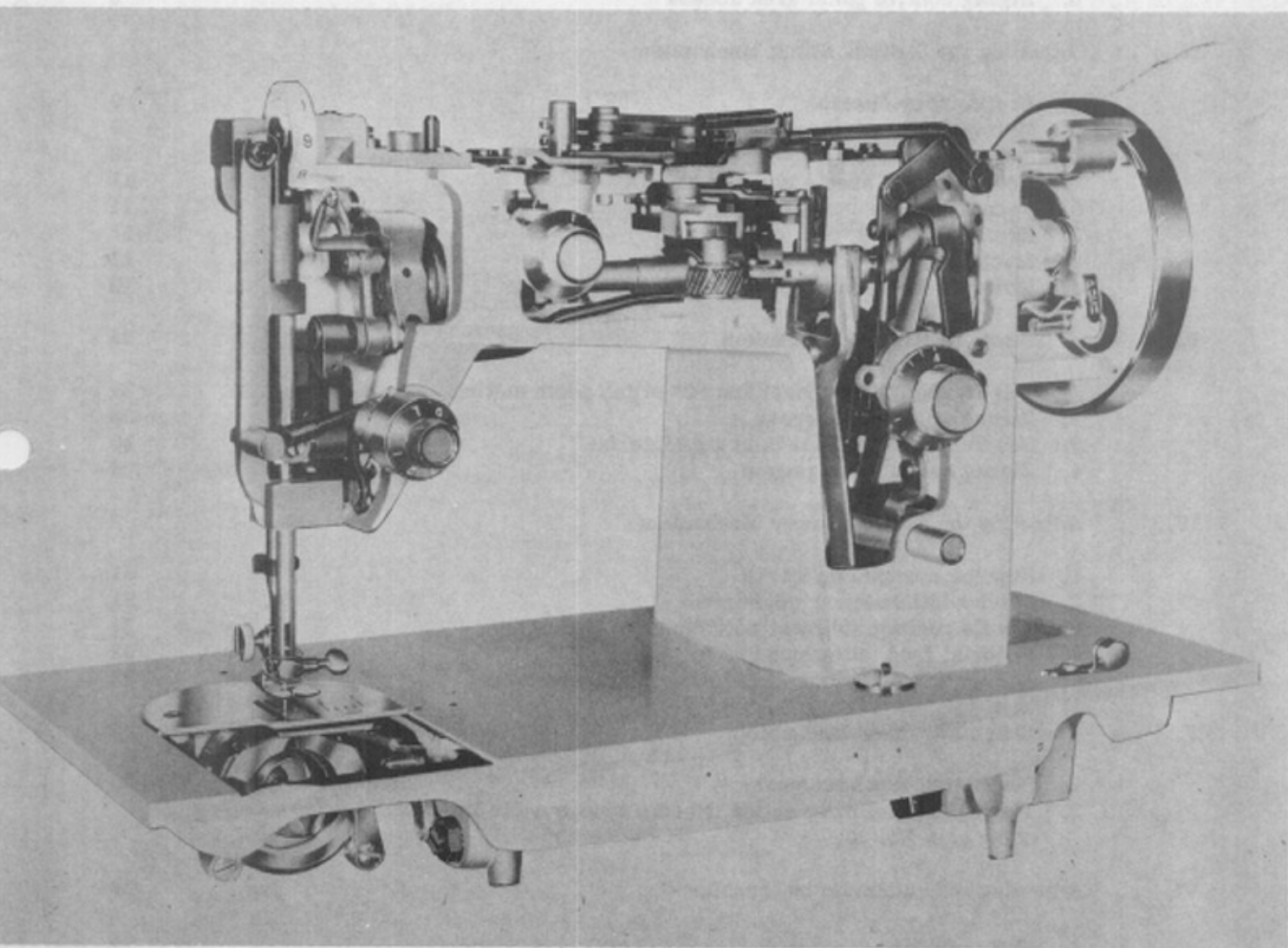




Service

ADJUSTMENTS AND SERVICE PROCEDURES



MODEL 158.90

ISSUED IN THE INTEREST OF BETTER SERVICE BY THE
PARENT SERVICE DEPARTMENT 731A - CHICAGO

DIV. 20

NOVEMBER 1961

NO. 9

PRICE \$1.50

INTRODUCTION

The new Sears model 158,900 represents one of the greatest advances in art of building sewing machines in a number of years. Mechanically, you will find it similar to the model 158,880, but with the following additional features:

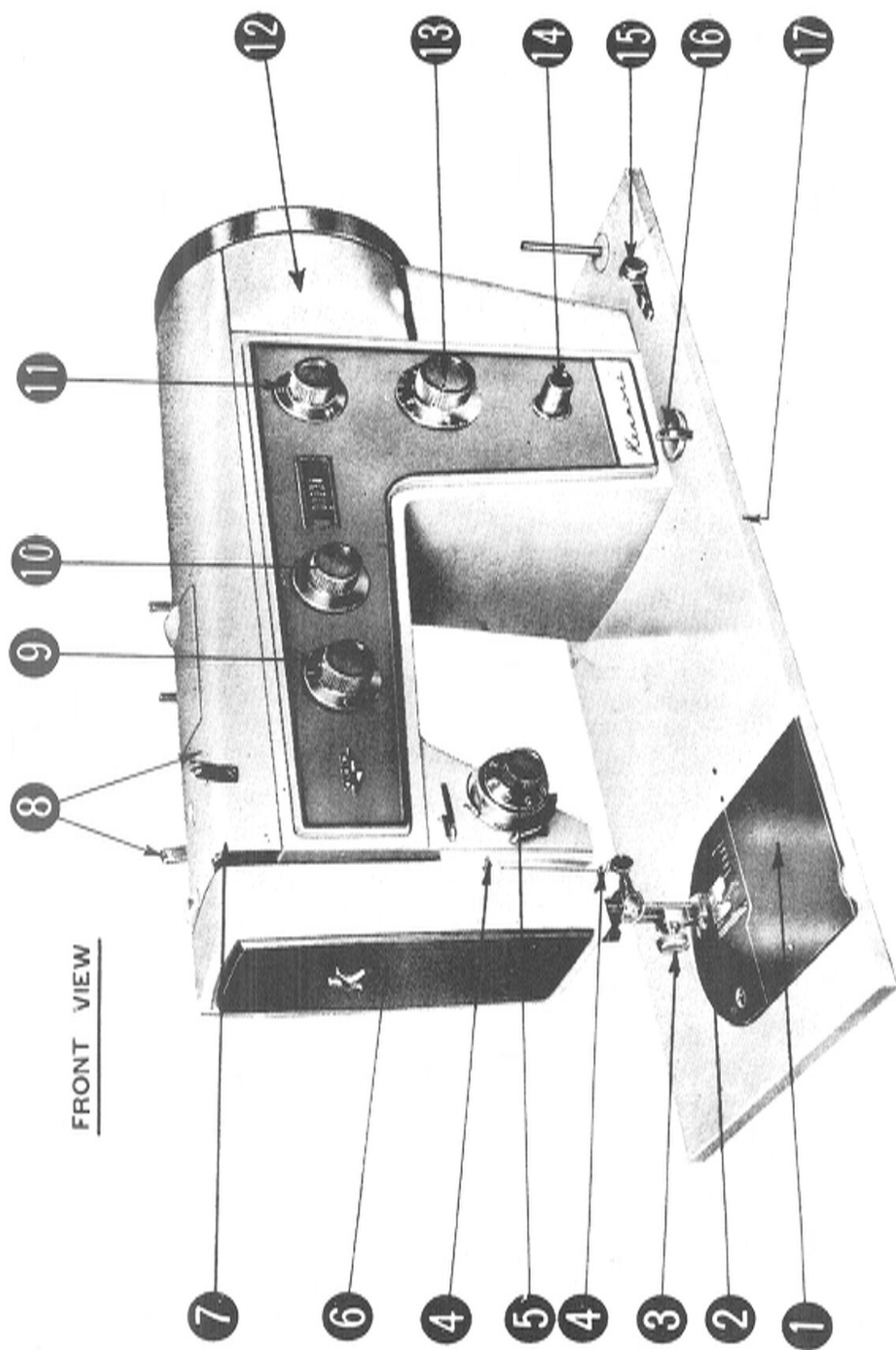
1. The feeding of the material, as well as the needle position and stitch width can now be controlled by cams.
2. The machine is now capable of making key-hole, eyelet, and regular buttonholes in a number of sizes without turning the material or readjusting the machine. Each buttonhole is made exactly the same size as the previous buttonholes unless the machine settings are changed. No need to measure or guess at the buttonhole size.
3. New simplified control panel makes the machine easier to operate.
4. All 30 patterns can now be made with either a single or double needle.

This booklet is designed to help you insure the customer satisfaction which this machine both mechanically and featurewise, was designed to provide.

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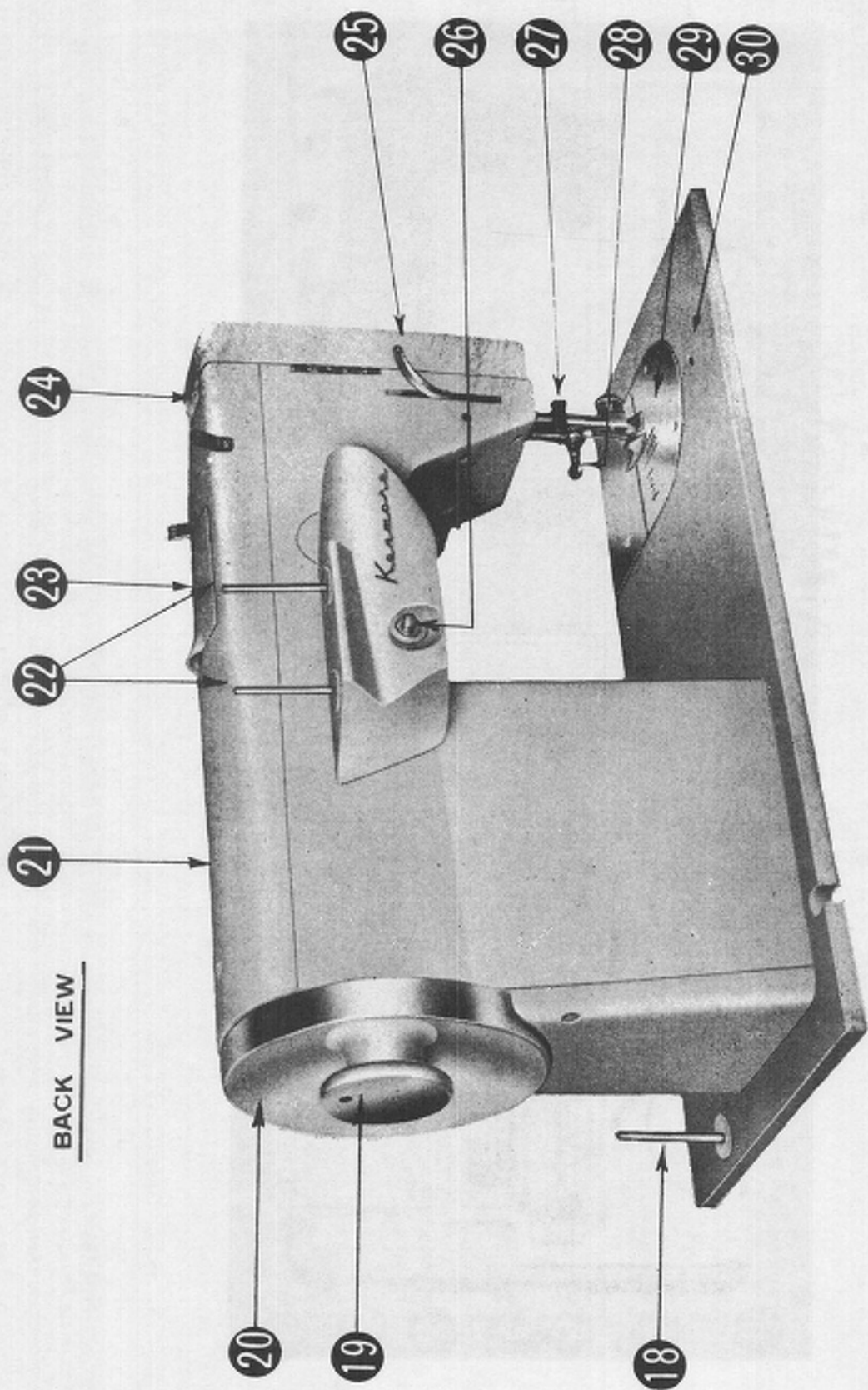
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FRONT VIEW

- | | | |
|-----------------------------|----------------------------------|--------------------------------|
| 1. Hand Hole Cover Plate | 7. Thread Take-Up Lever | 13. Stitch Length Control Knob |
| 2. Presser Foot | 8. Upper Thread Guides | 14. Reverse Stitch Push Button |
| 3. Presser Foot Screw | 9. Stitch Expander | 15. Bobbin Winder Tension Disc |
| 4. Face Cover Thread Guides | 10. Stitch Width Control Knob | 16. Feed Dog Control Knob |
| 5. Thread Tension Assembly | 11. Needle Position Control Knob | 17. Nomenclature Plate |
| 6. Face Cover Plate | 12. Bobbin Winder Mechanism | |

Figure 1



- | | | |
|--|--|--|
| 18. Thread Spool Pin for Bobbin Winder | 23. Cover to Automatic Decorating Stitch Mechanism | 27. Thread Cutter |
| 19. Clutch Release | 24. Presser Foot Pressure Regulator | 28. Needle Clamp Screw |
| 20. Hand Wheel | 25. Presser Foot Lever | 29. Needle Plate |
| 21. Arm Cover Plate | 26. Light Switch | 30. Guide Pin Hole for Buttonhole Attachment |

Figure 2

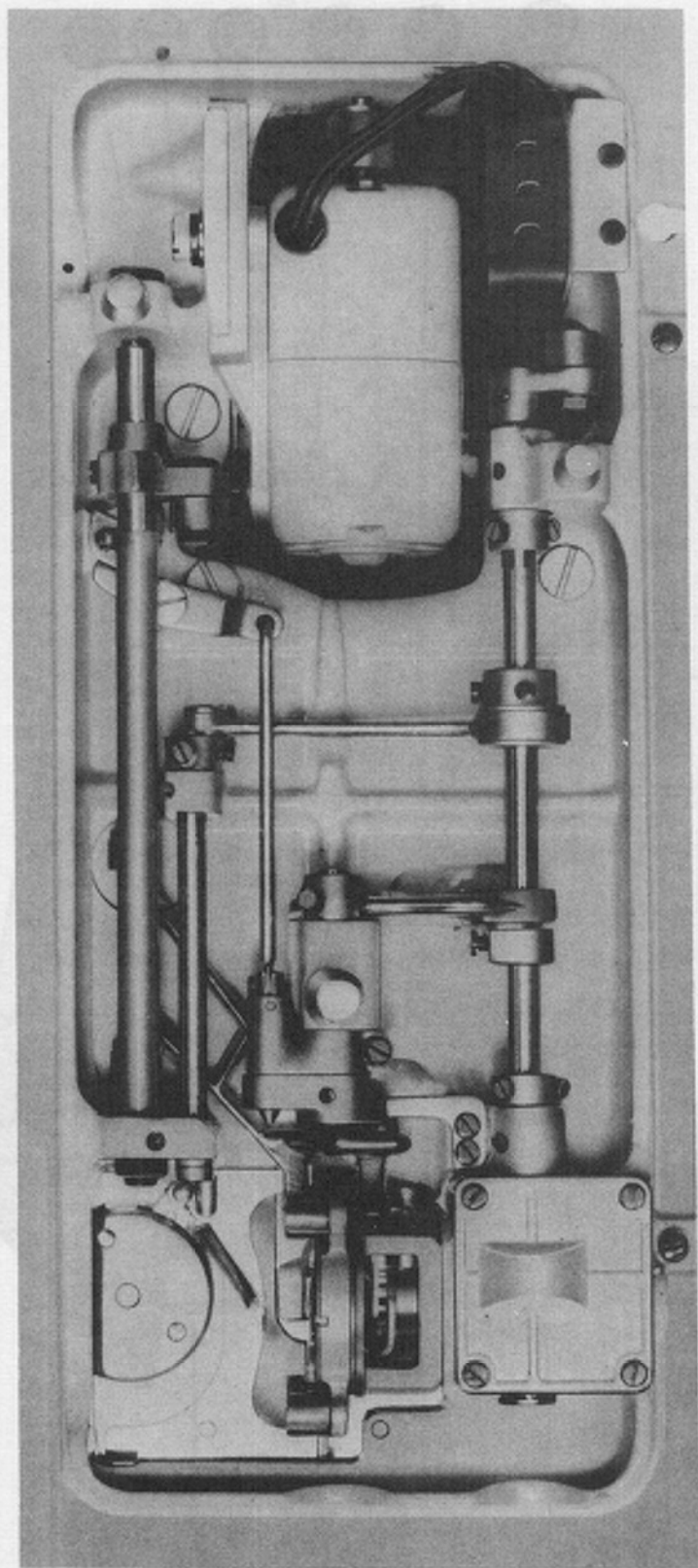


Figure 3

This under base view shows the new special hand hold cover plate located as it would be for making buttonholes. Also see Figures 43 to 47.

