loosen the mounting screw nearest the Cog Roller and tighten the other screw. To lower the support, reverse the procedure. After adjustment, make sure that the mounting screws are tight.

### XX-X INSULATED PILLAR

(For XX-X Wipers)

The Insulated Pillar assembly must be centered with the XX-X wire bank and should clear the wires by approximately .040". The pillar shall be visually perpendicular to the mechanism plate. Adjustment is made by loosening the two mounting screws and shifting the pillar. A slight bending of the mounting base is permissible. Then retighten the mounting screws.

### XX-X RACK ASSEMBLY

The XX-X Rack Assembly should mesh with the cup gear (the lowest gear on the X-Gear Cluster) in such a way as to permit free motion, without binding, of the rack assembly. Adjustment is made by loosening the

two screws holding the bracket to the mechanism plate and shifting the whole rack assembly in the desired direction. The backlash between the rack and the gear must be no greater than .010". Do not nick or bend the rack during adjustment. Adjustment of the wipers will be discussed in a later section.

### X-CARRIAGE

(See Fig. 16)

#### 1. CLEARANCE:

A limited amount of rocking motion has been built into the X-Carriage to assure free movement over the mechanism plate. All four feet shall have approximately the same clearance from the mechanism plate. To check the clearance, depress the cable side of the carriage until the feet on the same side contact the mechanism plate. Then measure, on the opposite side, the gap between the feet and the mechanism plate. This gap should be perceptible but should not exceed  $\frac{1}{32}$ ", as determined visually. Adjust the feet to these requirements by using a pair of "Duck Bill" pliers or by applying pressure, carefully, with a finger on that part of the carriage directly behind the foot that requires additional clearance.