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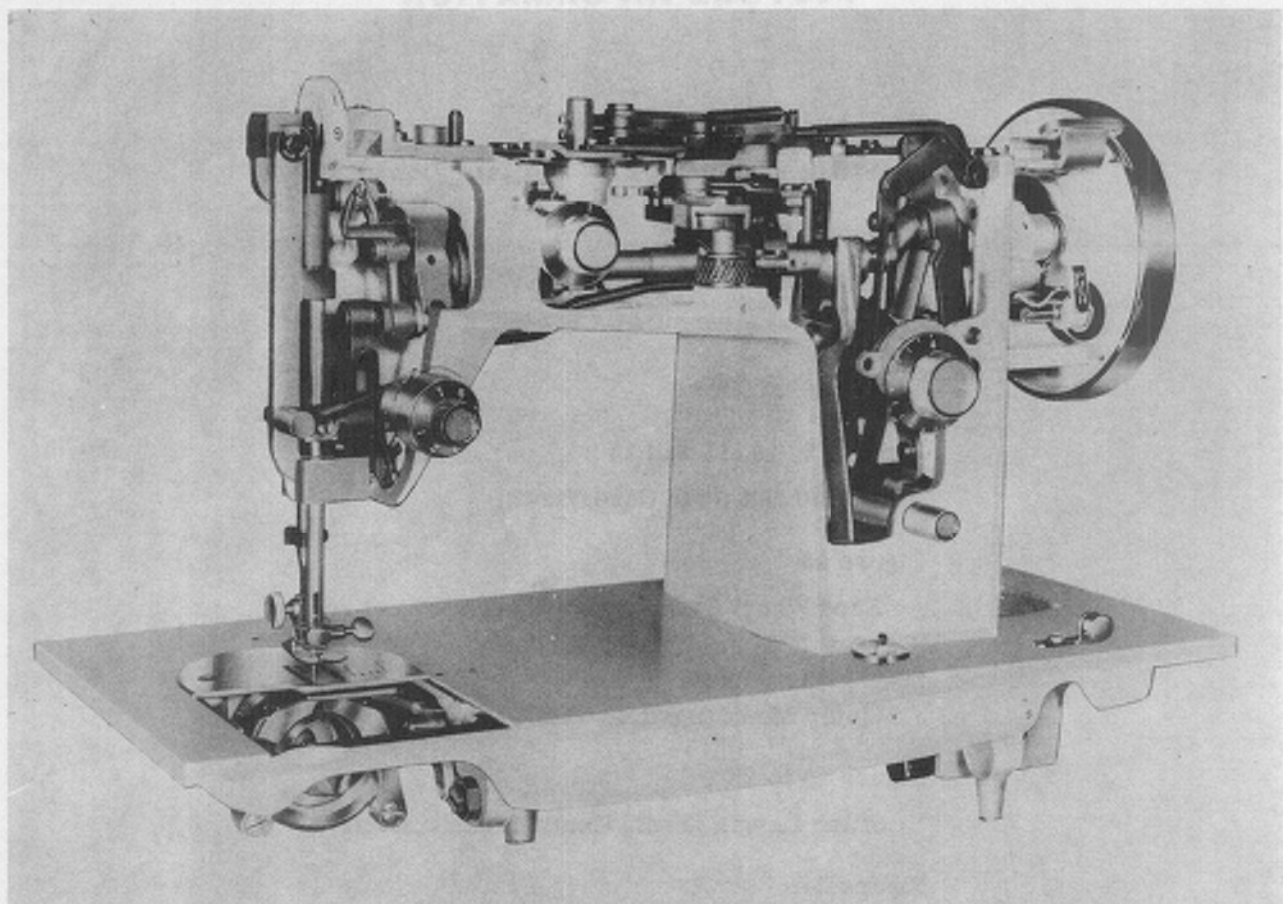


Figure 4

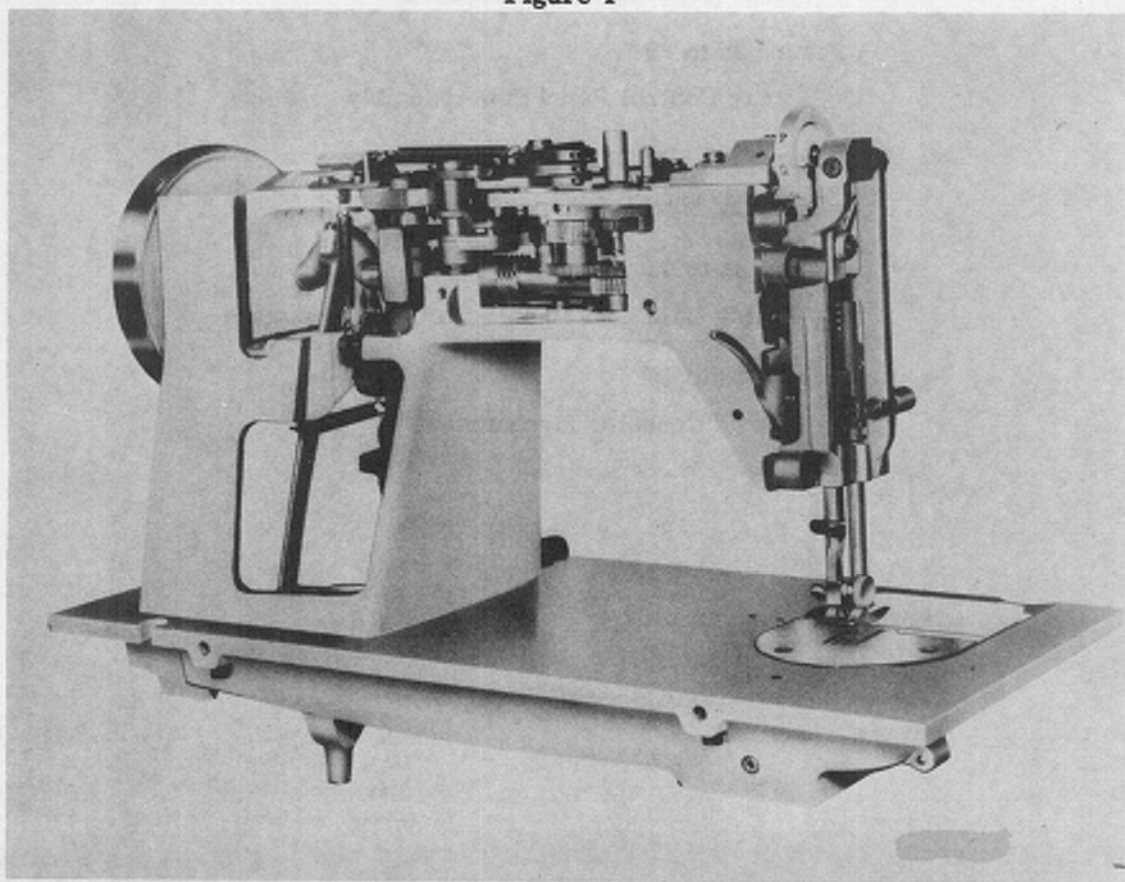


Figure 5
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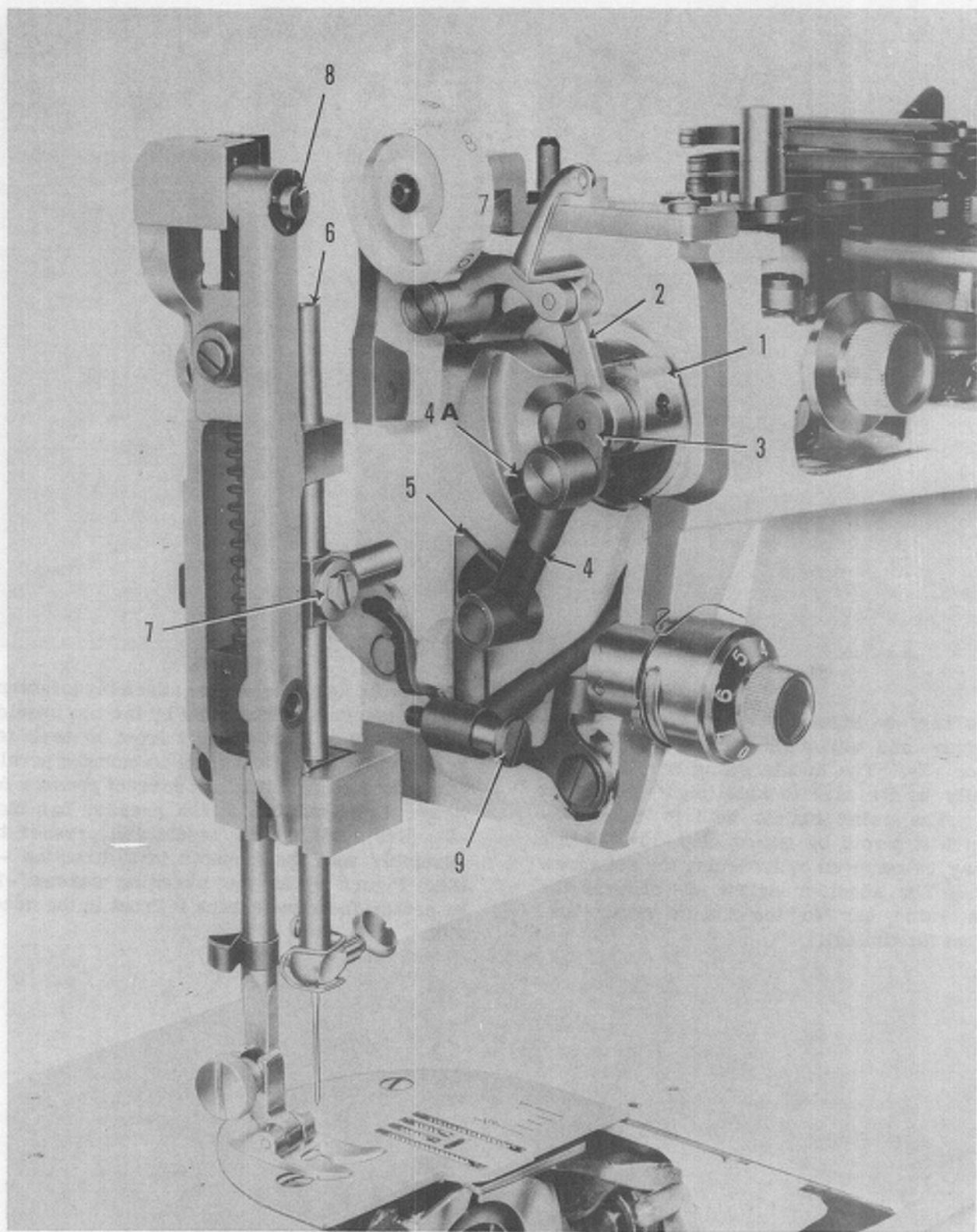


Figure 6

Here the needle and presser bar assembly is shown detached from the face end of the arm of the machine. -1- is the balance counter weight attached to the end of the main shaft. It is used as a crank to drive the take-up crank -3-. The needle bar through its block -7- is driven vertically by the connecting rod -4- which is guided in its vertical motion by guide -5-. In its side to side motion the needle swing bar pivots at -8- and at the same time the stud on the block -7- slides back and forth in the long bearing at the end of the rod -5-. In the needle swing bar is connected to the needle guide bar by the connecting rod -4- with guide -5- or by screw -A- being set too tight in the split connection of -4-. Excess play in the needle bar action will result if screw -A- in -4- is too loose.

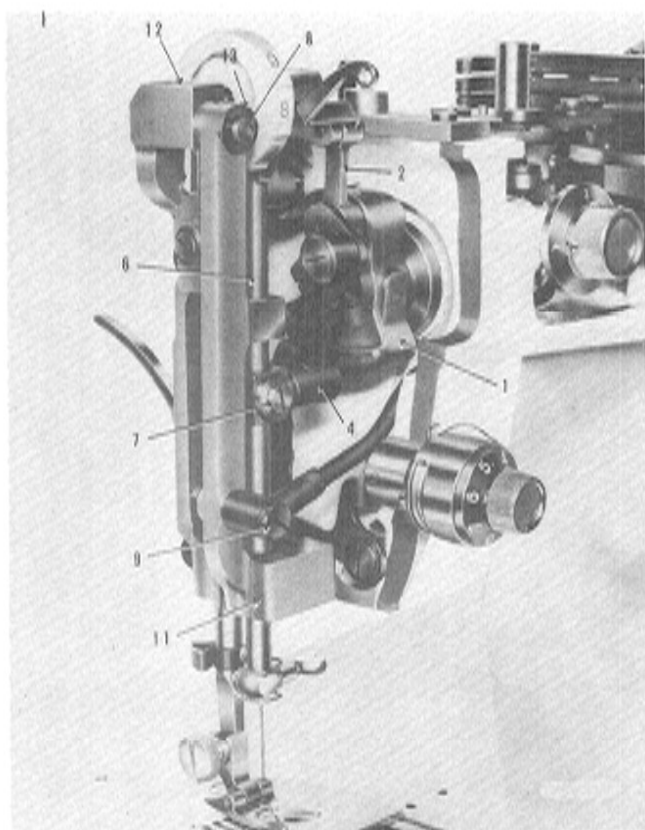


Figure 7

Needle bar -6- stroke (vertical) timing is controlled by and adjustable at the needle block location -7-. The needle swing bar is guided laterally in its side to side (bight) motion at -11-. The swing bar is held to the pin -8- on which it pivots by spring clip -13- and this pin may be removed by loosening the set screw at 12. The shoulder screw -9- secures the needle guide bar to the needle swing bar. (See text for timing).

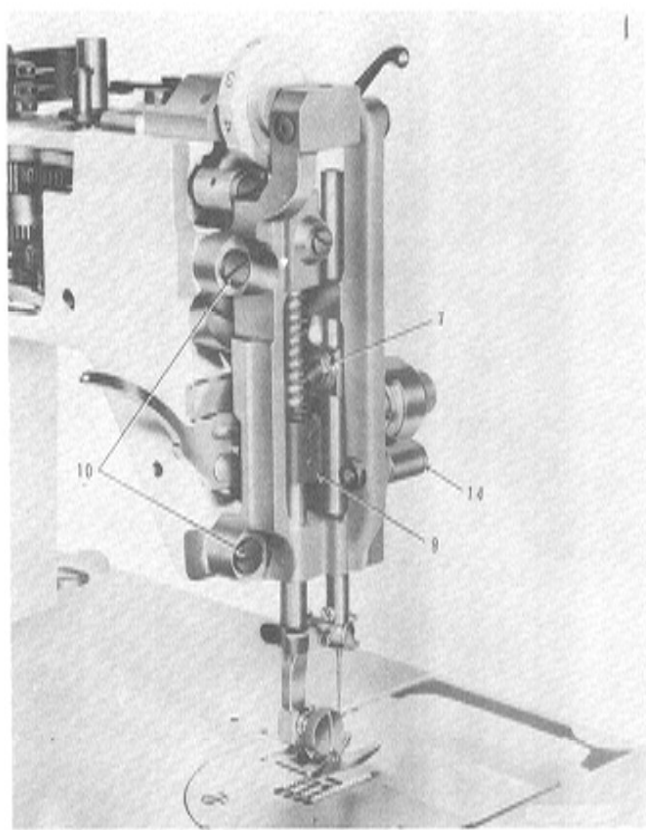


Figure 8

The needle and presser bar assembly is fastened to the machine arm casting by the two shoulder screws -10-. For straight front to back feed action the presser foot must be mounted parallel with the feed dog, this and correct presser foot height is adjustable at the presser bar block -9- (See text). The needle and presser bar assembly may be adjusted in a direction -Y- (See Figure 9) at the mounting screws -10- to center the needle back to front in the needle slot.

ACCESS TO THE MODEL 90

One of the big features of the new model 90 sewing head from the serviceman's point of view is the quick and easy access to the sewing mechanism, Figures 4 and 5. There are six major points of access to the model 90 head:

1. Access to the needle bar, presser bar and take-up mechanism is provided through the hinged face cover plate. This door is held closed by a spring action catch and may be completely removed by removing two hinge screws, See Figure 24.
2. Access to the belt and connecting rods is provided through the side cover plate located just below the handwheel. This plate can be removed by loosening two screws.
3. Access to the shuttle drive gear and sector gear is provided through the gear box cover located under the sewing machine bedplate and to the rear of the shuttle mechanism. It is necessary to loosen the four gear box cover screws, remove the gear box cover and cover gasket, and remove the grease in which the gears are packed to obtain a clear view of this mechanism.
4. Access to the zigzag mechanism and cam drive and follower mechanism is obtained by removing the arm cover plate. Remove the two screws which hold the cover in place and lift the cover off.
5. Behind the light housing are two access holes. One, covered by the lamp housing, provides access to the zigzag guide bar. The other covered by a metal plate which is held in place by two screws provide access to the stitch expander mechanism.
6. Access to the control panel adjustments is through the control plate. This is done in the following manner:
 - a. Loosen all control knob set screws and remove knobs.
 - b. Remove the three panel set screws located under the stitch expander knob, needle position control knob, and stitch length knob respectively.
 - c. Remove clip-on washer on the needle control shaft.
 - d. Lift out control plate.

To replace this panel reverse this procedure. Make sure that the set screw on each knob is mounted at right angles to the notch on each shaft.

To replace the stitch length control turn the stitch length control knob shaft so that the notch on the shaft is facing the right side of the machine. Slip stitch length knob onto the shaft so that the knob is set at "O". Push reverse button in as far as it will to facilitate slipping knob onto shaft. Tighten knob set screw. Check to see that the "O" marking on the knob is in line with the dot on the panel. With the knob at this setting you should not be able to depress the reverse button. Material should not feed on this setting. (See Page No. 3 for adjustment of Material feed). 10

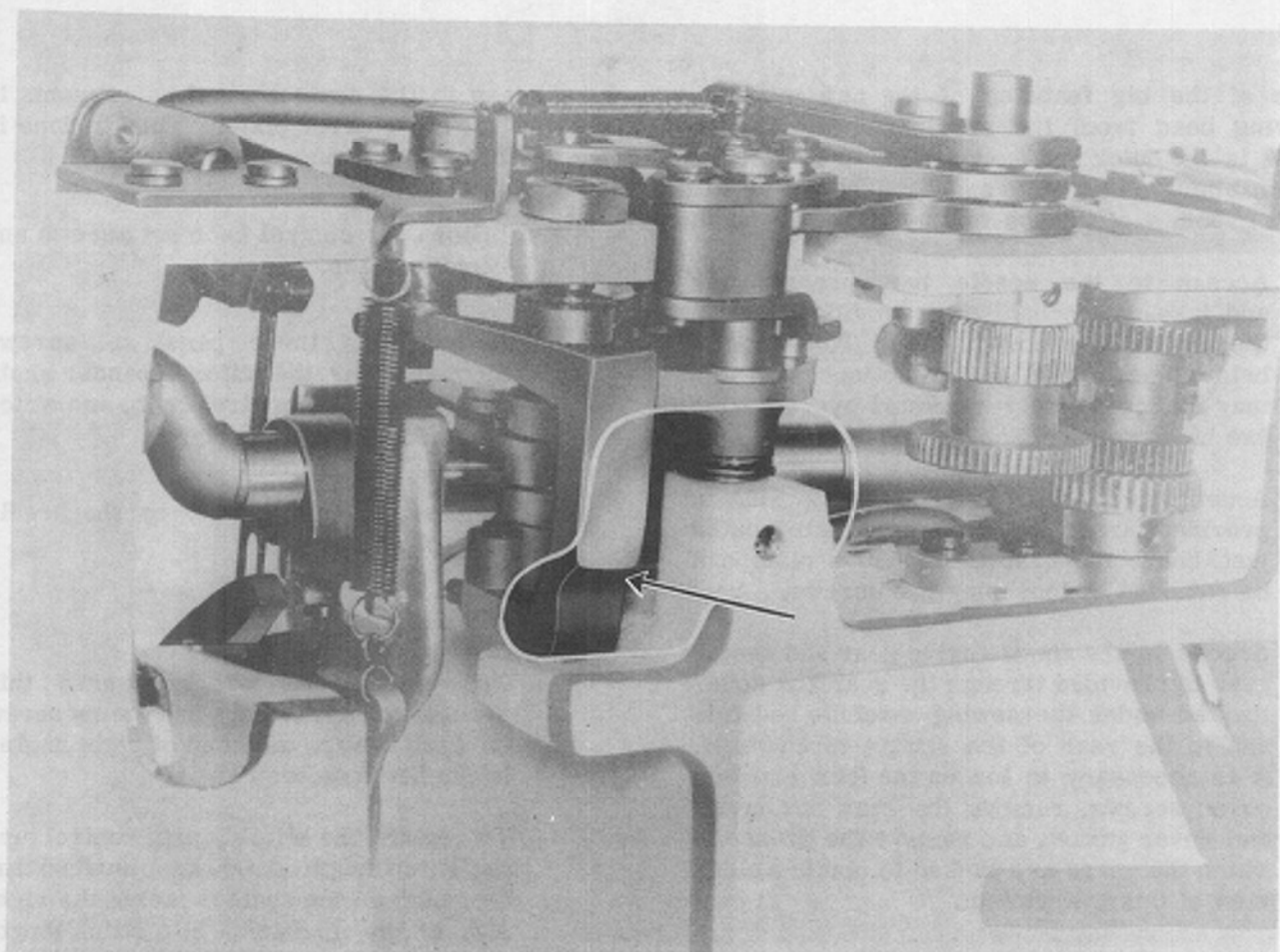


Figure 9A

The arrow here indicates access to the set screw in the connection between the vertical rocker arm and the needle guide bar. This is used to center needle in the -C- setting of the position control with the width control on -O-. This adjustment may also affect stitch bight width.

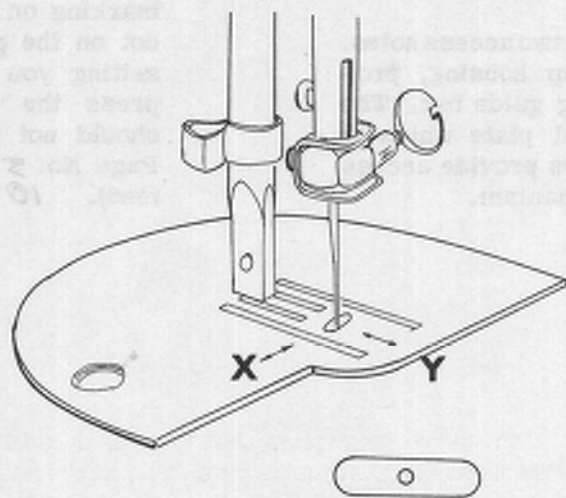


Figure 9B

If the needle is off center in an -X- direction, be sure needle is inserted correctly and straight, remove any cam and check back through the zigzag mechanism adjustments. If off center in the -O- Width Control position loosen the set screw securing the needle guide bar and to the vertical rocker arm connection. (See text, also see Figure 9A).

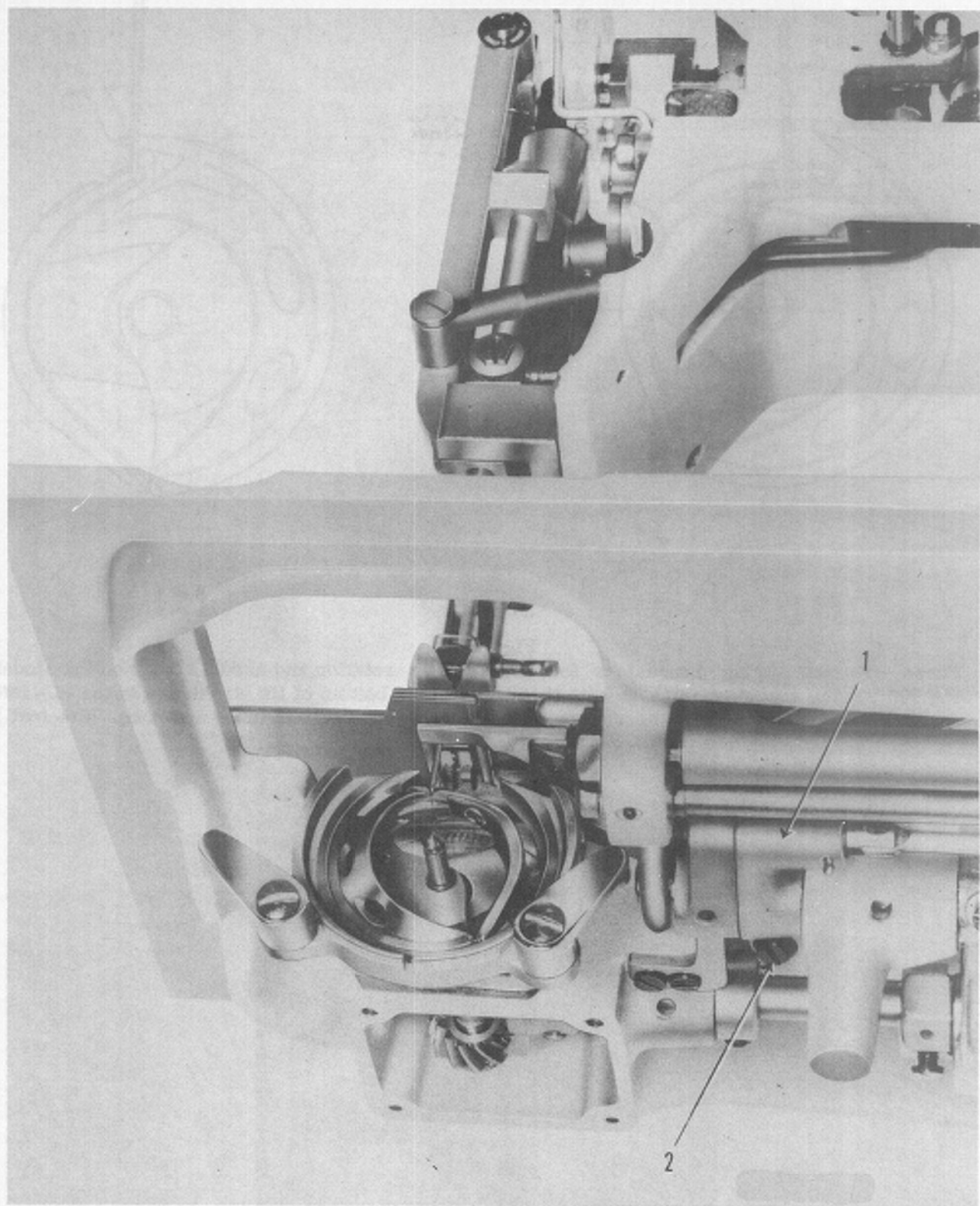


Figure 10

Shuttle rotational timing is also most important but is pinned and rarely requires service, for adjustment see text. For feed dog adjustment and height also see text. The drop feed center block can be relocated on the feed lift shaft by means of screw -2-. Loosen screw -2- and turn the center block -1- slightly toward the front of the machine to raise feed dog.

Noise, stiff operation, broken thread and skipped stitches are prevented by keeping the shuttle race clean and free of thread and lint. Also the shuttle should be in good condition and have a sharp point.

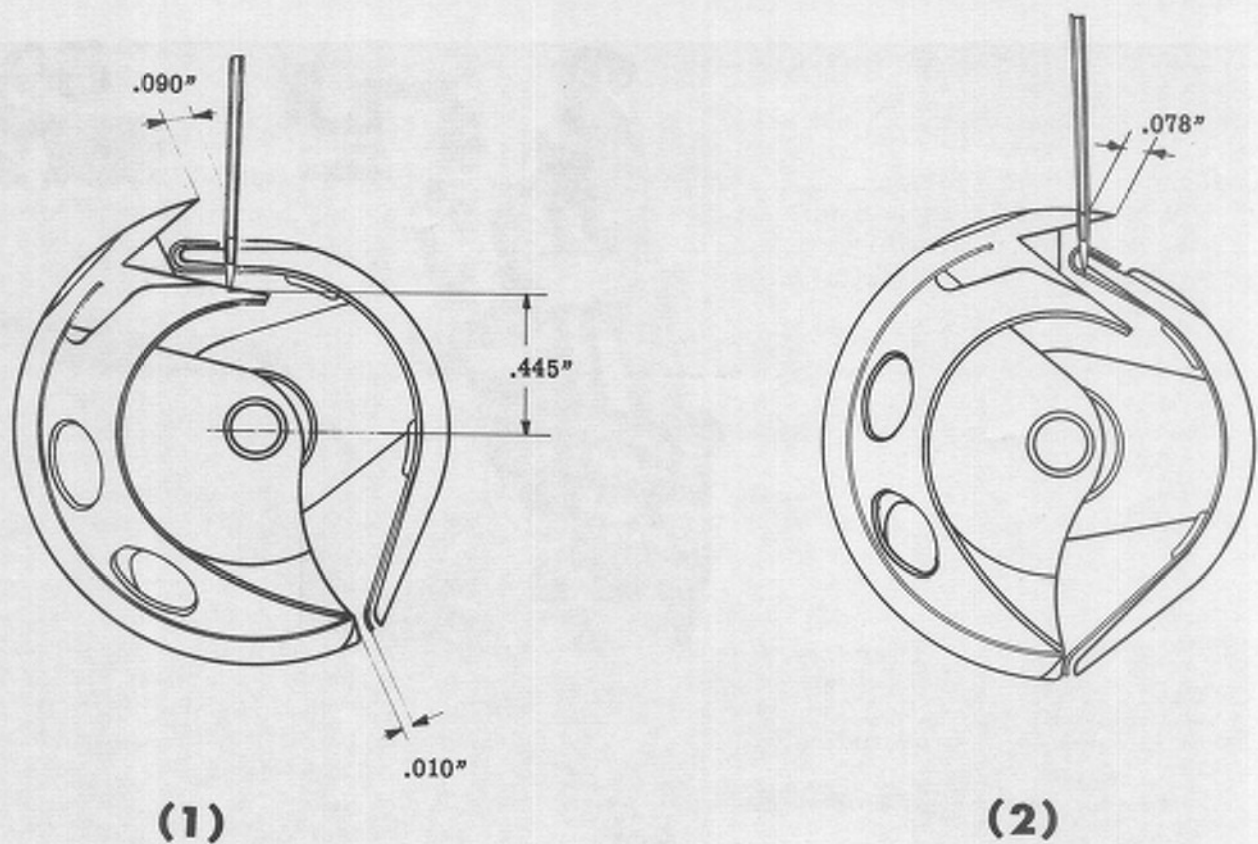


Figure 11

These are the timing dimensions for both shuttle rotation and needle stroke on the Model 158.900 sewing machine. -1- is with the needle in the bottom of its stroke and in the -L- left position. -2- shows the needle in the -R- right position and in its upstroke. (See text.)

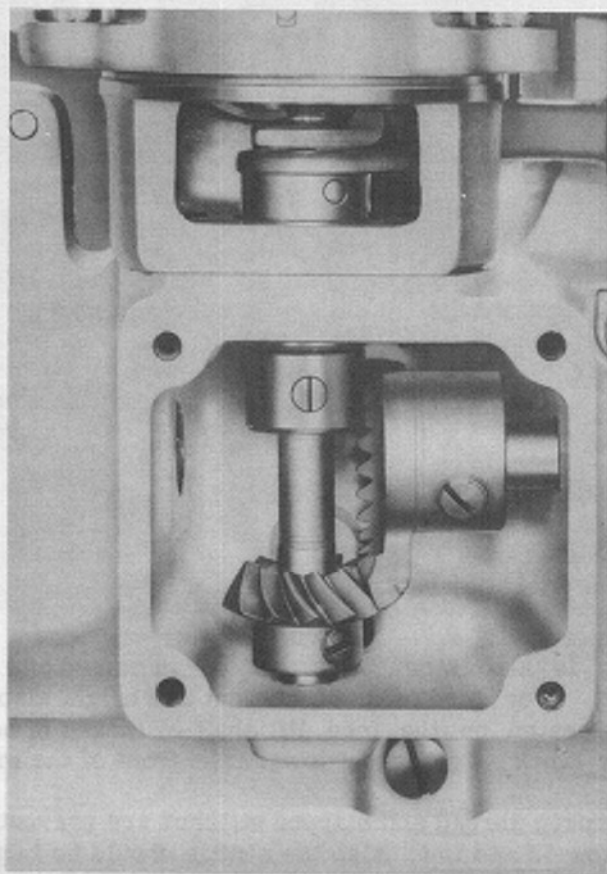


Figure 12

THE STRAIGHT STITCH MECHANISM

Approximately 60% of sewing machine service calls will be instructional in nature. Of the remaining 40%, about 30% will pertain to the adjustment of the straight stitch mechanism.

These complaints will be such things as, (1) machine skipping stitches, (2) material does not feed properly, (3) improper stitching, (4) attachments do not work properly, (5) machine runs hand, (6) belt slips.

On complaints of this sort, unless the trouble is readily apparent it is a good idea to:

1. Change the needle, use No. 6021 needle, (flat side of needle is to the rear on model 90). (Always toward the shuttle).
2. Rethread machine, top and bottom.
3. Clean the shuttle race carefully.
4. Oil machine if machine seems tight.
5. Reset tension.

Once your machine is properly set in the above manner it is much easier to locate the specific problem.

MATERIAL FEED PROBLEM

Material is fed through the machine by the feed dogs grasping the material and sliding it across the bottom of the presser foot. Material feed problems usually show up first when using attachments. Here are the points to check:

1. Make sure feed dogs are in the "UP" position.
2. Presser foot pressure - Dial the presser foot pressure regulator to the lowest number, and lift the presser foot about 1/8 inch up off the needle plate. This should require little or no effort. Dial the presser foot pressure regulator to the highest number. Lift the presser foot again. You should have to exert about 5 lbs. of pressure to raise the foot this time. The pressure for normal sewing is approximately 2-1/2 lbs. (No. 5 setting on the regulator). Thin materials require lighter pressure, heavy materials more pressure. Presser foot pressure is created by the presser bar tension spring

which is loaded along the bar between the presser bar cap and the holder block. A pin on the presser bar cap rides on a cam groove on the front face of the darning wheel. This is preset at the factory and seldom requires adjustment.

3. Presser Bar Lift. With the presser foot lever in the "UP" position, the distance between the top of the needle plate and the bottom of the leveled presser foot should be .234". By pushing the presser foot lever to its highest point the clearance should be 1/4". The presser bar guide bracket (Figure 8 No. 9) can be adjusted up or down by loosening the two screws on the presser bar guide bracket. In the "DOWN" position there should be approximately 1/8" clearance between the presser bar guide bracket and the cammed surface of the presser foot lever. It will also be noted, with the presser foot lever down, that the presser bar and foot can be forced up about 1/2" without disturbing tension. The presser foot lever only affects tension when raised.
4. Feed Dog Height. The feed dogs, at their highest point should rise between .035" and .040" (this is just between 1/32" and 3/64") above the needle plate. This can be adjusted by adjusting the Drop Feed Center Block (Figure 10 No. 1) on the Feed Lifting Shaft. Loosen screw (Figure 10 No. 2) and turn the Center Block slightly toward the front of the machine to raise the feed dogs and toward the rear to lower them.
5. If the feed dogs tend to pull the material to either the right or left, rather than straight, check to see that the feed dogs are level and properly aligned. To adjust, remove the needle plate and loosen the two screws which mount the feed dogs on the feed bar frame (Figure 10 No. 3) and adjust as necessary. After adjusting check to see that the feed dogs clear within the needle plate slots when stitch length is set on "4".
6. Presser Bar Rotational Alignment. First check to make sure that the needle does not rub or strike the presser foot. To adjust, loosen two screws on presser bar guide bracket (Figure 8 No. 9) and rotate presser bar slightly. Gages to check feed dog height, needle bar and presser bar alignment are

available from D/206. Specify Kit No. SE 6035 cost \$3.10 per set.

Another possible source of a material feed problem is the stitch length control mechanism.

A cammed guide groove is located on the rear surface of the stitch length knob (See Figure 15 No. 12). The front end of the regulating pin (Figure 15 No. 1) engages the bushing (No. 3). As the control knob is turned the regulating pin slides in or out, following the cammed surface. The opposite tapered end of this pin pushes against the upper half of a heart shaped cam (Figure 16 No. 10). As the cammed groove surface becomes deeper, the pin moves toward you allowing the heart shaped cam to tilt downward. This gives a longer stitch. As the cam grooved surface becomes shallower the pin moves away from you tilting the heart shaped cam upward.

Torque on the stitch length control is important. Insufficient torque will cause control motion and irregular feeding. Too much torque makes the stitch length knob hard to turn. Torque is adjusted by removing the side cover plate and adjusting the stitch length set screw (Figure 15 No. 8).

If the material feeds in either direction with the stitch length set on "O", adjustment should be made either by repositioning the stitch length control knob on its shaft or adjusting the nylon eccentric located at the rear of the heart shaped cam. Try the stitch length control knob first.

Loosen the stitch length knob set screw and relocate the knob along the length of the shaft so that the regulating pin (Figure 21 No. 1) engages the heart shaped cam at point A (Figure 21) when the knob is set on "O". Pushing the reverse button will make this easier to do. After adjustment tighten set screw firmly on the shaft.

If material still feeds, further adjustment may be made by turning the nylon eccentric (Figure 20 No. 17). Access to this eccentric is gained by removing the handwheel, side cover plate and bobbin winder bracket.

MACHINE SKIPS STITCHES

This is a fairly common complaint concerning sewing machines. Usually the problem is the result of (1) a bent or blunted needle; (2) needle not set in the machine properly; (3) improper tension adjustment; or, (4) a blunted shuttle point. If none of these problems exist, the problem is in the machine timing.

Rotational Timing. With the needle bar in the left position and with the stitch width control set on "O" the shuttle point should have moved counter clockwise until it reached a point .090" to the left of the left side of the needle. In this position the needle point should be .445" above the center of the shuttle center post. (See Figure 11 No. 1).

Now change the needle bar to the right position and rotate the handwheel until the eye of the needle, moving in an upward direction is flush with the outside diameter of the shuttle. At this time the shuttle point, moved in a clockwise direction, should be .078" to the right of the needle.

Correction of rotational timing of the shuttle can be made by adjusting either the lower shaft bevel gear or loosening the shuttle drive shaft bevel gear and rotating the shuttle drive shaft. Both gears are set screwed and pinned, it will be necessary to remove the pins prior to making this adjustment. The adjustment will rarely be necessary, but if it is, it may be necessary to redrill shaft and gear and relocate the pin.

Make sure that there is no end play in the shuttle driver shaft or lower shaft bevel gears. A small amount of end play can cause the machine to skip stitches. See Figure 12.

When the shuttle point passes the needle it should pass behind the needle, with a side to side clearance of .004" to .007". The shuttle rotates through an arc of 216 degrees to 217 degrees. This will not vary unless the wrong forked connecting rod, clevis, lower shaft bevel gear of shuttle shaft bevel gear have been installed or end play has developed (See Page 11 - Noise).

If adjustment of the side to side clearance between the needle and the shuttle point is ever required, either remove the face cover plate and loosen the two screws which fasten the needle and presser bar assembly to the arm (Figure 8 No. 10) which may then be adjusted slightly or adjust at the mounting of the shuttle race to the gear box. See Figure 32. Great care must be exercised to maintain proper vertical and horizontal alignment. Always try several needles, change the shuttle and check to make sure that the needle bar isn't bent prior to attempting this adjustment. -It is rarely needed-

Needle Bar Timing. Since it is not pinned the easiest and most common timing adjustment is that of the needle bar. Loosen the needle bar

set screw (Figure 7 No. 7) and adjust the needle bar up or down to bring the machine into proper time. With the point of the shuttle located just opposite the shank of the needle, the shuttle point should be at least $1/32$ " over the top of the needle eye in any needle bar position, it may be as much as $3/32$ " depending on the side to side location of the needle bar. The dimensions shown in Figure 11 also serve as a check on needle bar timing. A needle bar height gage is included in the Sewing Machine Test Gage Kit No. SE 6035 which was mentioned earlier in this book. This kit is available from your D/206. Cost is \$3.10 per set.

NEEDLE HITTING NEEDLE PLATE OR SHUTTLE

The most usual cause of this complaint is a bent or improperly inserted needle. If not this, first determine whether the needle is hitting due to being off along the "X" axis or the "Y" axis. (See Figure 9). If the needle is off along the "Y" axis check to see if the needle bar is bent. If it is not, remove the face cover plate and adjust the presser and needle bar assembly as outlined above.

If the needle is off along the "X" axis, remove the light housing and light housing bracket. Loosen screw (beyond arrow) Figure 9A and adjust the connecting link to the connecting bar swing. This adjustment may effect stitch bight so care must be used not to limit maximum stitch (width) bight.