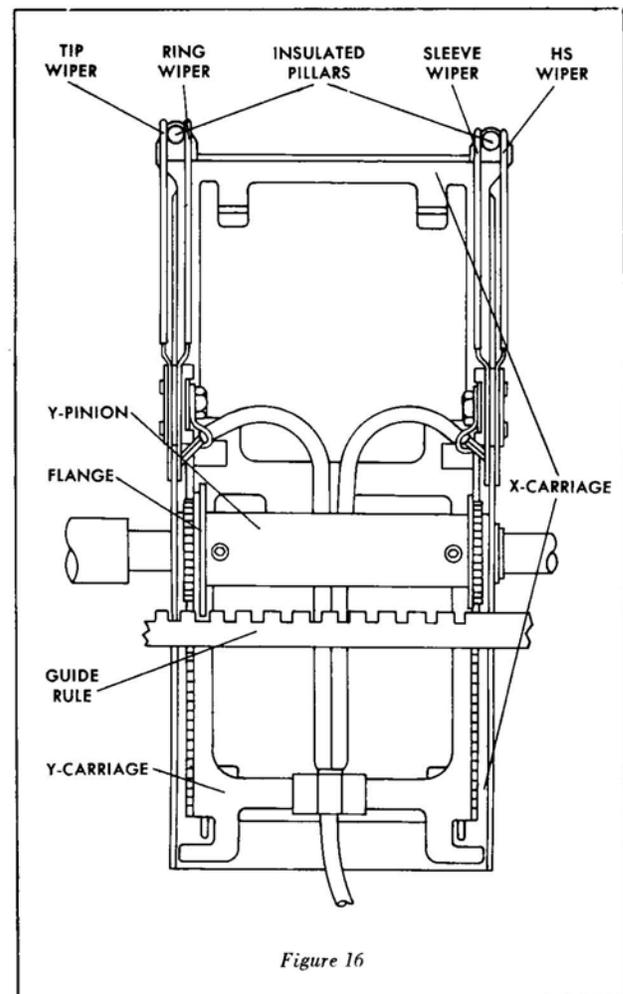


Figure 16

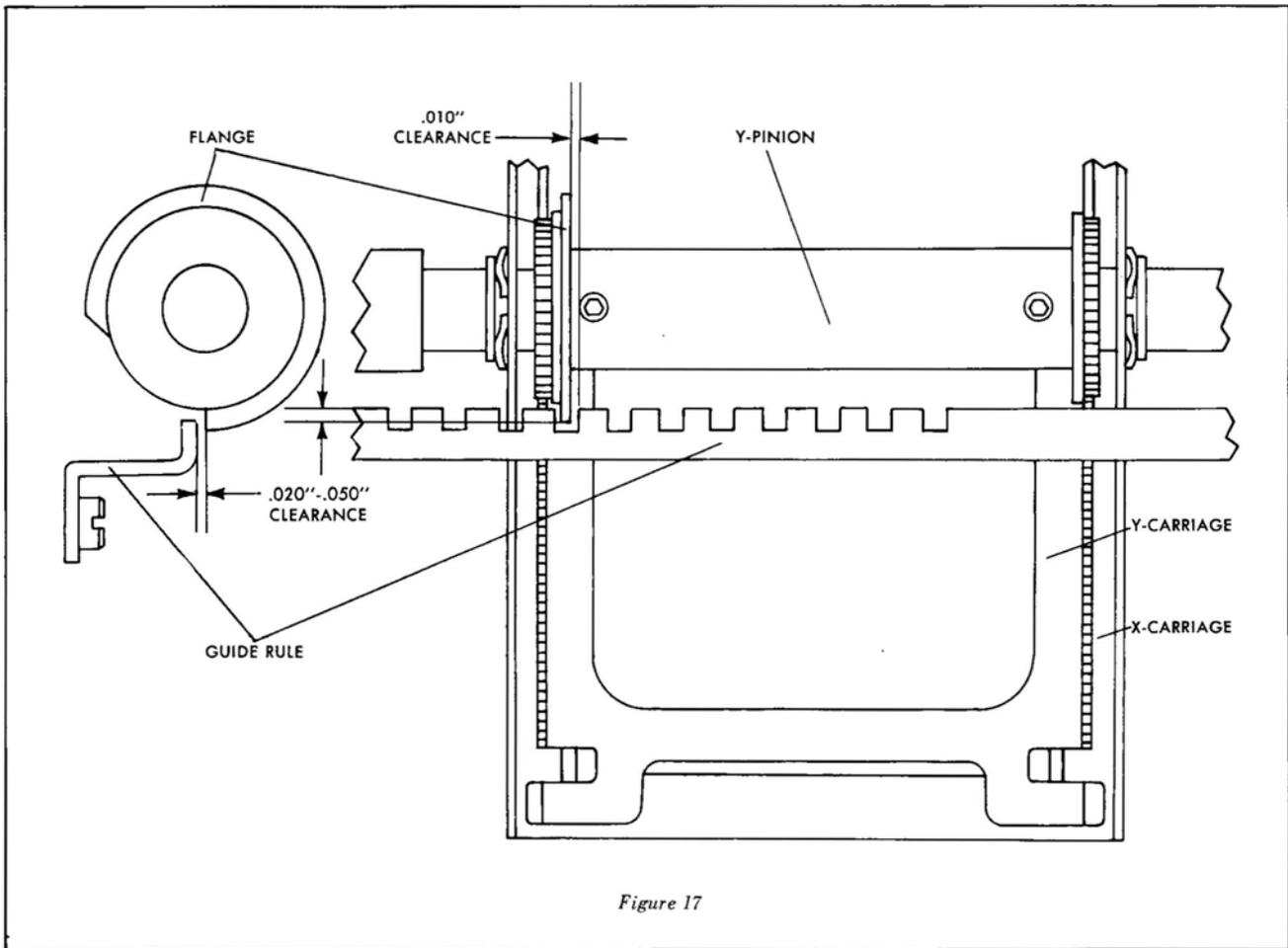


Figure 17

## 2. INSULATED PILLARS:

The front part of the X-Carriage, including the insulated pillars must clear the front of the wire banks by .040" as shown in *Figure 17*. Adjustment is made by reforming the pillar mounting section with a pair of long nose pliers.

## Y-PINION ASSEMBLY

(See Fig. 17)

The Y-Pinion Assembly is fastened to the Cog Roller Assembly by six set screws. The pinion is properly located when the following requirements have been met.

- The cut-out in the flange lies .020"-.040" above the Guide Rule.
- Insulated pillars are within .010", as determined visually, of the center line of their associated wire banks.

Adjustment is made by loosening the six set screws and either rotating or shifting the pinion or both.

If one or both pillars are tilted from the vertical, they can be straightened by slightly bending the mounting flange of the X-Carriage. *Do not attempt to straighten by forcing the pillar.*

## GUIDE RULE

(See Fig. 17)

The Guide Rule shall be located to engage the flange of the pinion by .020" minimum. The flange shall clear the sides of the slots in the Guide Rule by .010" as determined visually. Adjustment is made by loosening the two screws, one at each end of the rule, and shifting the rule in the proper direction. Care should be taken to prevent burring of the left screw for it may snag the cable.

## Y-CARRIAGE

(See Fig. 17)

The Y-Carriage shall ride in the X-Carriage with no binding at any point of travel in the Y-direction. Backlash between the Y-Carriage rack and the pinion can be no greater than .010". Adjustment is made by bending the feet as shown in *Figure 17A*.

The side play between the X and Y-Carriages must be held to a minimum without causing binds. Maximum side play is .010". Adjustment is made by bending the feet as shown in *Figure 17B*.