If the needle strikes the needle plate when sewing with a zigzag pattern cam only, an adjustment must be made to the cam follower mechanism only. This will be covered in the section of this book devoted to this mechanism (See Page 26)

MACHINE IS NOISY

This customer complaint is often one of the most difficult to correct because the subject of noise is a difficult one to define. First check the shuttle race to make sure it is clean. Then oil and operate the machine to see if the noise level drops. If it does not, change the shuttle. Check the clearance between the shuttle and the shuttle driver (Figure 11 No. 1). Clearance should be $.010$ ". Bend the driver spring as necessary to obtain this clearance. Then check the following:

1. End play in the shuttle driver shaft.
2. Backlash between shuttle driver shaft and lower shaft bevel gear.

3. Fit of connecting rod on the main shaft.
4. Fit of the stud screw for the connecting rod.
5. End play in the lower shaft.

An accumulation of play in the five areas mentioned above may also cause skipped stitches. To check this play hold the handwheel to keep the main shaft from moving and force the shuttle drive shaft to and fro. If the shuttle drive shaft does move thusly, locate the source of play and correct it.

There is also the possibility of play in the vertical stroke of the needle bar. To check this hold handwheel with the right hand and attempt to wiggle the needle bar up and down.

Play sometimes develops in the connection between the needle-bar connecting rod (Figure 6 No. 4) and the sleeve of the crank (Figure 6 No. 3). To correct this, adjust the screw (Figure 6 No. 4A) in the split of the connecting rod.

MACHINE BREAKS THREAD

This is a fairly common problem. Check the following:

1. Remove thread and rethread machine top and bottom.
2. Wind a bobbin to check for even bobbin fill.
3. Change needles and check needle vs. thread size (see instruction book chart)
4. Check tension on tension check spring. This may need to be tightened, should hold thread firm until needle just starts to penetrate material. (Loose tension on check spring may also cause crooked stitches).
5. Loosen both top and bottom tension.
6. Make sure customer starts machine with takeup lever at highest point.
7. Make sure customer pulls bobbin thread up and to the rear of the machine before starting to sew.

MACHINE BINDS

1. Check shuttle to make sure it is clean.
2. Check fit of shuttle drive gear and lower shaft bevel gear. They may be meshed too tightly.

3. If bind seems to be in the needle bar, check the alignment of the needle bar guide plate (Figure 6 No. 5). Realign guide plate by loosening and resetting two screws. To obtain access to these screws loosen the tension assembly set screw and remove the tension assembly. Insert screwdriver through the hole in the casting and loosen the two screws.
4. Machine will also ^{bind} ~~be~~ behind if it has been dropped and the Main shaft bent or bed-plate cracked. Sears shops are not equipped to do these repairs. See Bulletin)-260 for details of handling.

MOTOR WON'T RUN

When checking into a complaint of this sort, first check or replace the foot or knee control. It is usually less expensive to replace this control than to repair it.

Next check and adjust the belt tension. If belt is too tight motor may bend, if loose pulley will slip. The motor is mounted under the bed-plate. The motor mounting bracket is attached to the motor by two screws. The bracket is attached by means of a set screw which is inserted into a vertical slot in the machine bed-plate casting (See Figure 14).

To adjust the belt tension loosen set screw (Figure 14 No. 2) and slide motor mounting bracket up or down to obtain proper adjustment. Tighten set screw.

To replace belt remove the end plate. Remove clutch nut stop screw. Unscrew clutch nut. Remove clutch nut stop washer and handwheel. Remove worn belt and replace with new one as shown in Figure 13. To reassemble, reverse the above procedure.

If the motor is burned out or defective, do not attempt to repair it. It is usually cheaper to replace it. Remove motor bracket set screw (Figure 14 No. 2). Remove motor from motor bracket. Remove motor pulley from motor shaft. Disconnect motor leads from terminal block. Install new motor by reversing the above procedure.

Replacement motors for all Japanese made machines are available at low cost, thus making repairs impractical. Refer to the latest Repair Parts Bulletin (Division 20) and Standard Nomenclature information. (For example, at this time, Motor Specialty, Inc. will replace an out of guarantee motor for \$1.50 exchange cost to store).

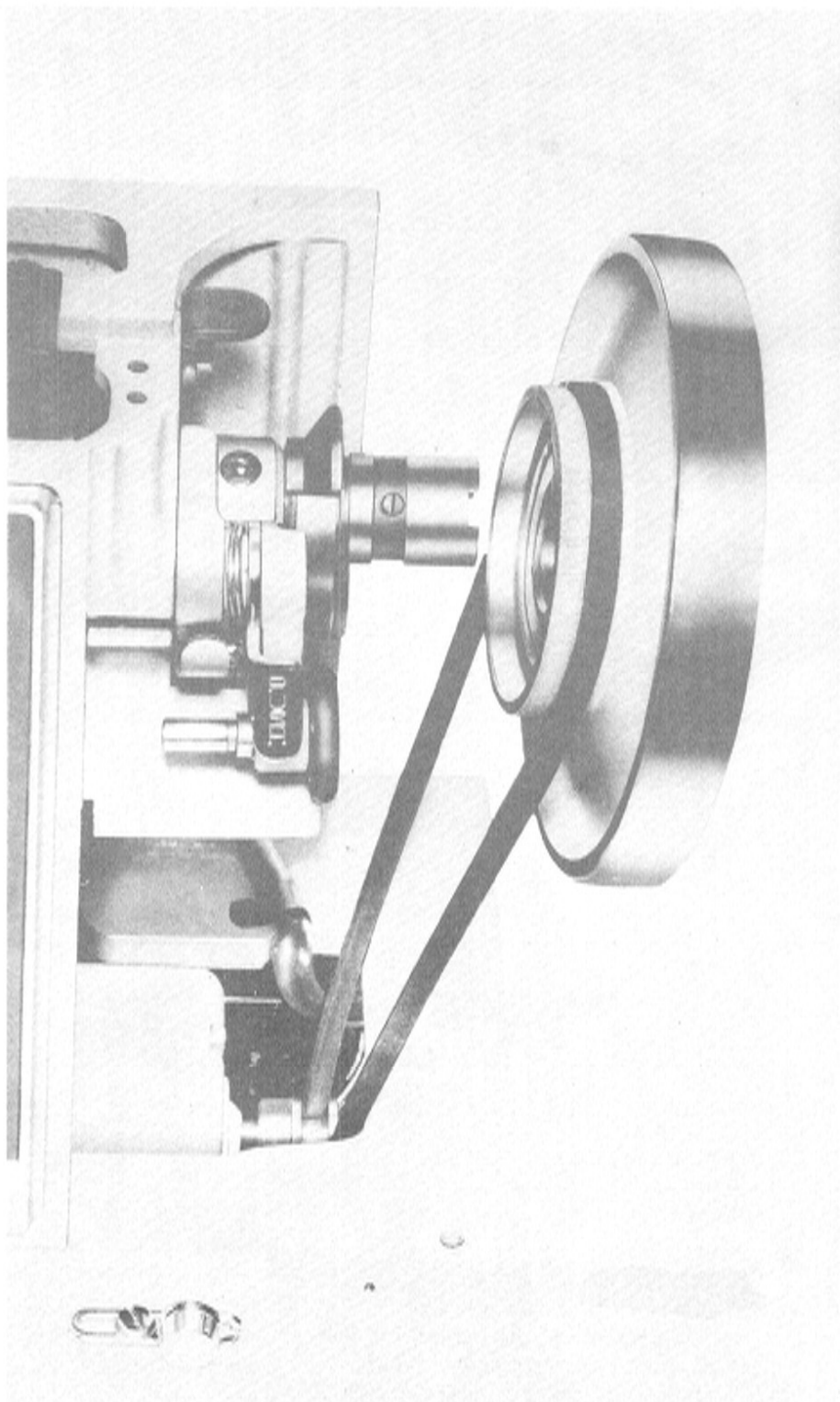


Figure 13

This illustrates the hand wheel mount to the collar on the end of the main shaft along with the drive belt. An end plate and the hand wheel must be removed to replace the belt. The main shaft bearing should be lubricated regularly thru the spring loaded oil fitting located in the bearing casting just over the bobbin winder.

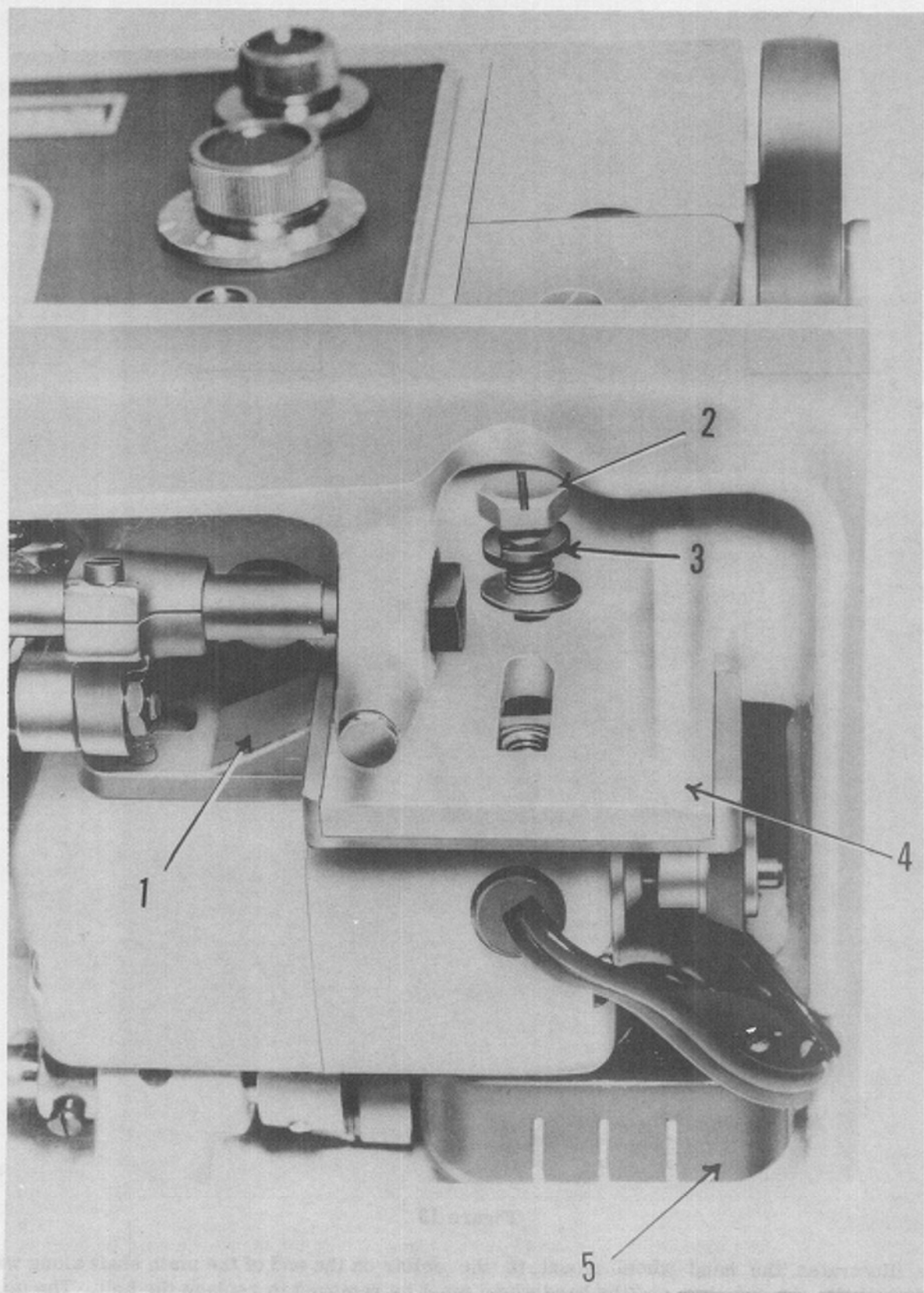


Figure 14

The motor is mounted to a bracket -1- which in turn is fastened under the bed plate as shown by a bolt -2- and lock washer -3- to the casting -4-. Belt tension is adjustable at this point.

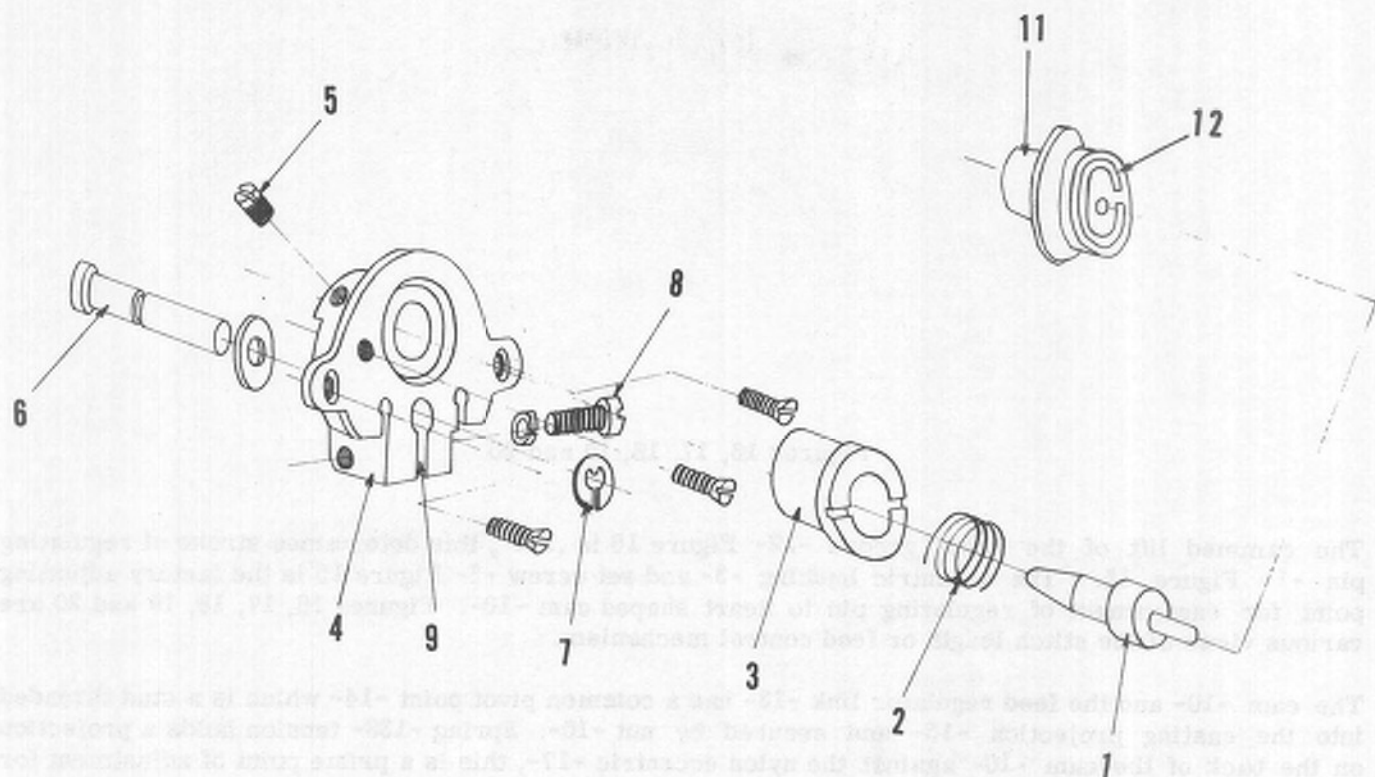



Figure 15

An exploded view of the Stitch Length Control Knob and Base Components

1. Regulating Pin (rides against heart shaped cam -10- Figure 16)
2. Compression Spring (sets in bushing)
3. Eccentric Bushing
4. Shaft Base
5. Set Screw (locates eccentric bushing in base)
6. Stitch Regulating Shaft (held in split of base by spring clip)
7. Spring Clip for -6-
8. Shaft -6- Tension Adjustment Screw
9. Mounting for Shaft -6-
10. Base Mounting Screws
11. Stitch Length Control Knob (Rear View)
12. Cammed Guide Groove (Pin -1- rides in and out thru eccentric bushing as guided by cammed groove.)



Figures 16, 17, 18, 19 and 20

The cammed lift of the guide groove -12- Figure 15 is $.164^{\circ}$, this determines stroke of regulating pin -1- Figure 15. The eccentric bushing -3- and set screw -5- Figure 15 is the factory adjusting point for engagement of regulating pin to heart shaped cam -10-. Figures 16, 17, 18, 19 and 20 are various views of the stitch length or feed control mechanism.

The cam -10- and the feed regulator link -13- has a common pivot point -14- which is a stud threaded into the casting projection -15- and secured by nut -16-. Spring -13S- tension holds a projection on the back of the cam -10- against the nylon eccentric -17-, this is a prime point of adjustment for coordinating dial reading and feed action. -20- is a pivot connection between links 13 and 19 secured by set screw -21-. The free end of -19- connects with the forked connecting rod as usual.

Links -24- pivots at connection -25- which is fastened to a projection on the arm casting. Links -27- and -24- connect cam -10- to the Reverse Button -23- by the connection of -24- at -26-. A guide bracket -28- is provided for the push button -23- which is held forward by the action of spring -29- on link -24-.

Bracket -30- connects with feed control link -13- at pivot -31- and thru its connection to the -L- shaped crank -32- provides the feed direction pattern cam linkage with the feed control device. The long slot in -30- allows free action of both the stitch length control knob and the reverse push button without interference with the pattern cam linkage.

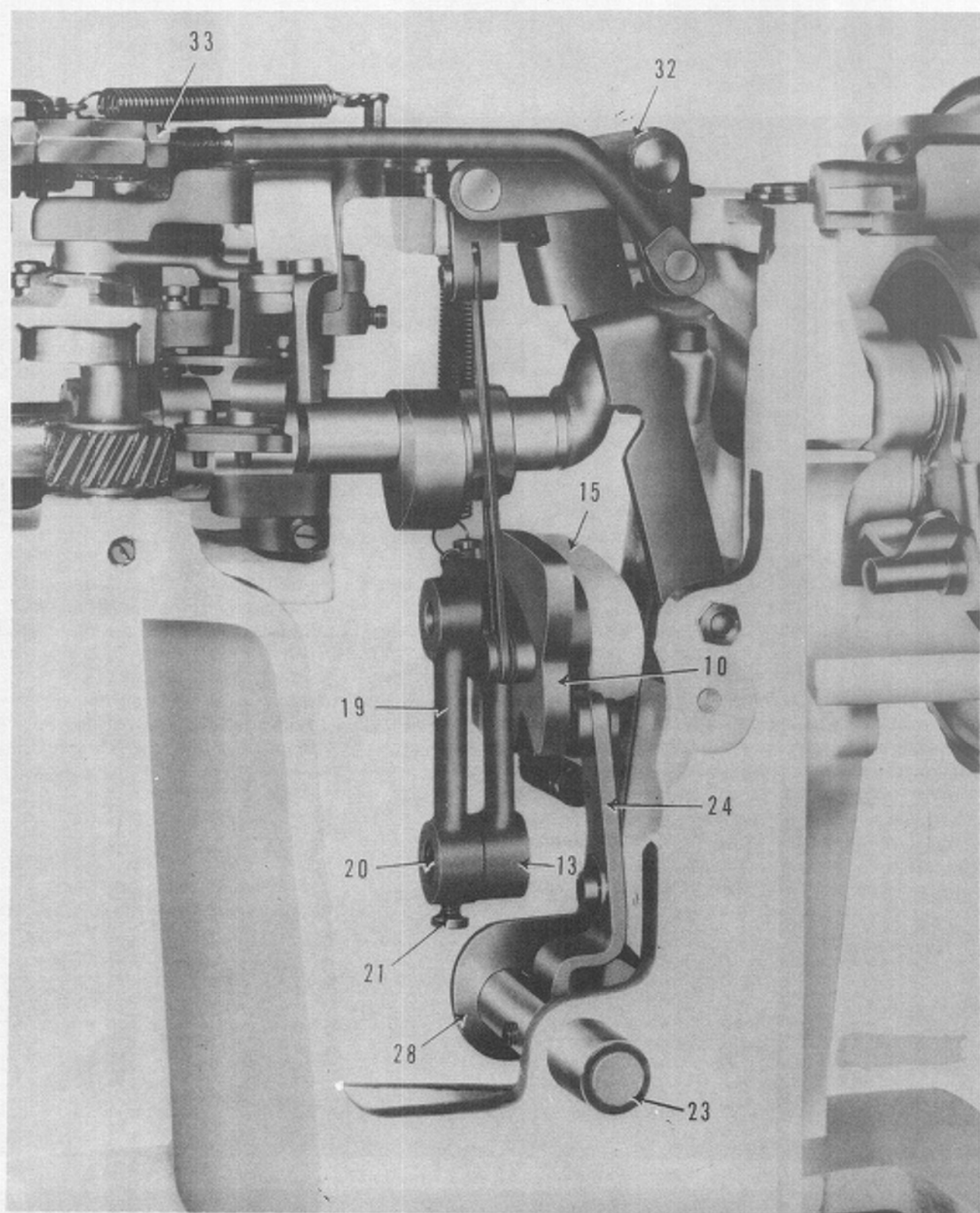


Figure 16

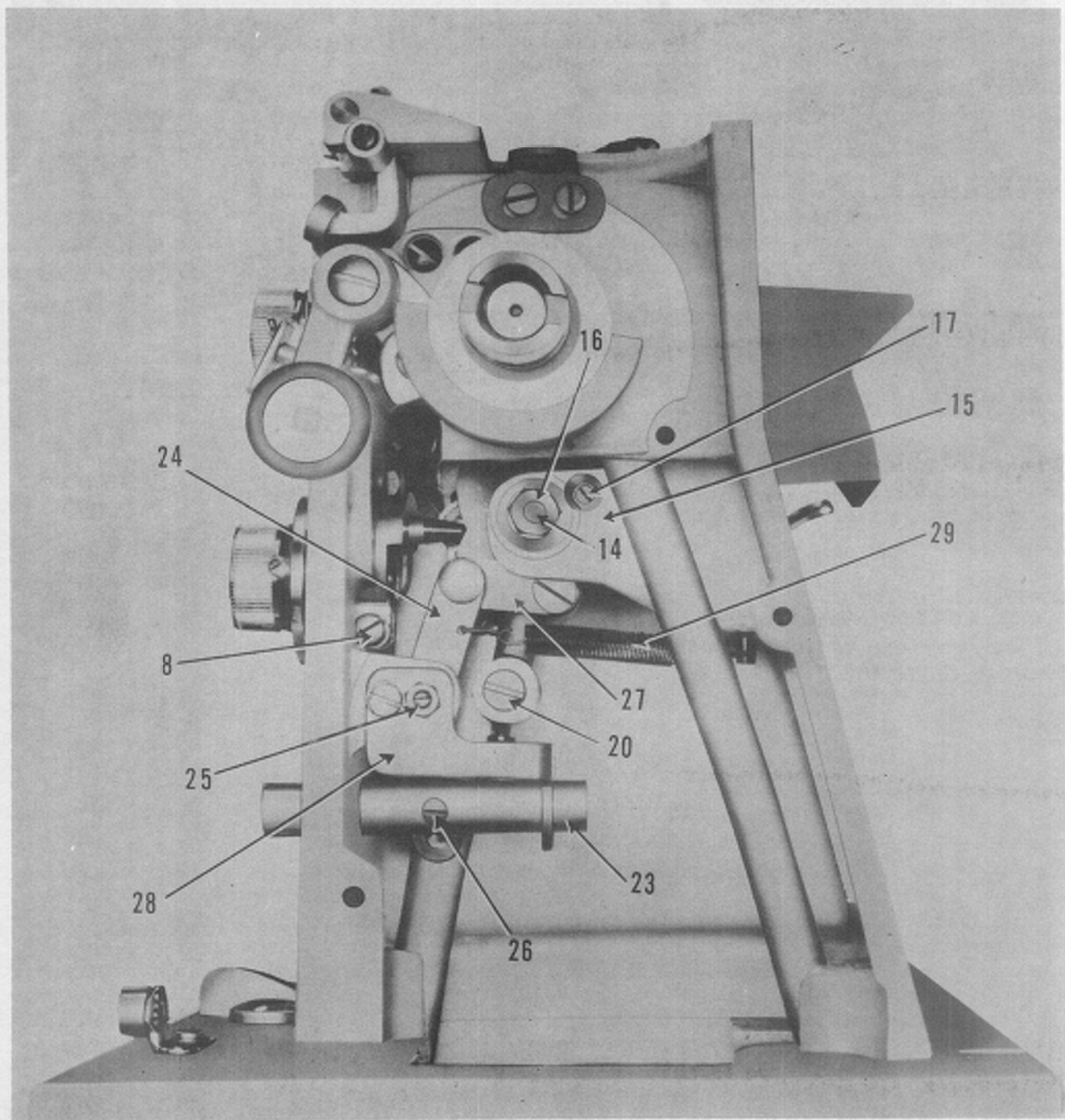


Figure 17

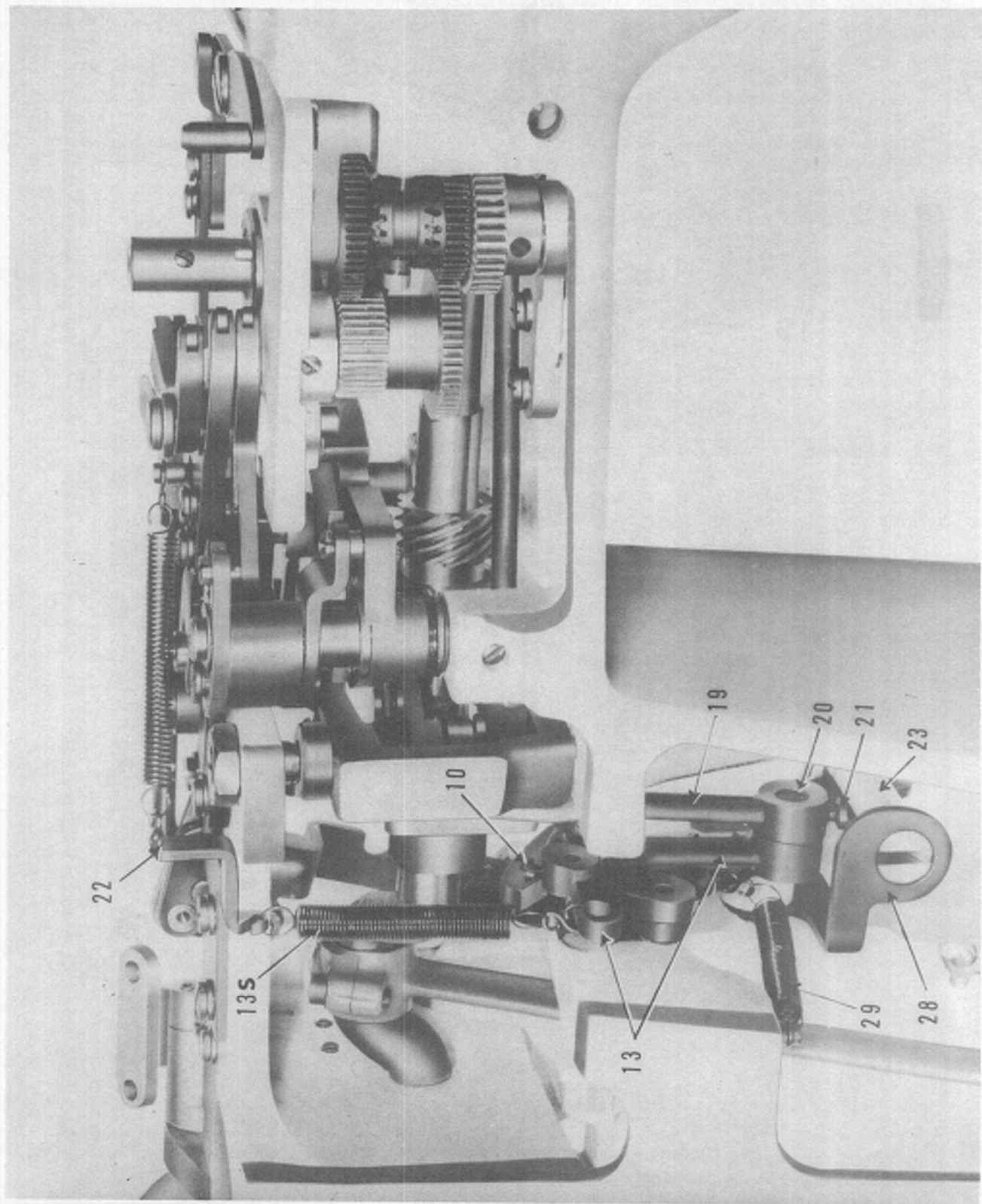


Figure 18

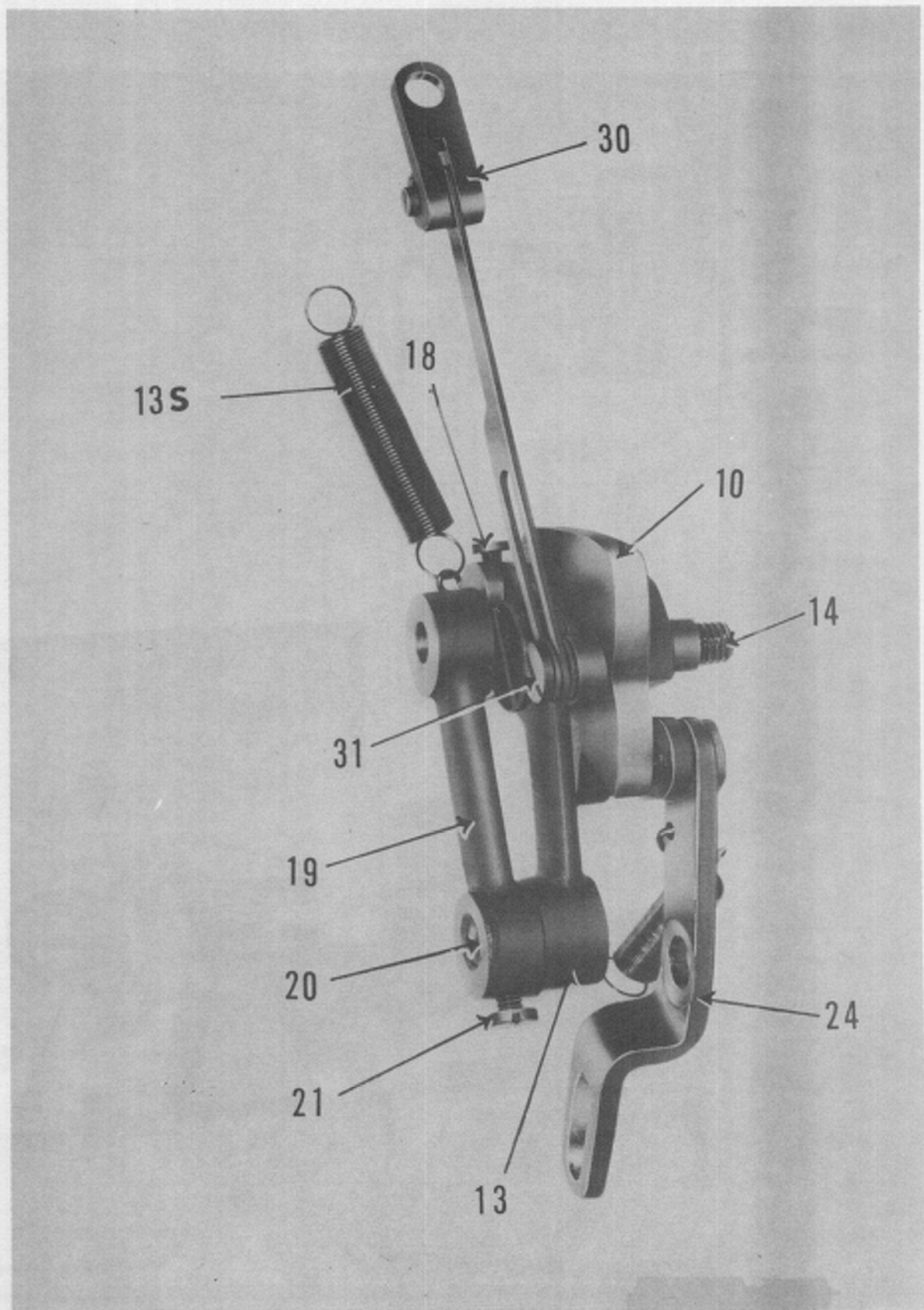


Figure 19

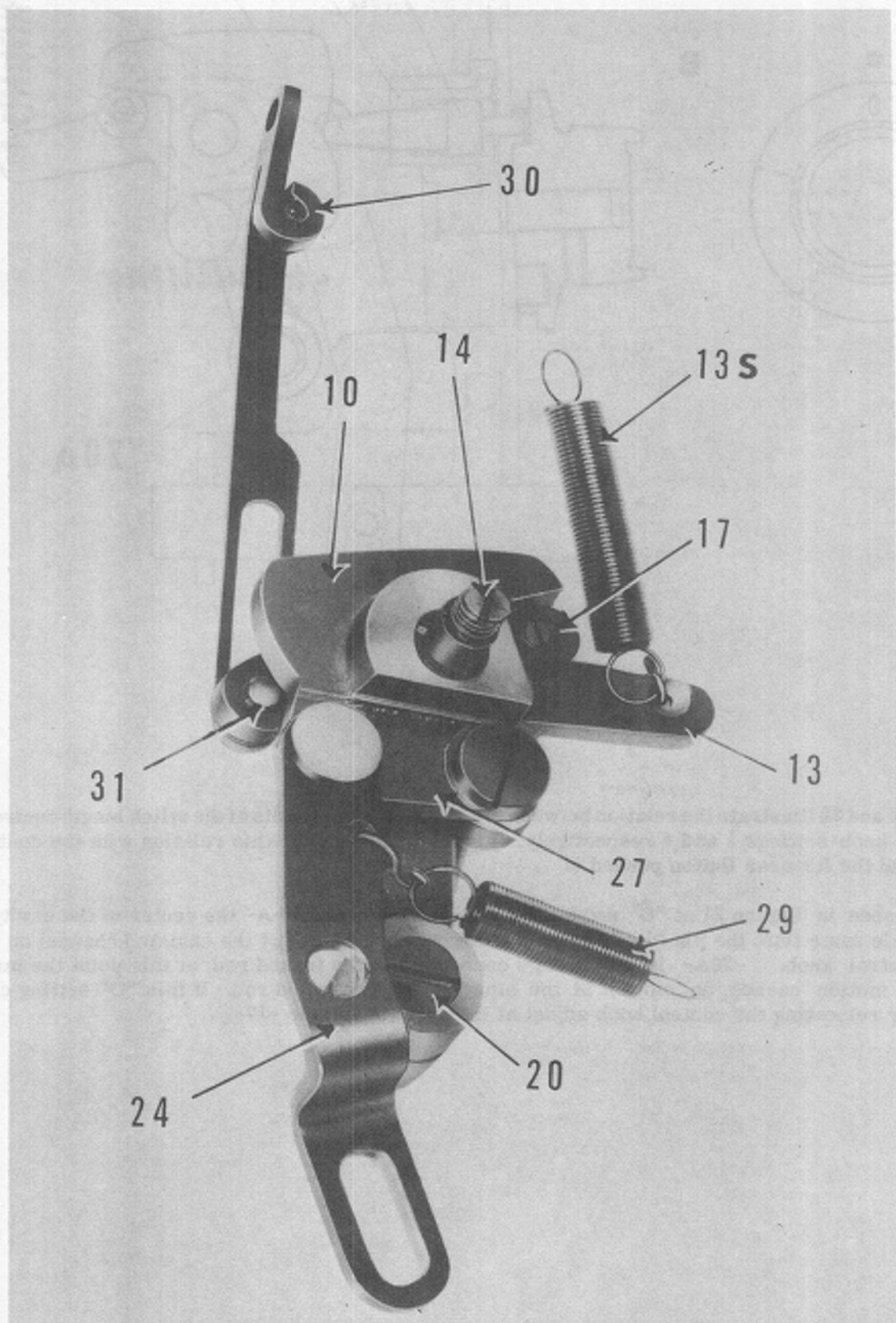


Figure 20

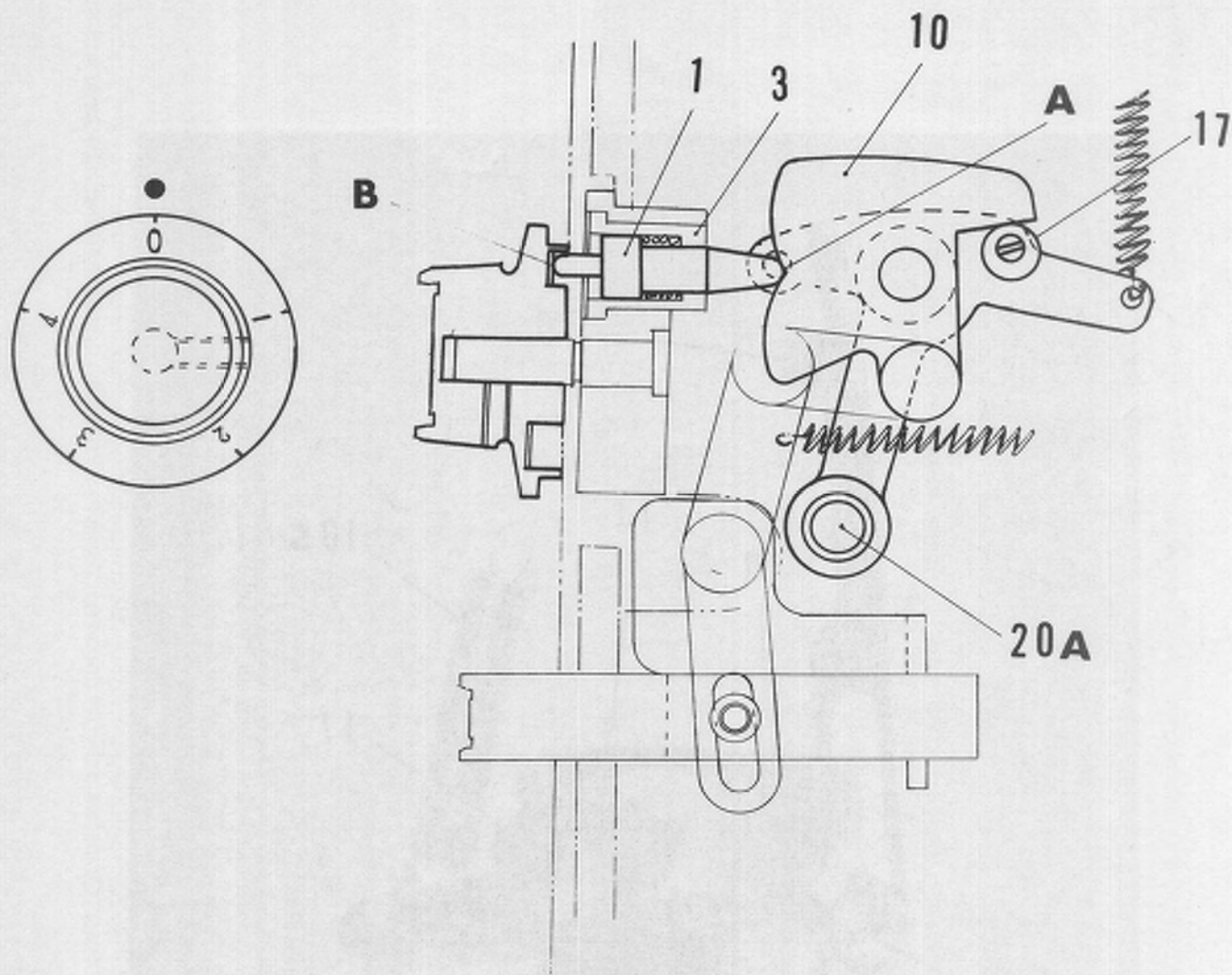


Figure 21

Figures 21 and 22 illustrate the relation between the various components of the stitch length control device at control knob settings 1 and 4 respectively. Figure 23 illustrates this relation with the control knob set on 4 and the Reverse Button pushed in.