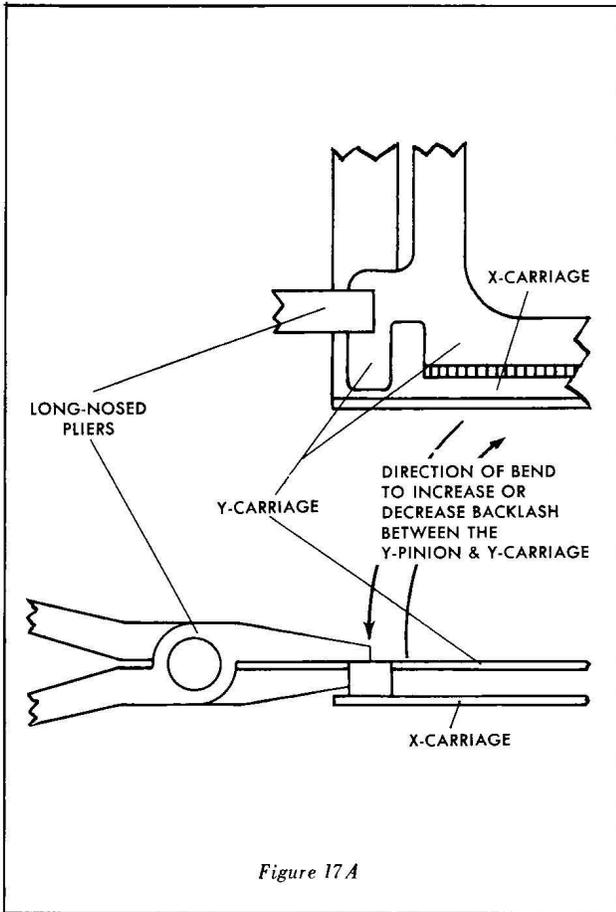


Figure 17 A

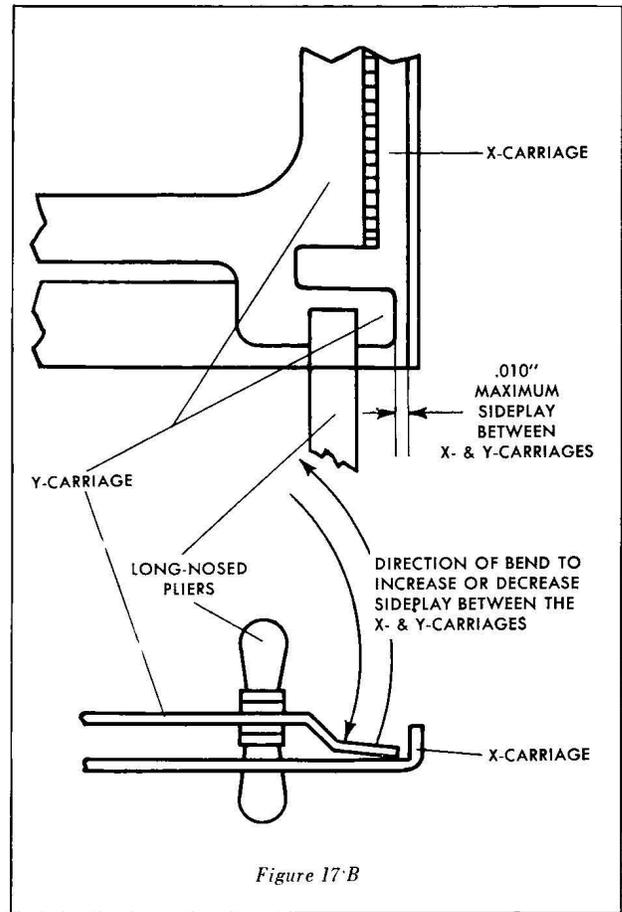


Figure 17 B



Learning Proper Maintenance Procedures in the XY Training School

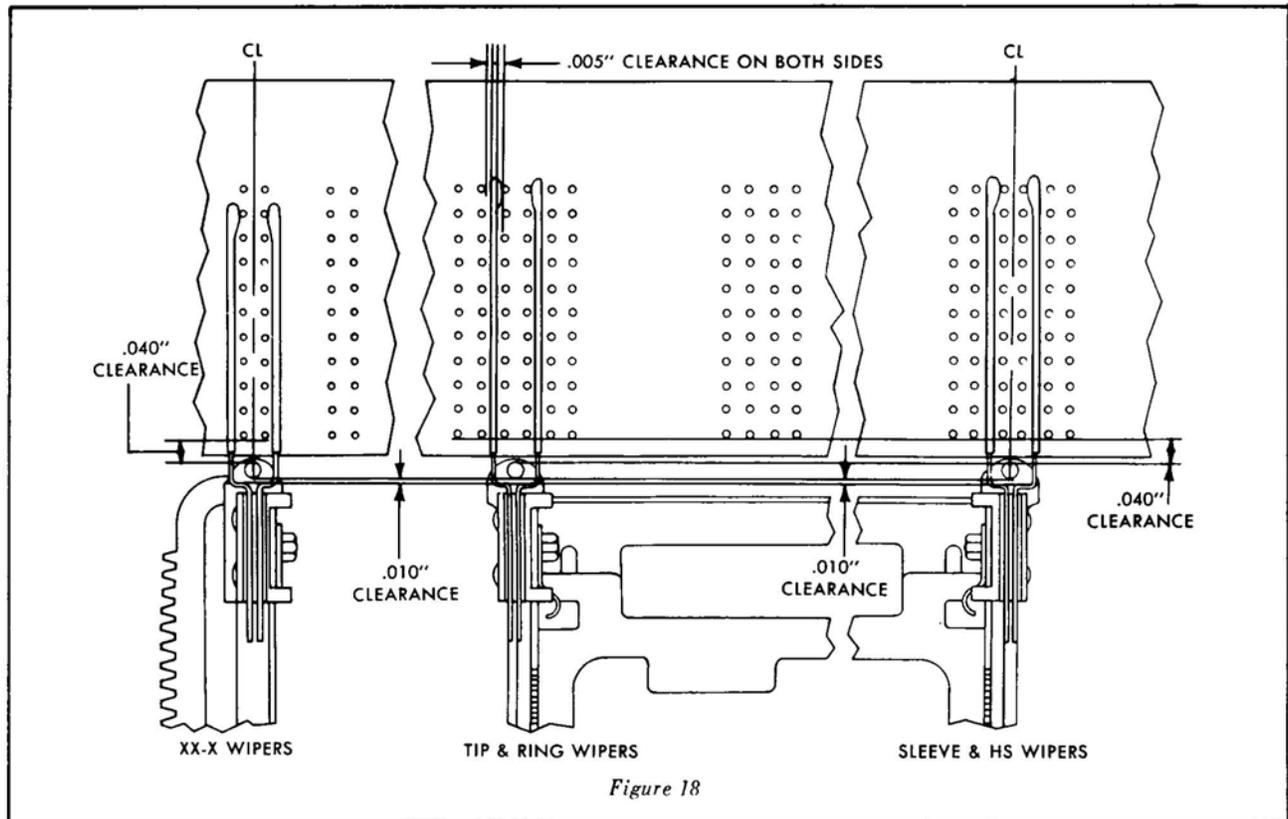


Figure 18

## WIPER ADJUSTMENTS

(See Fig. 18)

An open-faced Wiper Alignment Fixture will have to be used to check the alignment of the pillars and wipers to the wire bank. To reduce the effect of accumulated tolerance, step the carriages to X-5. In this position, the following requirements must be met:

a. With the carriages at X-5, and Y-1, the flat contact area of the wipers shall be centered on the first pair of wires in the wire bank. Adjustment is made by loosening the clamping nut which holds the wiper assembly to the Y-Carriage and moving the wipers in the proper direction. Tighten the nut after setting.

b. With the carriages at X-5, and X-Overflow, the insulated sides of the wipers should clear the wire bank wires, on both sides, by a minimum of .005". Adjustment is made by putting tension into or taking tension out of the wipers with a pair of "Duck Bill" pliers.

c. With the carriages at X-5 and the wipers in their most extended position, the "U" portion of the wiper assembly must clear the insulated pillar by .010" all around. Adjustment is made by rotating the stop cam, shown in Figure 1, so that the Y-Stop limits the amount of travel of the Y-Carriage and, hence, the wipers.

d. With the carriages at X-5, and Y-Normal, the flat contact area of the wipers should be centered on the insulated pillars as determined visually. To meet this condition, the X-Carriage under the insulated pillar may be bent.

e. Each tine of every wiper shall exert 15 to 45 grams of pressure on the insulated pillar. Adjustment is made by tensioning the springs with "Duck Bill" pliers.

f. To obtain the utmost in switching reliability, it is recommended that the tips of the wipers also be cleaned every six months. Doe's plug burnishing paste is the only cleaning agent recommended. It is to be used on a soft lint-free cloth. Be careful not to disturb the wiper pressure setting during the cleaning procedure.