It can be seen in Figure 21 at "O" setting the pin -1- should be at -A- the center of the cavity in cam -10-, at this same time the pin -1- is in the shallowest portion -B- of the cammed channel on the back of the control knob. -20A- is the linkage connection to the forked rod, at this point the main shaft feed cam motion causes no motion at the other end of the forked rod. If this "O" setting cannot be obtained by relocating the control knob adjust at the nylon eccentric -17-.

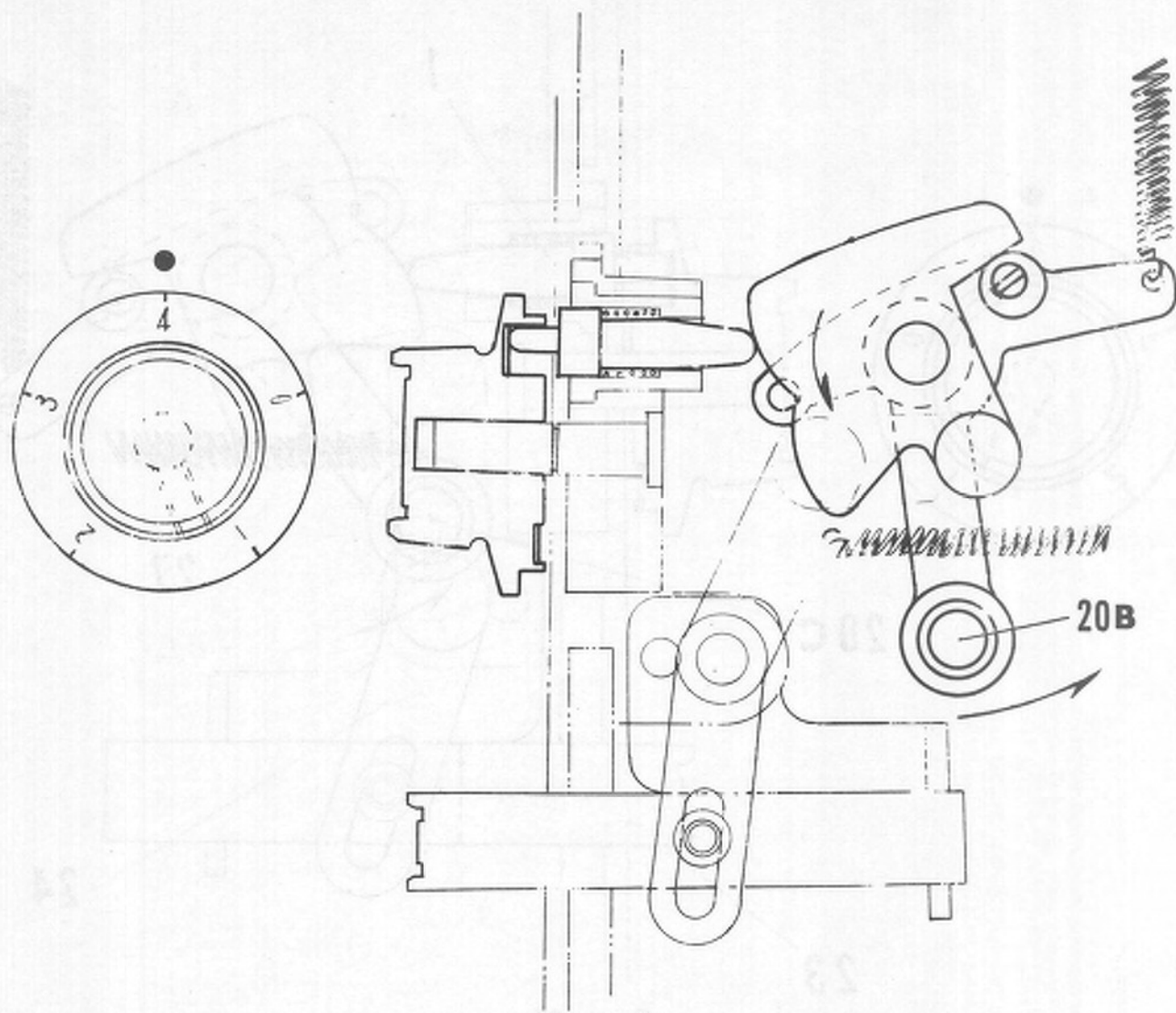


Figure 22

Figure 22 shows the opposite position of the control knob with the pin in the deepest part of the cammed channel, the cam -10- in its lowest position and the change in the location of the forked rod connection -20B-.

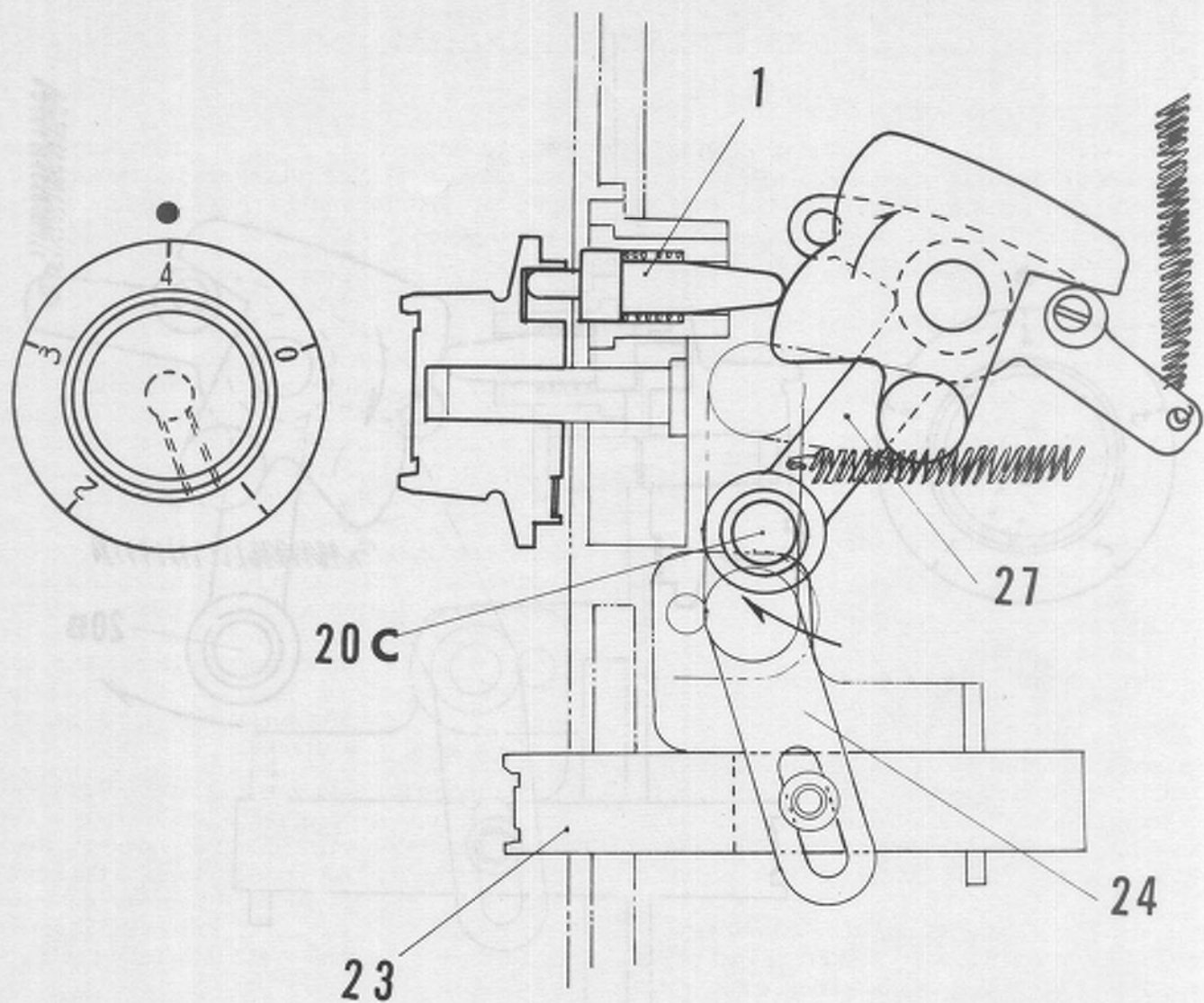


Figure 23

Figure 23 is the No. 4 position of the control knob but with the Reverse Button pushed in. This should result in the same reverse stitch length as No. 4 forward stitch length. Note that the link connection to the forked rod is now toward the front of the machine at -20C-.

THE ZIGZAG MECHANISM

As we stated in the introduction ~~of Section II~~ of this book, most of your sewing machine adjusting will be made to the straight stitch part of your machine. There are, however, a number of adjustments to the zigzag mechanism.

Before we go into specific zigzag problems, let us look at the mechanism.

THE ZIGZAG CONTROL PANEL

The zigzag control panel is located just behind the control plate and consists of:

1. The stitch width adjustment knob and its associated mechanism.
2. Stitch width setting indicator.
3. Needle position knob and automatic reverse activator and their mechanism.

To make adjustments to this panel remove the control knobs and control plate (See "Access to your Model 90" and Figure No. 24). Loosen the four screws holding control panel in place (Figure 25 No. 1) and lift out the control panel.

The stitch width control and stitch width setting indicator are mechanically similar to that of the Model 48. Rotation of the stitch width shaft (Figure 26 No. 2) changes the width of the needle swing. When the stitch width knob is pressed inward the shaft moves in against a compression spring (Figure 25 No. 3). The inward motion of the shaft disengages the pinion gear (Figure 29 No. 4) from the stop rack (Figure 29 No. 5). As the pinion gear disengages the stop rack it engages the racked bar (Figure 29 No. 6).

When the stitch width knob is pressed inward it can be rotated. As the knob rotates the pinion gear, since it is mounted on a common shaft, it rotates also. The racked bar, which the pinion gear now engages, slides to the right or left as the knob is turned. A hook on the end of the racked bar engages the spring loaded zigzag lever (Figure 30 No. 12) and in this manner increases or decreases the stitch width.

On the front side of the racked bar (Figure 27 No. 6) a stitch width indicator is mounted (Figure 27 No. 8) by means of two set screws. The holes in the stitch width indicator are oblong so that it can be adjusted to coincide exactly

with the actual stitch width. A calibrated plastic lens (Figure 27 No. 10) covers the stitch width indicator and is visible through a slot in the control panel.

On the right side of the control panel is a second shaft which is rotated by the needle position control knob. This shaft varies the needle position and also engages and disengages the cam operated stitch length control. Mounted on the rear of this shaft is a notched cam (Figure 28 No. 11), and mounted on the cam is a stud (Figure 28 No. 12). The stud engages the slider bar (Figure 28 No. 12) at its hook (Figure 29 No. 14). A projection from the center of the slider bar (Figure 29 No. 15) engages the needle position lever (Figure 30 No. 9) which is spring loaded toward the left position. Positive positioning for the left, center and right positions is caused by a spring loaded pawl (Figure 28 No. 16) with an engaging pin (Figure 28 No. 17) riding on the notched cammed surface (Figure 28 No. 11) to which the stud is attached.

In addition to the stud, an engaging pin (Figure 29 No. 18) is also located on the flat surface of the needle position cam. When the needle position knob is turned to "AR" this pin engages the notch (Figure 31 No. 16) in the Automatic Reverse Shift Lever and causes the automatic reverse mechanism to respond to the action of the pattern cam.

Except for the changes in the control panel noted above the Model 90 zigzag and needle position arrangements are almost identical to the Model 88.

Now let's look at some of the problems which you may encounter which pertain to the zigzag mechanism.

1. Machine won't sew a straight stitch - it continues to zigzag even when set for regular sewing.

When the machine is set for straight stitching and there is no cam in the machine there may be side to side needle motion so small that it is hardly noticeable. The customer may complain instead, about a ragged looking stitch. To check for needle motion set the stitch width on "O" and remove the arm cover plate. Turn the handwheel by hand for a few stitches and observe the zigzag crank rod (Figure 30 No. 6).

As the handwheel is turned the zigzag cam guide (Figure 30 No. 3) should swing from side to side, but should impart no motion to the zigzag cam lever. If there is motion at zero, adjustments must be made. Turn the stitch width control from "0" to "4" a few times. Notice that as the stitch width is increased the zigzag rocker (Figure 30 No. 11) forces the sliding block (Figure 30 No. 4) to move forward in its curved channel, and that as the sliding block moves forward, it imparts more motion to the zigzag crank rod which, through a mechanical linkage, swings the needle from side to side. As the stitch width is decreased the sliding block moves back in the channel and imparts less motion to the crank rod until at a point directly over the cam guide stud there is no movement of the crank rod. Adjust "0" stitch width to stop the zigzag crank rod at this point. To do this, check the following:

With the stitch width knob in "0" position the zigzag rocker, Figure 30 No. 11, should rest against the zigzag rocker stop plate, Figure 31, -E. The plate can be adjusted to position the sliding block directly over the cam guide stud.

If the zigzag rocker does not rest against the stop plate, check the following:

- (1) See that the sliding block moves freely in its channel.
- (2) With the stitch width knob on "0" the zigzag slide (Figure 28 No. 7) should clear the zigzag lever (Figure 30 No. 12) by approximately .008". This clearance may be adjusted by loosening the two screws which hold the zigzag lever in place (Figure 30 No. D). NOTE: Maintaining this clearance is important to minimize machine noise during its operation with pattern cams.

2. Zigzag stitch isn't wide enough (or too wide).

The maximum width of the zigzag stitch with the stitch width control on the No. 4 setting is between .152" and .156". This adjustment is made by loosening the two screws which hold the zigzag lever in place (Figure 30 No. D) and adjusting the lever slightly to

your left. With the stitch width lever in the "0" position maintain a clearance of approximately .008" between the zigzag lever (Figure 30 No. D) and the zigzag slide (Figure 28 No. 7).

3. Needle moves from side to side while it is in the material. (See Figure 39)

Figure 39
This problem can originate either in the cam follower mechanism (~~See Section IV, Page 13 and Page 21~~) or in the zigzag mechanism. If the problem occurs only when a pattern cam is being used the problem is in the follower mechanism. If it also occurs when zigzag stitching without a cam, the problem is a result of the positioning of the spiral gear (Figure 31 No. A) on the main shaft. Before adjusting the spiral gear, mark its lineal position on the main shaft. All adjustment to this gear must be made by rotating the gear. Its lineal position on the shaft should not be disturbed. Next set the stitch width control to "0", loosen the two screws which hold the spiral gear in place on the shaft and rotate the gears on the shaft slightly. Reset the gear and check to see that the needle swings only when it is out of the material. Set and check the gear position until you have solved the problem.

4. The zigzag stitch looks ragged.

With the needle in its left position the needle should enter the material in a straight line at the left side of the zigzag stitch on alternate strokes of the needle. In its right position it should enter the material in a straight line at the right side of the zigzag stitch on alternate strokes of the needle. With the needle in the center position left and right strokes of the needle should be equal distances from the center of the needle hole. To check this set the needle position on "L" and turn the handwheel until the needle enters the needle plate hole on the left hand side. You should now be able to turn the stitch width lever from "0" to "4" without causing any side to side movement. If any side to side vibration occurs when turning the stitch width lever, loosen checknut and adjust eccentric at point B on the cam guide No. 3 in Figure 31. When side to side movement is corrected in one position, all other positions are adjusted automatically.

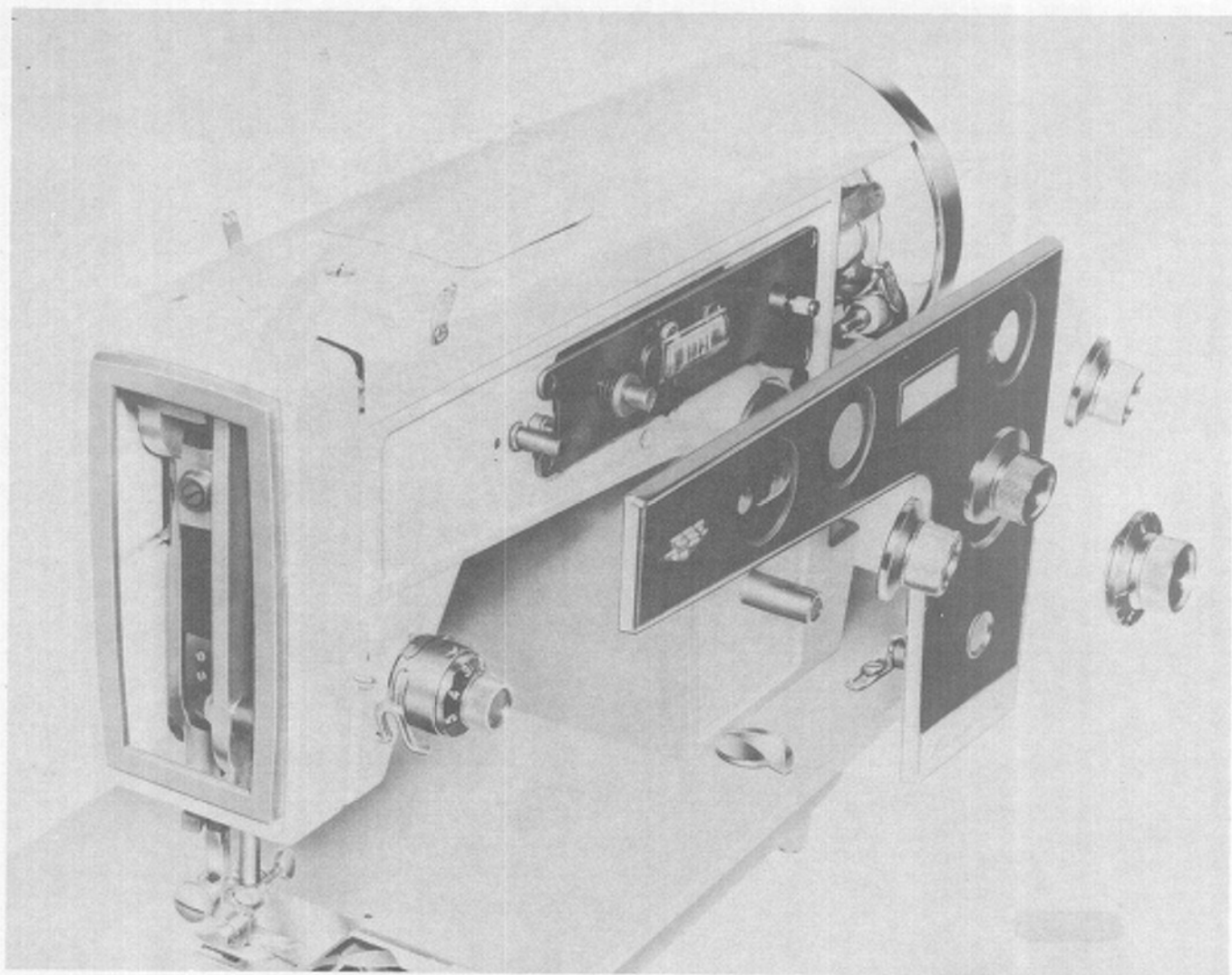


Figure 24

FRONT CONTROL PANEL - A screw behind the Stitch Expander, Stitch Position and Stitch Length Control Knobs plus a hairpin clip at the Needle Position Control secures this panel.

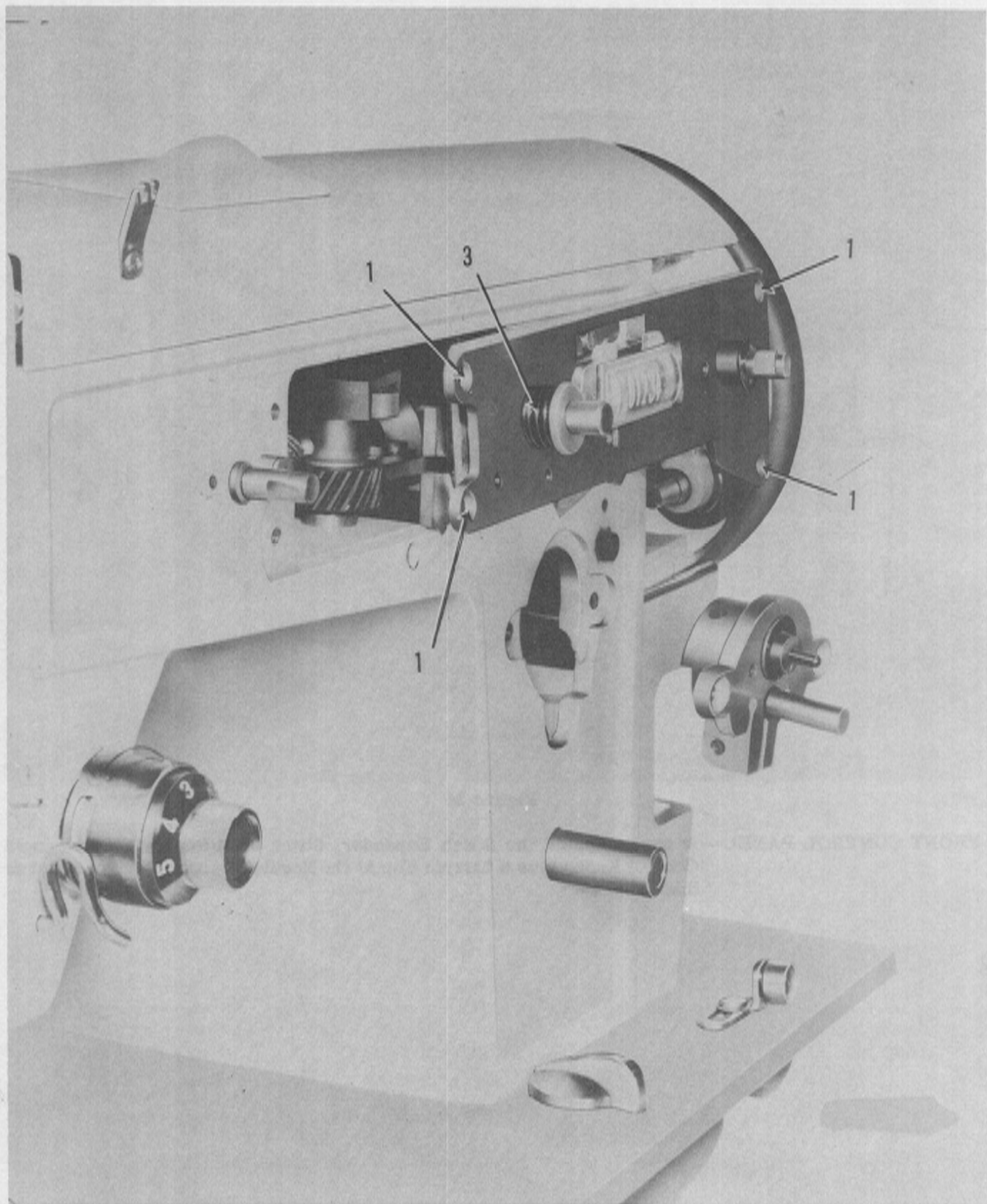


Figure 25

Zigzag Base Plate Removal is simple - 4 screws at -1- Note spring -3- on Stitch Width Control Shaft and Stitch Length Control Base Assembly just below handwheel.

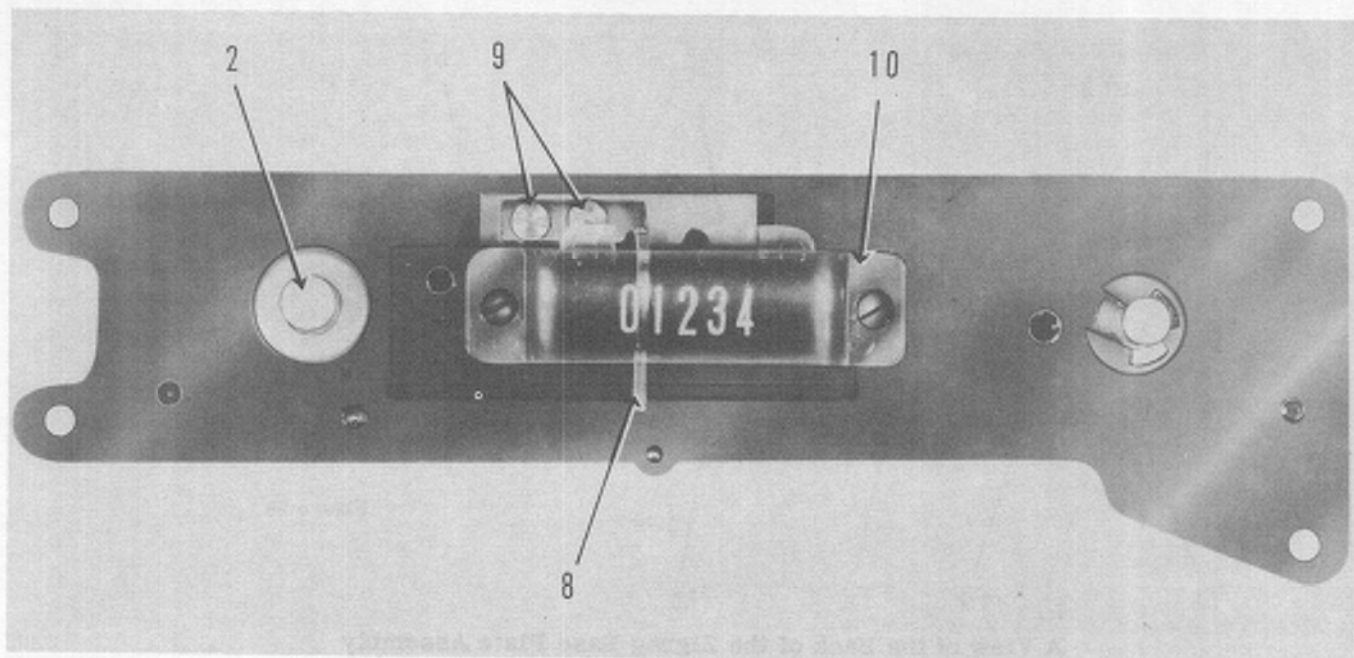


Figure 26

A Front View of the Zigzag Base Plate Assembly

-2- is Width Control Shaft (with compression spring removed), -8- is Width Indicator, -9- Indicator adjustment and -10- Numbered Plastic Window

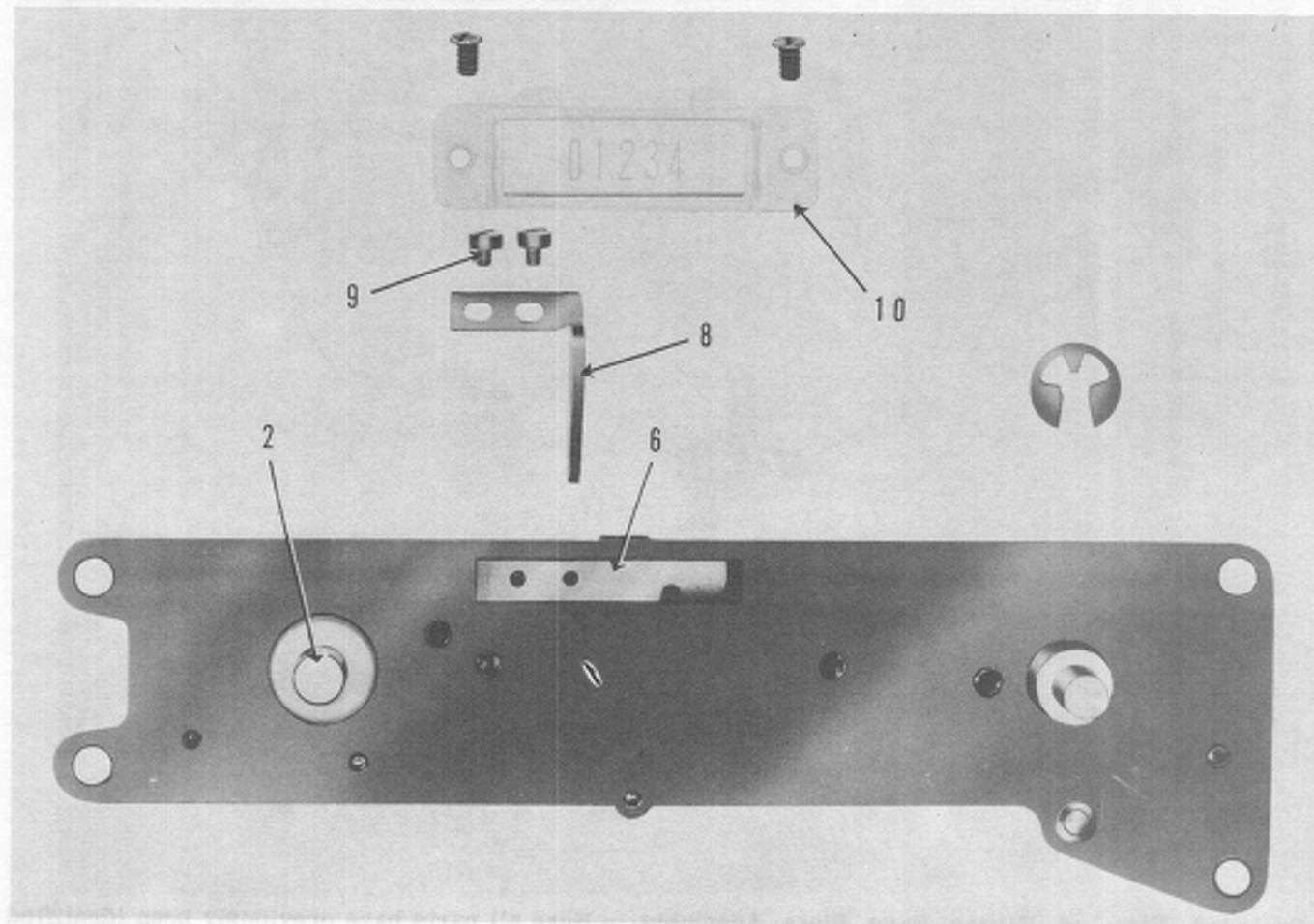


Figure 27

Same as Figure 24 With the Various Components Detached

-6- is the Front of the Racked Bar with is located by the Width Control

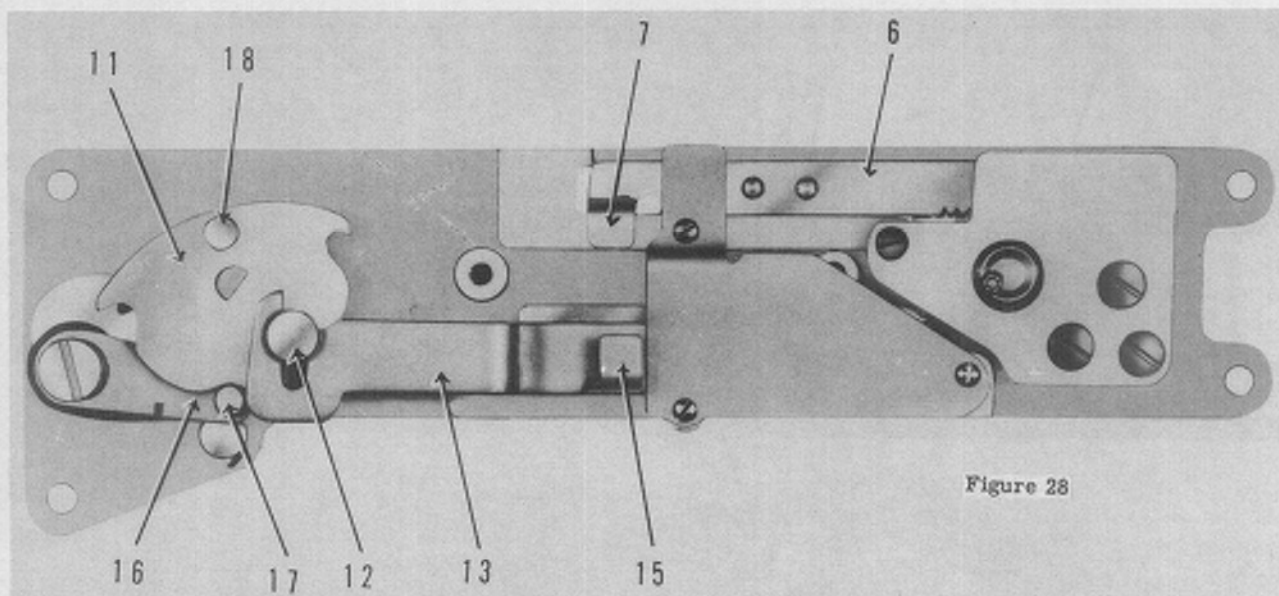


Figure 28

A View of the Back of the Zigzag Base Plate Assembly

-6- Raked Width Locating Bar and Its Operating End -7-, Notched Cam -11- and Pin -12- Operate Position Control Slider -13-, A Projection -15- on Slider -13- Engages with Needle Position Lever, Spring Loaded Lever -16- at Pin -17- Engage in Notches of Cam -11- to Locate Position Control at L-C-Rand AR Positions. Pin -18- Operates Position Control Shift Lever shown later. At -AR- Pin -12- is free of Slider -13-, Spring Loaded Lever -13- locates Needle Bar in Left Position, thus Automatic Reverse stitching can occur in "Left" Position only.

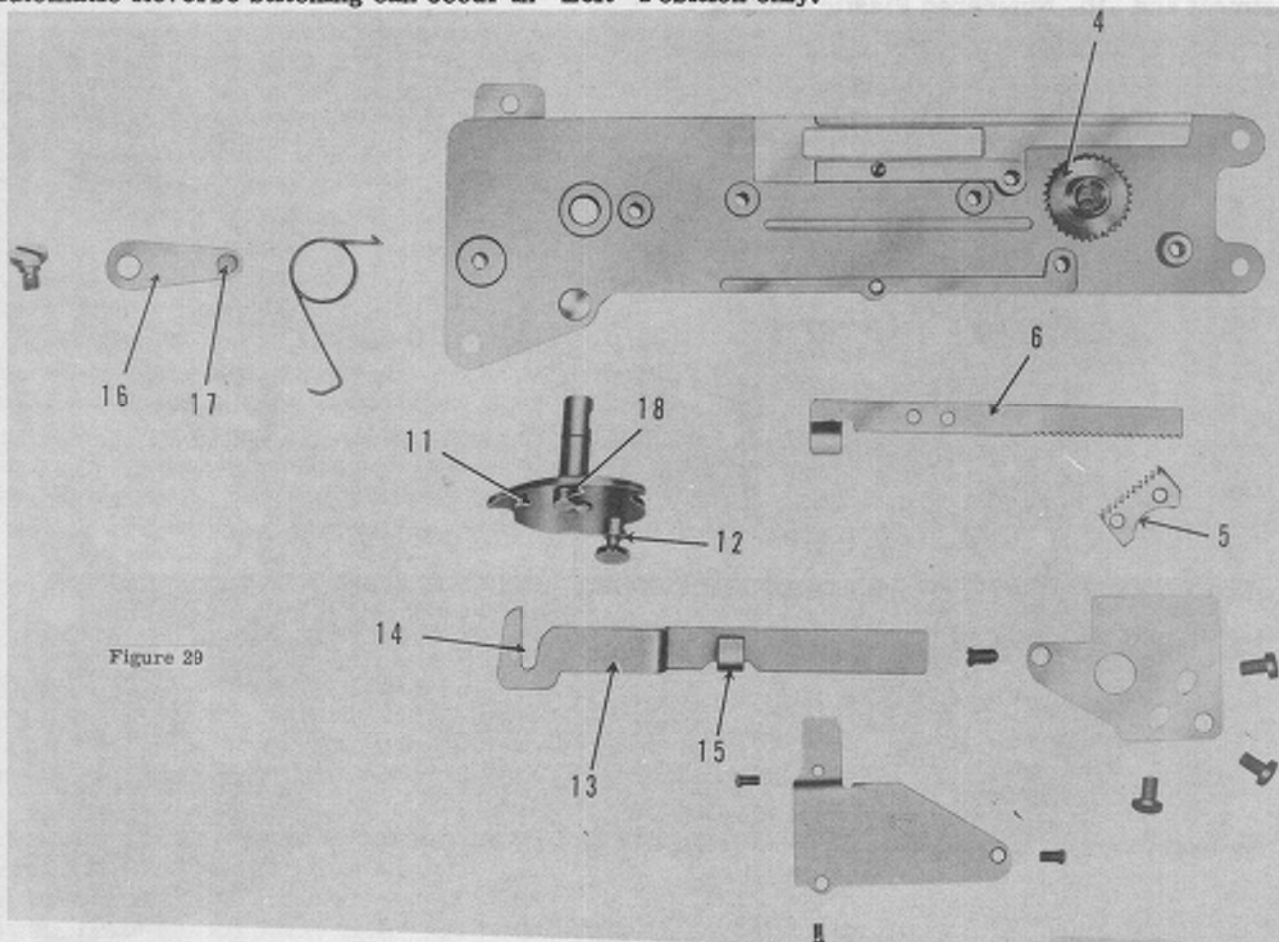


Figure 29

Exploded View of Zigzag Base Plate Assembly. Here all parts have previously been identified except -4- Spiral Gear located on back of Width Control Shaft and Normally Under Spring Tension is locked by -5-. Pushing in on Width Control disengages Pinion -4- from Lock -5- and allows Pinion -4- to be turned and relocated Width Locater Rack -6-.