## RELEASING MECHANISM

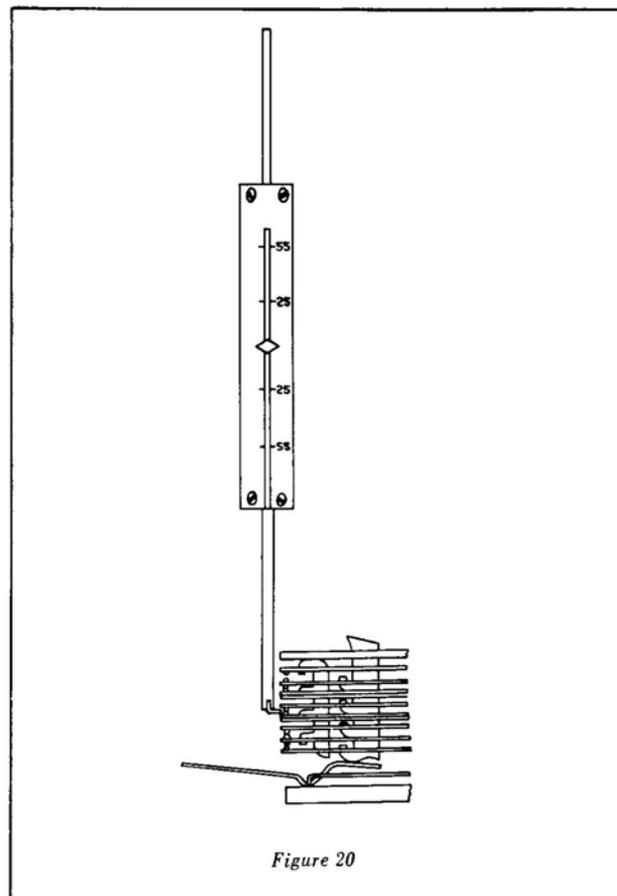
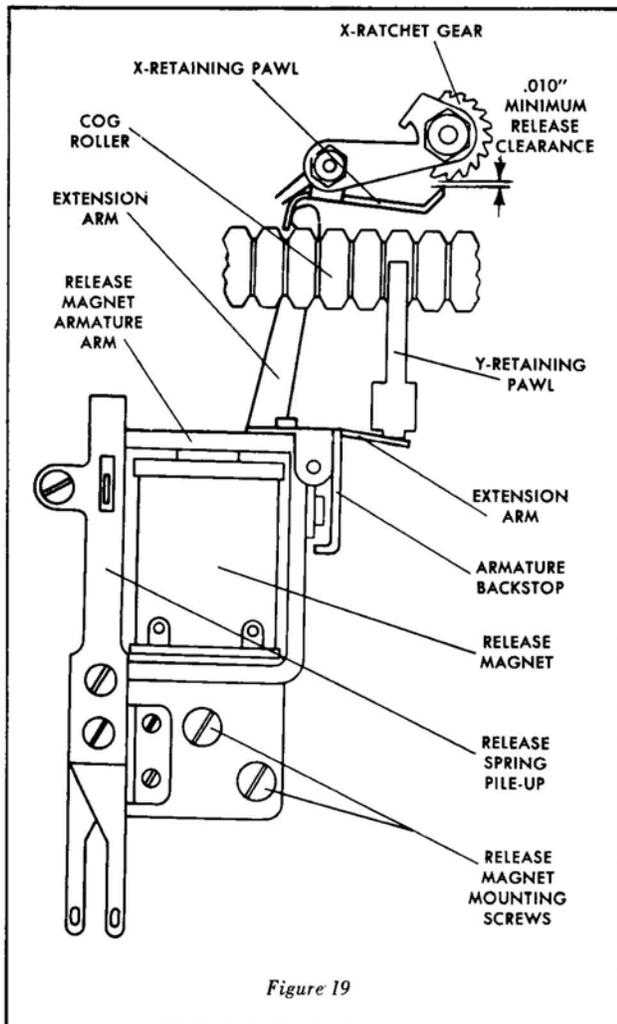
(See Fig. 19)

### 1. THE ARMATURE CAMMING SURFACE:

This should just clear the roller on the underside of the associated spring pile-up when the magnet is unoperated. Adjustment is made by bending the armature backstop.

### 2. X-RELEASE REQUIREMENTS

The releasing mechanism must be located so that the long extension arm will cause the X-Retaining Pawl to disengage and clear the periphery of its associated ratchet by a minimum of .010" when the magnet is energized; also, the make contacts in the associated spring pile-up must make before the X-Retaining Pawl fully disengages its ratchet. These requirements can be met by loosening the mounting screws on the release magnet mounting base and shifting the release magnet assembly.



### 3. CLEARANCE

When the X-Carriage is on step 8 or 9, check for clearance between the extension arm that releases the X-Retaining Pawl and the stop bar, and between the extension arm and the Y-Stop Ratchet. Bend the extension arm to provide clearance.

### 4. Y-RELEASE REQUIREMENTS

When the release magnet is energized, the Y-Retaining Pawl shall clear the Cog Roller by .003" to .010". It is permissible to bend the extension arm that activates the Y-Retaining Pawl to meet this requirement.

### 5. RELEASE SEQUENCE

Slowly operate the release magnet by hand. The Y-Retaining Pawl should disengage the Cog Roller before or at the same time that the X-Retaining Pawl clears its ratchet. If these requirements are not met, adjust by relocating the whole release mechanism and readjusting the extension arms.

### 6. THE RELEASE SPRING PILE-UP

This shall meet the following requirements:

- a. There shall be .005" to .008" clearance between open contacts.
- b. Both halves of the bifurcated springs must make and break in unison as determined visually.
- c. All "break" contacts must break before the "make" contacts make.
- d. There should be 25 to 55 grams of pressure per pair of contacts of the bifurcated springs.

Field adjustment is generally limited to bending the unsupported end of the clamp plate on top of the spring pile-up, and to the light contact springs. The heavy contact springs should not be disturbed.

If it becomes necessary to increase all the "make" pressures uniformly, then bend the clamp plate downward with tool No. 72. When a single combination needs adjustment, bend the light spring by tensioning with tool No. 66. To tension individual springs, start the tool at the mounting end of the spring and while slightly bending the spring, slide the tool toward the contact end. Back pressures are adjusted on individual light springs in the same manner. Care should be exercised when bending individual springs to prevent breakage of pushers and stops.

Contact pressures are measured with a gram gauge (tool No. 102) as illustrated in Figure 20.

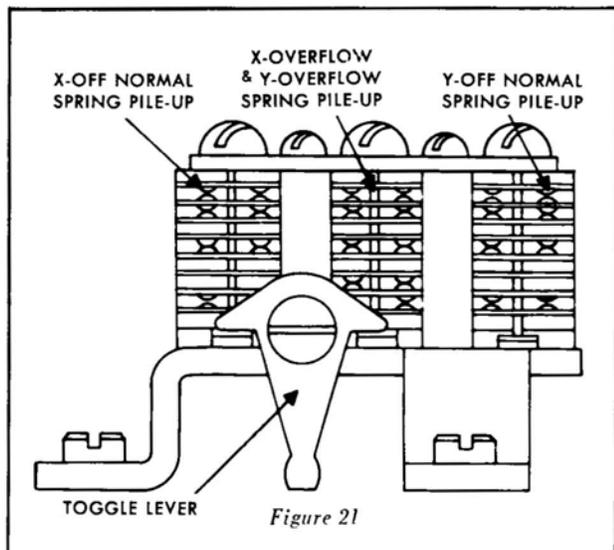


Figure 21

### SPRING PILE-UPS

Off Normal and Overflow (See Fig. 21)

a. The Off-Normal and Overflow Spring Pile-Ups have the same requirements and adjustments as that pile-up mentioned in section 6 of the Releasing Mechanism.

b. The spring pile-up actuating levers should be adjusted so that the toggle lever, when in the neutral (vertical) position, exerts only a slight pressure on the

upper sides of the actuating levers. With the toggle lever in the same position, there should be a clearance, not to exceed .005", between the light contact springs and associated pusher arms. Re-adjust the actuating levers as necessary, however be careful not to distort the actuating lever clips nor to break the pushers.

c. Locate the mounting bracket for the spring pile-ups to meet the following requirements:

1. The X-Off Normal Pile-Up shall be released by the toggle in the zone of operation X-Normal to X- $\frac{3}{4}$ .

2. The X-Overflow Pile-Up shall be operated by the toggle in the zone of operation X- $10\frac{1}{4}$  to X-11.

d. The mounting bracket should be located so that the switching lever moves freely without interference by the toggle lever.

e. Two cams are mounted on the left end of the tubular shaft and are held in place by set screws. These cams operate the Y-Off Normal and the Y-Overflow Spring Pile-Ups. The location of the cams is determined visually to permit operation of their respective pile-ups as follows. (See Figure 22) :

1. The Y-Off Normal Pile-Up shall be released by its respective cam in the zone of operation Y-Normal to Y- $\frac{1}{2}$ .

2. The Y-Overflow Pile-Up should be operated by its respective cam in the zone of operation Y- $10\frac{1}{2}$  to Y-11.

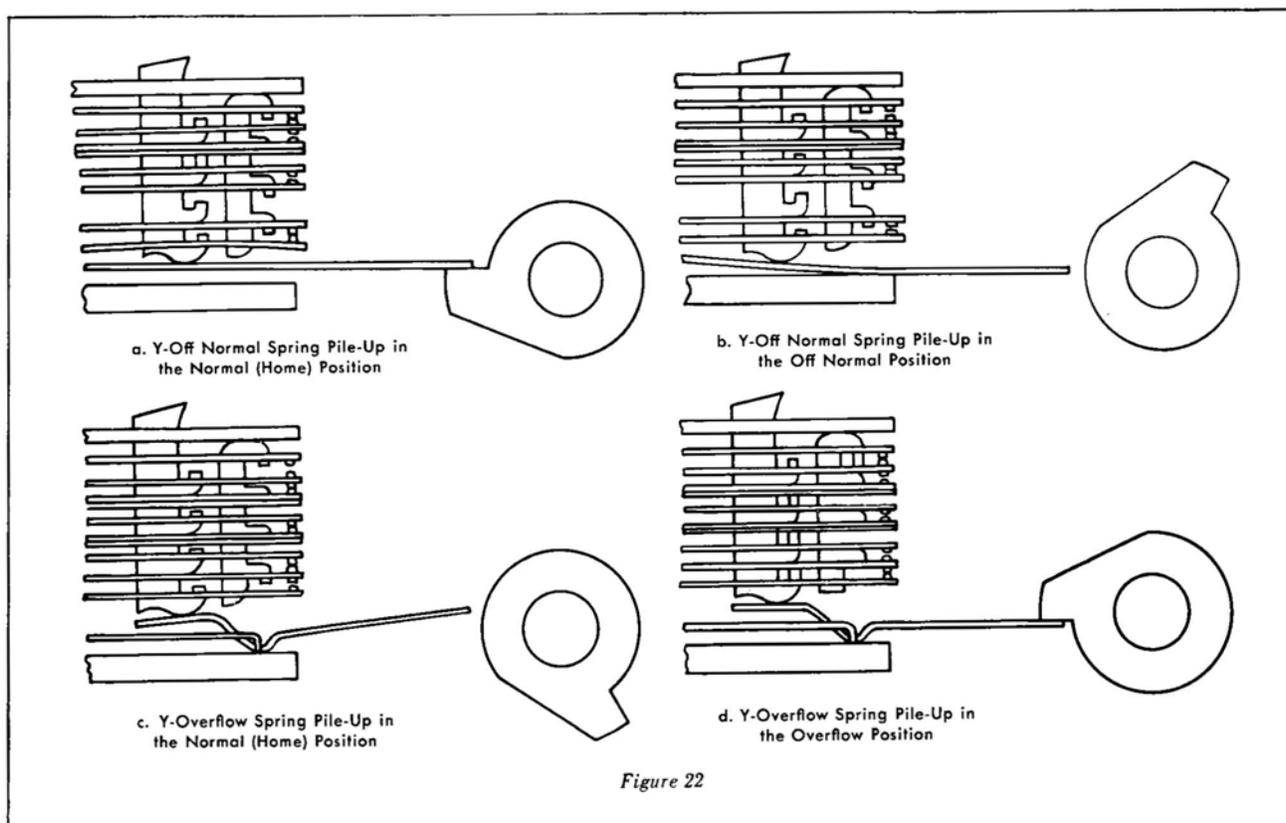


Figure 22

## CABLE AND PLUG ASSEMBLY

(See Fig. 23)

The Plug and the switch are wired in accordance with the wiring diagram *Figure 23*. The color codes are indicated on the wiring diagram. The cable assembly is made up of nylon insulated tinsel wire. It is not necessary to skin the insulation in the normal way. The wire, insulation and all, may be threaded through the respective eyes of the solder terminals. When heat is applied with a hot iron, the insulation will melt permitting a good soldered connection to the tinsel wire.

Care should be taken when jacking the plug into an associated circuit plate, for when forced there may be a possibility of bending individual tines in the plug causing opens or shorts. These deformations can be corrected by carefully aligning and tensioning the individual tines with the aid of a pair of long-nosed pliers.

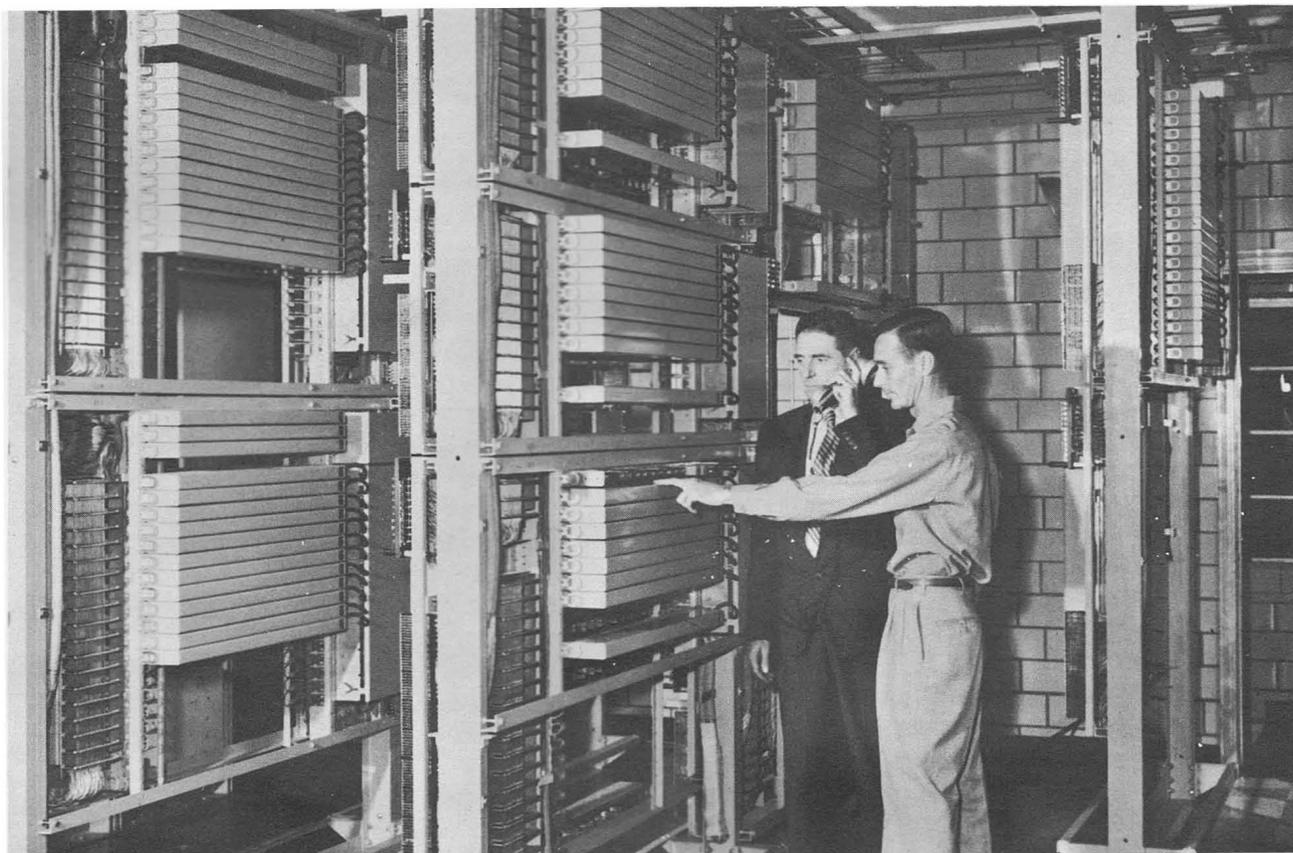
## ELECTRICAL REQUIREMENTS

1. When a portable XY Universal Switch Test Set (No. 484731 or equivalent) is available, it should be used for checking the performance of the switch electrically. A means is provided for observing the operation of the switch under extreme line conditions. Signal lamps are provided to indicate stepping speed and proper operation of the spring combination. Automatic

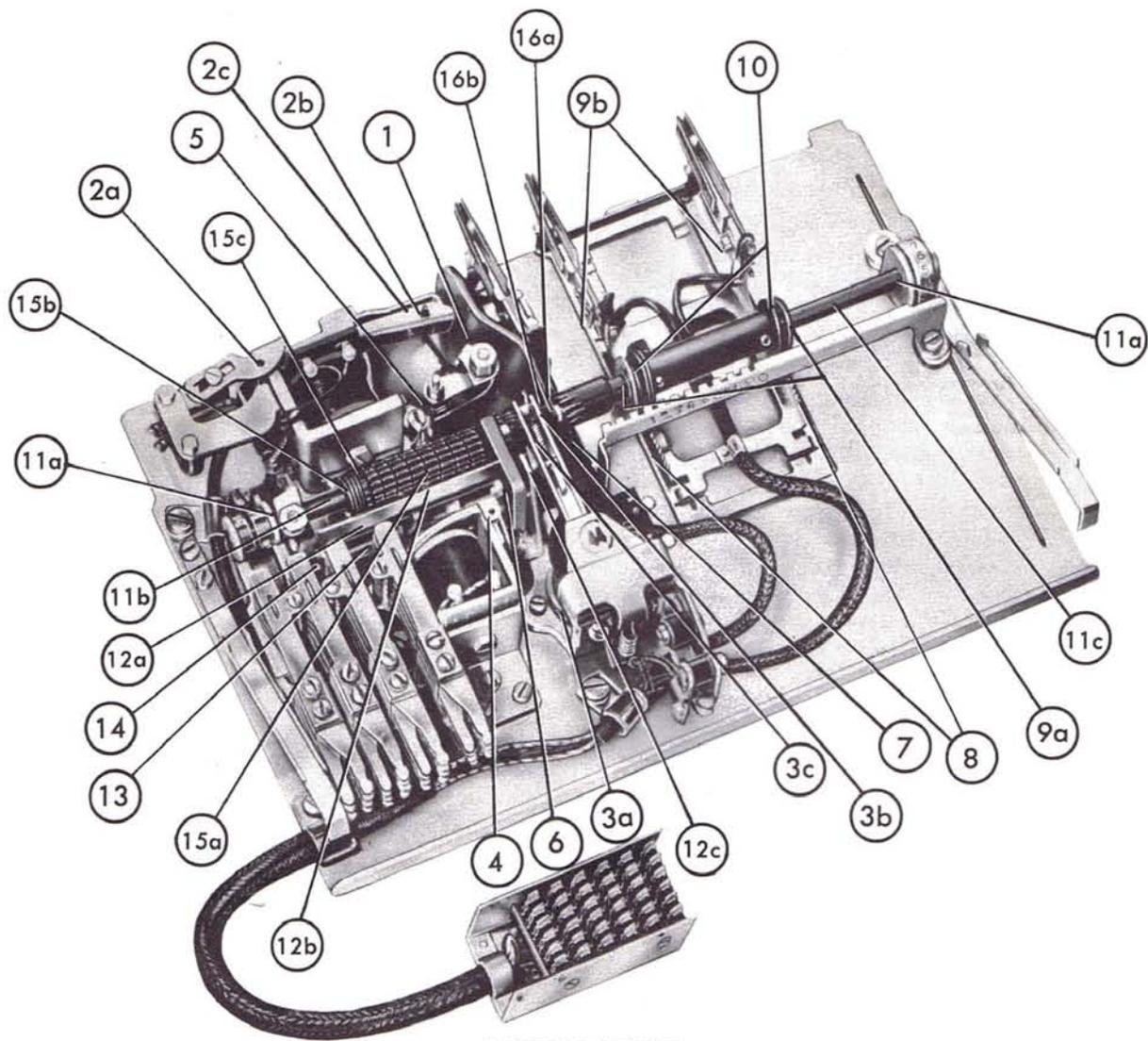
recycling permits continuous operation in either X or Y direction with the switch operating under pulsing or hunting conditions. Sections of wire bank permit checking the wiper settings to assume positive operation in the cell. For detail operating information, see instructions furnished with the Test Set.

2. If the above Test Set is not available, limited operating tests can be made with a Pulsing Limits Test Unit (Stock No. 482058 or equivalent). Jack the XY Universal Switch under test into a selector shelf. Plug the Pulsing Limits Test Unit into the A Jack of the Test Make Busy Unit of the associated selector circuit plate. Dialing the Test Unit, with the shunt button depressed, steps the switch under simulated maximum shunt line conditions. When the Test Unit is dialed without the shunt button depressed, the switch steps under maximum loop resistance conditions.

3. If neither of the above test sets is available, it is suggested that the switch be placed in the line finder shelf and jacked into its associated circuit plate. When the Routine key on the allotter is turned on the switch operation can be observed as it steps to position X-O, Y-Overflow and releases. Additional tests may be performed by plugging a hand test telephone into the "Odd" or "Even" Jack on the Allotter and observing the switch hunt for line 3-9 or 2-1 respectively.



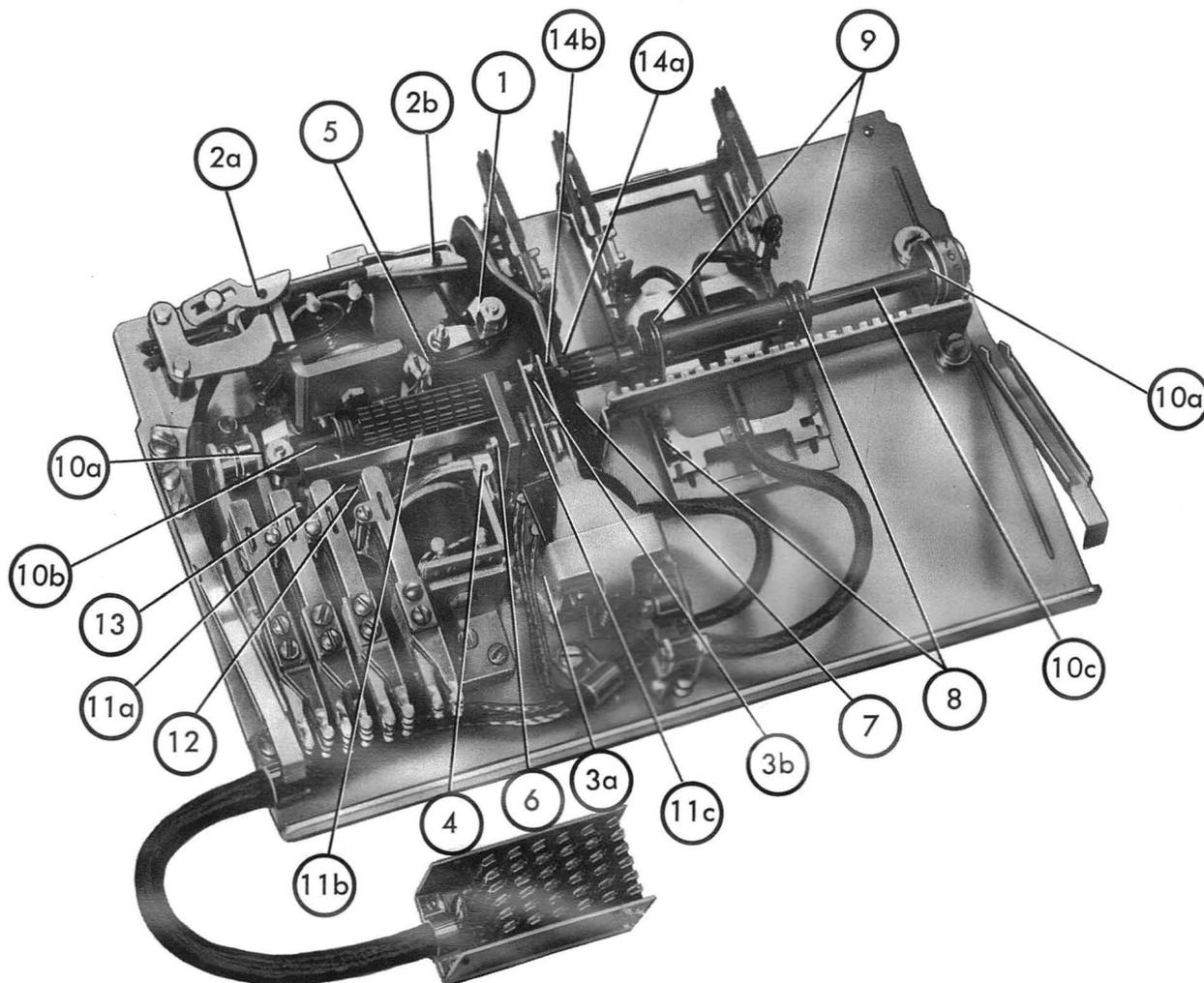
*A Typical XY Dial System Showing Routining of Equipment*



## LUBRICATION

The switch is to be lubricated with 204806 XY Universal switch oil at cutover (if necessary) and every six months thereafter. The oil is to be applied by means of the brush furnished with the bottle. The brush shall be drawn across the edge of the container to remove excess oil and the lubricant shall be applied sparingly except to parts having the black finish. The black parts shall be oiled heavily but not dripping. Lubricate the following parts:

2. X-magnet assembly
  - 2a. Hinge pin
  - 2b. Pawl pin
  - 2c. Pawl return spring and pawl
3. Y-magnet assembly
  - 3a. Hinge pin
  - 3b. Pawl pin
  - 3c. Pawl return spring and pawl
4. Release magnet assembly—Hinge pin
5. X-retaining pawl assembly—Post, Spring and Pawl
6. Y-retaining pawl assembly—Bearings, Spring and Pawl
7. XX-X wiper assembly—Rack (oil very heavily) and ways
8. Y-carriage assembly—Rack
9. X-carriage assembly
  - 9a. Bearings
  - 9b. Ways
10. Pinion assembly—gears
11. Tubular shaft assembly
  - 11a. End bearings
  - 11b. Key slot
  - 11c. Sliding surfaces
12. Stop bar assembly
  - 12a. Feet
  - 12b. Pawl edge
  - 12c. Roller and Spring
13. Switching lever—apply oil very sparingly and only when dry
14. Spring combination—Toggle and Toggle Bearing
15. Cog roller assembly
  - 15a. Teeth
  - 15b. Keys
  - 15c. Ratchet
16. Cog roller support
  - 16a. Bearing area
  - 16b. Pawl ejector



## LUBRICATION

All lubrication of the XY Universal Switch should be accomplished with XY Universal Switch Brand Oil Number 204806-000. The XY Universal Switch should be lubricated at least every six months. The Switch receives initial lubrication upon assembly at the factory. However, each Switch should be thoroughly inspected and lubricated when installed in the exchange.

Apply the oil with the brush supplied with the bottle. After dipping the brush in the bottle, draw it across the edge of the bottle to remove the excess oil. Apply the lubricant sparingly to all parts indicated.

### 1. X-Gear Assembly Bearings

X-Magnet Assembly

2a. Hinge Pin

2b. Pawl Pin

Y-Magnet Assembly

3a. Hinge Pin

3b. Pawl Pin

4. Release Magnet Assembly—Hinge Pin

5. X-Retaining Pawl Assembly—Post Bearings

6. Y-Retaining Pawl Assembly—Bearings

7. XX-X Wiper Assembly—Rack and Ways

8. X-Carriage Assembly  
Bearings  
Ways

9. Pinion Assembly—Gears and Bearings

Tubular Shaft Assembly

10a. End Bearings

10b. Key Slot

10c. Sliding Surfaces

Stop Bar Assembly

11a. Feet

11b. Pawl Edge

11c. Roller

12. Switching Lever—Apply oil around way screws only

13. Spring Combination—Toggle Bearing

Cog Roller Support

14a. Bearing Area

14b. Pawl Ejector

# WIRING DIAGRAM

PLUG WIRING - OPEN SIDE

31	31
25	25
19	19
13	13
7	7
1	1
2	2
8	8
3	3
4	4
5	5
9	9
10	10
11	11
15	15
16	16
17	17
21	21
22	22
23	23
26	26
27	27
32	32
33	33
34	34
35	35
36	36

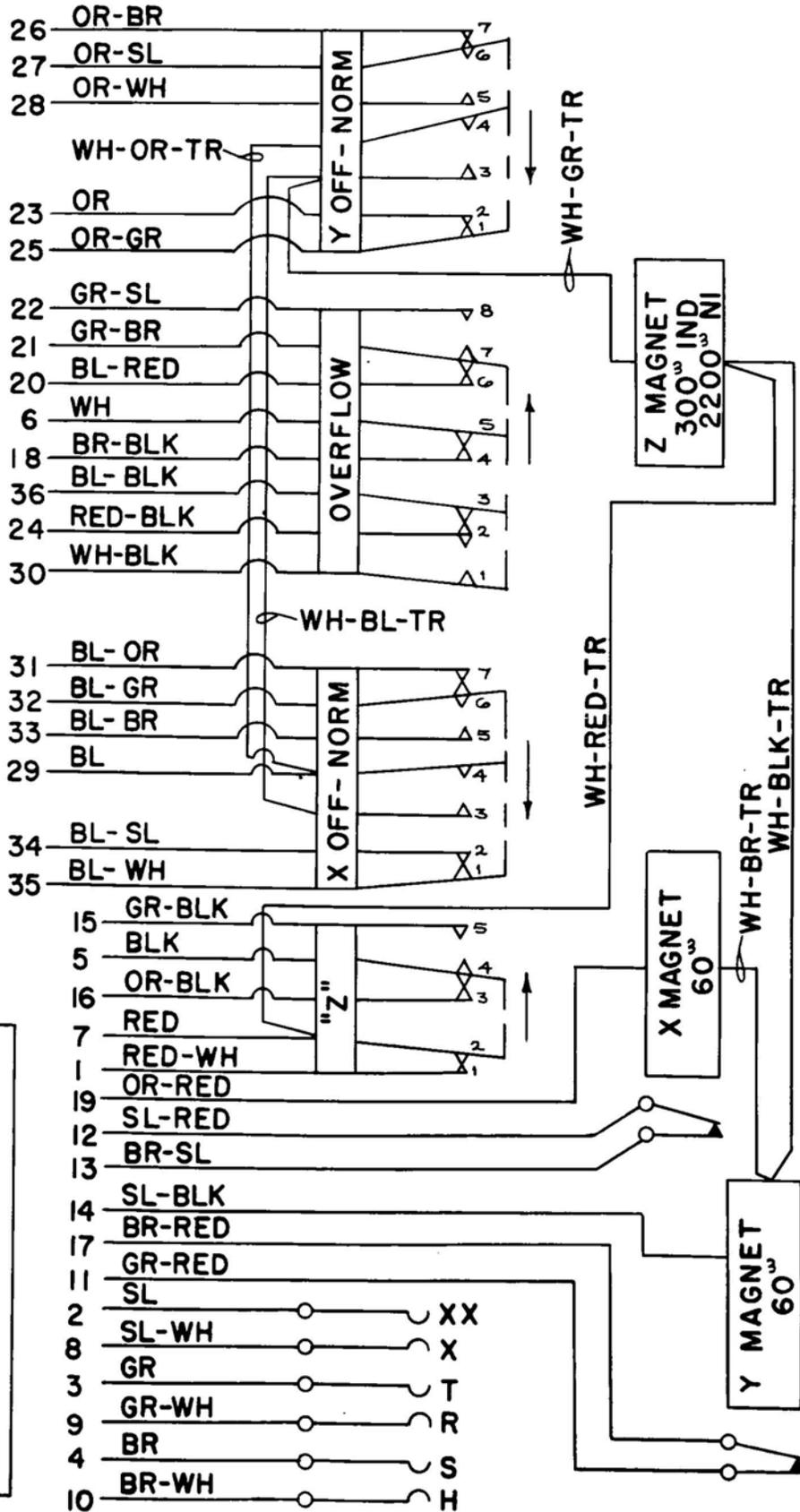


Figure 23



# **STROMBERG-CARLSON COMPANY**

A DIVISION OF GENERAL DYNAMICS CORPORATION

**Factory, General Offices: Rochester 3, New York**

**Sales Offices: Atlanta 3, Chicago 6, Kansas City 8, San Francisco 3.**



**MAKERS OF THE FAMOUS XY® LINE OF PRODUCTS, TELEPHONES AND SWITCHBOARDS  
INDUSTRIAL COMMUNICATION AND INTERCOM SYSTEMS  
SOUND EQUIPMENT AND ELECTRONIC CARILLONS • TELEVISION, RADIOS AND RADIO-PHONOGRAPHS**