THE CAM FOLLOWER MECHANISM

THE AUTOMATIC PATTERN MECHANISM

The Automatic Pattern Mechanism consists of:

1. The cam drive shaft
2. The stitch expander
3. Three cam followers and their control linkages.

On the cam drive shaft plate the three cam followers are mounted so that they pivot about a common axle. The top cam follower is connected to the material feed and controls the direction in which the material moves under the needle. The middle cam follower controls the width of the needle swing, and the bottom cam follower varies the needle position.

The pattern disc slips over the cam drive shaft. Power to turn the cam drive shaft (which in turn rotates the pattern disc) comes from the main shaft by means of a worm gear through a two step speed changer called the stitch expander. In position 1 the cam drive shaft (and hence the pattern disc) makes a complete revolution for every 32 revolutions of the main shaft. In position 2, the cam drive shaft makes a complete revolution for every 65 revolutions of the main shaft.

Each of the three cam followers track on a separate cam surface of the pattern discs on cams 21-30. In cams 1-20 the material feed action does not vary, so only two cam surfaces are provided and the top cam follower is inactive.

If it is necessary to readjust the stitch width, stitch length, or needle position lever you will be wise to also check and possibly readjust its corresponding cam follower.

Should it be necessary to remove the cam drive shaft plate, each follower should be checked and adjusted as necessary when the plate is replaced.

TO CHECK STITCH WIDTH BIGHT FOLLOWER ADJUSTMENT

1. Insert stitch width cam No. 1. Set stitch width at "0". Since this cam has only two cammed surfaces the stitch width (or middle) cam follower will ride on the top cammed surface.

2. Using this cam, the width of the pattern at the highest point on the cam should be at least .140". At the lowest point on the cam you should have a straight stitch. If the cam follower does not produce this pattern, it should be adjusted.
3. Turn handwheel until the roller on the point of the middle cam follower comes to the lowest point on the cammed surface. Check clearance. Clearance should be .008" (Figure 32 No. 3). If the clearance is more than .008" the pattern will be too narrow. If the clearance is less than .008" a zigzag stitch will tend to be made where a straight stitch should have been in the pattern.
4. To adjust the clearance at this point loosen the two set screws on the base of the follower (Figure 32 No. 2) and adjust as necessary.
5. After this adjustment has been made, turn the handwheel until the roller on the middle cam rides on the high point of the No. 1 cam. Next turn the stitch width knob to 4. With the machine on this setting the clearance between the follower Roller (Figure 32 No. 4) and the high point on the cam track should be between .008" and .020" (Figure 33). If clearance differs from this, a second adjustment can be made to this cam -- loosen set screw (Figure 32 No. 5) and turn the eccentric pin as necessary to bring the follower point within the tolerances specified above. The wider tolerance is allowed at the high point of the cam to provide for easier insertion and removal of the cams.

TO CHECK NEEDLE POSITION FOLLOWER ADJUSTMENT

As mentioned earlier the bottom cam follower controls needle position. Improper follower adjustment will result in pattern distortion on certain patterns. Here is the checking procedure.

1. Insert No. 9 disc and set needle position on "L". Turn the handwheel until the lowest point on the bottom cam track comes just under the roller of the bottom cam follower. The clearance between the roller and the low point on the cam surface should be .008". To adjust clearance loosen set

screw (Figure 32 No. 7) and adjust the forked rocker plate (Figure 32 No. 8) until proper clearance is obtained. Tighten set screw.

2. To recheck this adjustment set needle position to "R" and turn handwheel until the highest point on the cammed surface comes under the roller on the bottom cam follower. Clearance should be .008" to .020".

TO ADJUST MATERIAL FEED CAM FOLLOWER

The top cam follower controls material feed. To check this adjustment use pattern cam No. 26. Set the machine as follows:

Needle position control	AR
Stitch width control	0
Stitch expander	1
Stitch length control	3 or 4

The forward motion of the material is controlled by the stitch length setting. The adjustment to this follower pertains to that portion of the pattern in which the machine operates in reverse. Thread the machine and actually sew with the machine set as indicated above.

The reverse portion of the pattern should be adjusted until the machine sews a reverse loop the same as is shown on the pattern disc. You will note that the high portion of the cam surface causes the machine to reverse. To adjust the cam follower loosen the two set screws at either end of turnbuckle on the reverse cam follower linkage (Figure 35 No. 1). To increase the length of the reverse loop turn turnbuckle toward you. To decrease length of the reverse loop turn turnbuckle away from you. When the reverse linkage is properly adjusted, tighten the set screws at either end of the turnbuckle.

AUTOMATIC POSITIONING OF CAM FOLLOWERS TO RECEIVE CAMS

On the Model 88 it was necessary to set the needle Position to "R" and the stitch width to "4" to insert the cams. On the Model 90 each cam follower is automatically positioned to receive a cam when the cam cover is opened. A mechanical linkage with the door positions the cam followers. This is shown in Figure No. 42. If the cam followers do not swing back far enough to receive the cam when the door is opened, the linkage may be adjusted by loosening two set screws (Figure 42 No. 7) and adjusting the length of the bar.

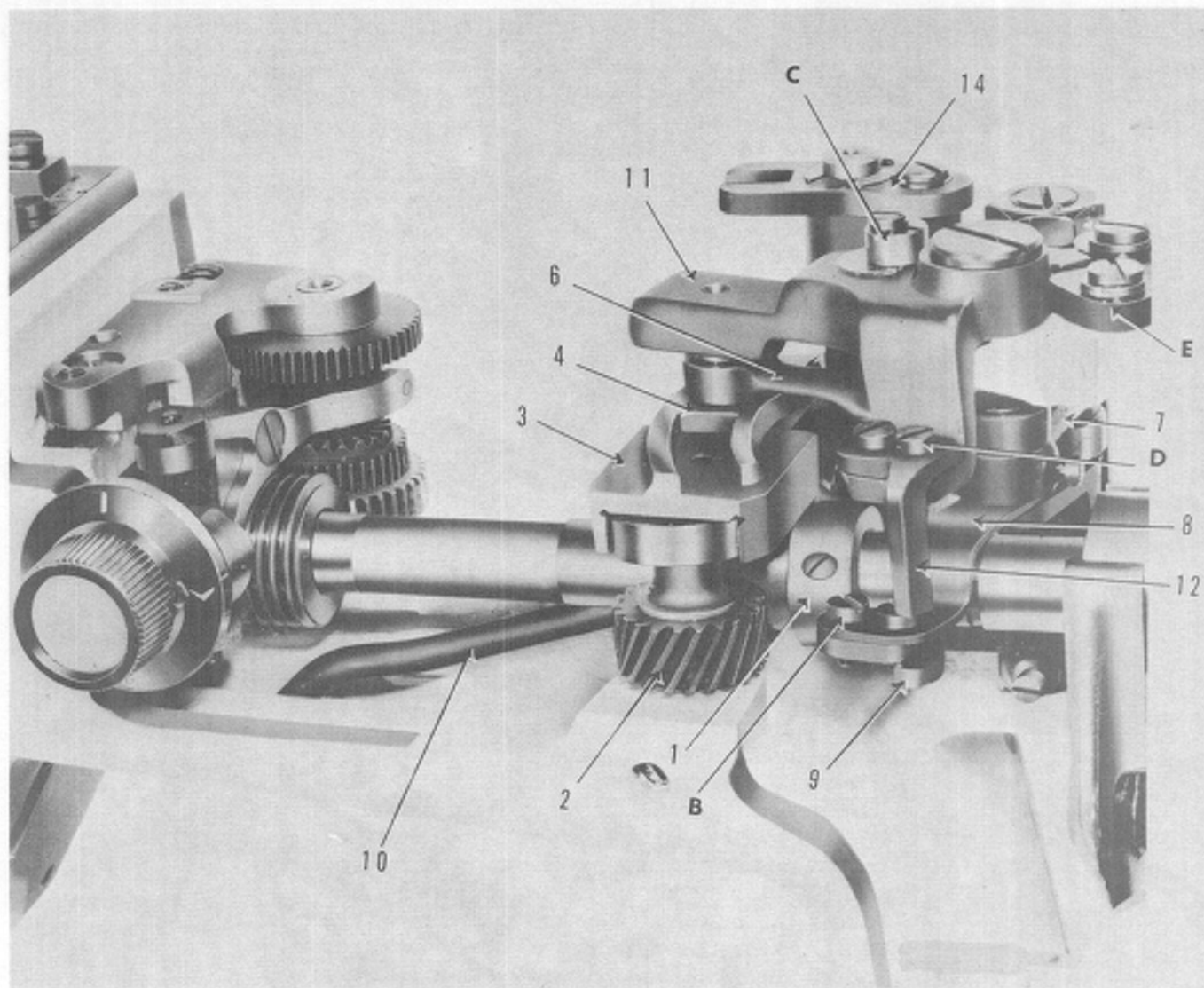


Figure 30

This is a cut-a-way view of the stitch width mechanics -1- is the collar end of the main shaft spiral or worm gear, -2- the gear driven cam, -3- the cam driven zigzag cam guide and -4- the fan shaped slider attached to the connecting rod -6-, -7- is the vertical rocker arm link to the connecting rod. -8- is the Position Control Spring lever or base, -10- the guide bar connecting the vertical rocker shaft to the needle swing bar, -11- is the zigzag rocker arm and -E- the stitch width stop which is the adjustment point for centering the zigzag rocker and roller assembly over the cam guide pivot point. -12- is the stitch width or zigzag lever and "D" the adjustment point for changing stitch width or bight (maximum bight a shade under $5/32$ "). -14- is the needle position rocker arm and -9- the position control adjustment "B" lever used in properly locating needle positions L-C-R and AR.

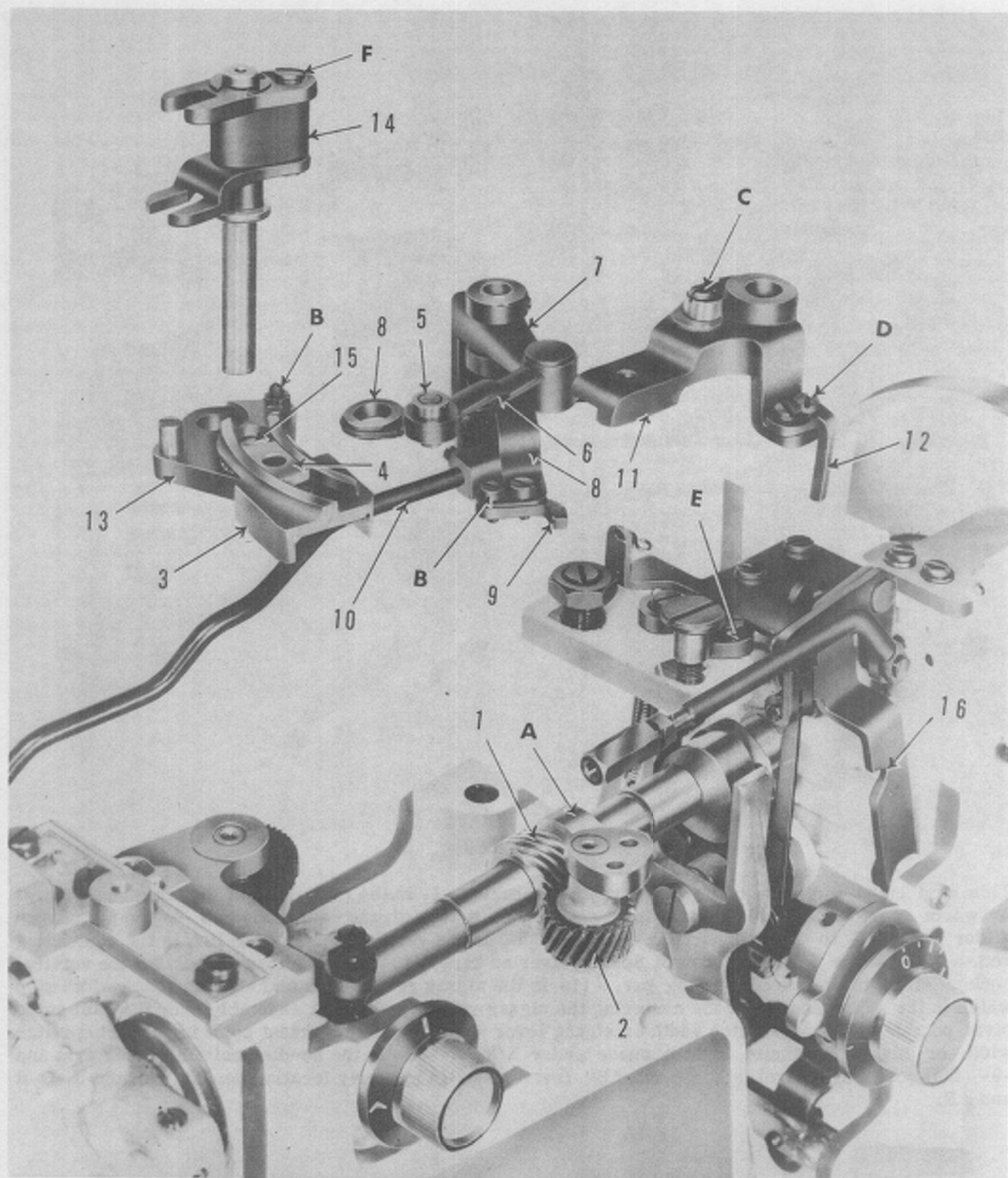


Figure 31

This is an exploded view of the stitch width or zigzag mechanics and the parts called out are the same as those in Figure 30. In addition the eccentric adjustment "B" on the cam guide base -13- is used if at the L and R needle positions (with the width control set on "0"), straight stitching appears ragged looking. A slight adjustment only should be necessary (see page 26.) The roller -5- rides in the channel in the under side of the zigzag rocker -11-. The adjustment -F- is used to change the relation between the forks in the block -14- and to realign the position of the cam guide base 13 in relation to the cam follower. "C" is an eccentric attached to the zigzag rocker used in adjusting its relation to the cam follower.

THE STITCH EXPANDER MECHANISM

The stitch expander mechanism consists of a group of gears which are driven by a worm gear on the main shaft. The stitch expander reduces the speed of the main shaft and transmits the power to the cam drive shaft, which in turn drives the pattern discs. An inspection plate located under the lamp housing provides access to this mechanism for cleaning and inspection. To further service this mechanism (for example, to remove play in the cam drive shaft) it will be necessary to remove the cam drive shaft plate.

To remove the cam drive shaft plate, remove the spring clip (Figure 36 No. 1) on the tail end of the needle position cam follower, unhook the pull spring (Figure 36 No. 2) from the stitch width cam follower, and disconnect the material feed cam follower at the turnbuckle (Figure 35 No. 1). Now the cam drive shaft plate can be removed by loosening three set screws which attach the plate to the arm of the machine.

The stitch expander operates as follows:

1. The worm (Figure 37 No. 8) drives the worm gear (Figure 37 No. 9) which in turn rotates the expander shaft (Figure 37 No. 12) and the sliding gear (clutch) (Figure 36 No. 13). The large expander gear (Figure 37 No. 10) and the small expander gear (Figure 37 No. 11) are free on the shaft, but each gear has a set of teeth on its side which can mesh with the teeth of the sliding gear. The sliding gear slips up and down the shaft in response to a mechanical linkage with the stitch expander control knob.
2. The cam drive shaft has two gear surfaces attached to the lower end of the shaft (Figure 36 No. 19). The smaller gear surface on the cam drive shaft meshes with the large expander gear (Figure 36 No. 10) and the large gear surface meshes with the small expander gear (Figure 36 No. 9).
3. Thus, it can be seen that when the slide gear is in the up position power flows from the worm (Figure 37 No. 8) to the worm gear (Figure 37 No. 9) to the shaft (Figure 37 No. 12) to the sliding gear (Figure 36 No. 13) to the large expander gear (Figure 36 No. 10) to the small gear surface on the cam drive shaft, and hence to the cam drive shaft itself. The large cam drive shaft gear is free to rotate at the same speed

because the small stitch expander gear (Figure 36 No. 11) is now disengaged and turns freely. With the slide gear in the down position the power flows from the slide gear (Figure 36 No. 13) to the small expander gear (Figure 36 No. 11) to the large gear surface on the cam drive shaft. The small gear surface on the cam drive surface to the cam drive shaft. The small gear surface on the cam drive shaft rotates at the same speed as the large gear surface and the large stitch expander gear (Figure 36 No. 10) is disengaged and turns freely on its shaft.

4. When power flows from the small expander gear to the large cam drive shaft gear surface one turn of the cam drive shaft is made for every 32 revolutions of the main shaft. When the power flows from the large expander gear to the small cam drive shaft gear surface, one turn of the cam drive shaft is made for every 65 revolutions of the main shaft.

TIMING CAM FOLLOWER ACTION (Needle Swings From Side to Side While Still in the Material When Using Cam No. 20)

This condition may occur when using the cam with the needle in either the "L" or "R" position. This indicates improper timing between the cam drive shaft and the needle bar. The condition may be caused by either (1) excessive play between the worm and the worm drive gear on the stitch expander (Figure 37 No. 8 and No. 9) or (2) the worm gear may have slipped on the main shaft.

If excessive play has developed remove cam drive shaft plate as described on Page 20. Loosen the set screws on each of the stitch expander shaft bearing brackets (Figure 36 No. 4 and No. 5) and reposition the worm gear so that it meshes more closely with the worm (Figure 37 No. 8 and No. 9). After replacing the cam drive plate it will be necessary to recheck each cam follower for proper positioning (See Pages 31-35).

Figure 39 No. 1 illustrates a normal blind stitch pattern with the needle in the right position.

Figure 39 No. 2 shows the way the stitch will look if the cam drive shaft is improperly timed.

Figure 39 No. 3 shows the arc that the needle will describe if it begins its side to side motion too early (needle position right) with the needle in the up stroke.

Figure 39 No. 4 shows the arc that the needle will describe when it begins its side to side motion too late.

To adjust the needle swing arc, it is necessary to rotate the worm (Figure 37 No. 8 on the main shaft).

1. Remove the cam drive shaft plate as described on Page 20.
2. Mark the position of the worm on the main shaft. It is important to keep the worm from sliding along the shaft.
3. Loosen the three set screws on the worm sleeve.
4. If needle begins its side to side motion too early (Figure 39 No. 3) hold the worm in position and turn the handwheel 30 degrees to 50 degrees away from operator. Replace cam drive shaft. Reset cam followers (See Pages 17-20) and check needle swing with No. 20 cam. Sew with cam on both R and L settings to check performance.
5. If needle begins its side to side motion too late (Figure 39 No. 4) loosen the three set screws on the worm sleeve, hold worm in position, and turn the handwheel 30 degrees to 50 degrees toward operator. Replace the cam drive shaft, reset cam followers (See Pages 17-20) and check the needle swing using the No. 20 cam. Sew with cam on both "R" and "L" settings to check performance.

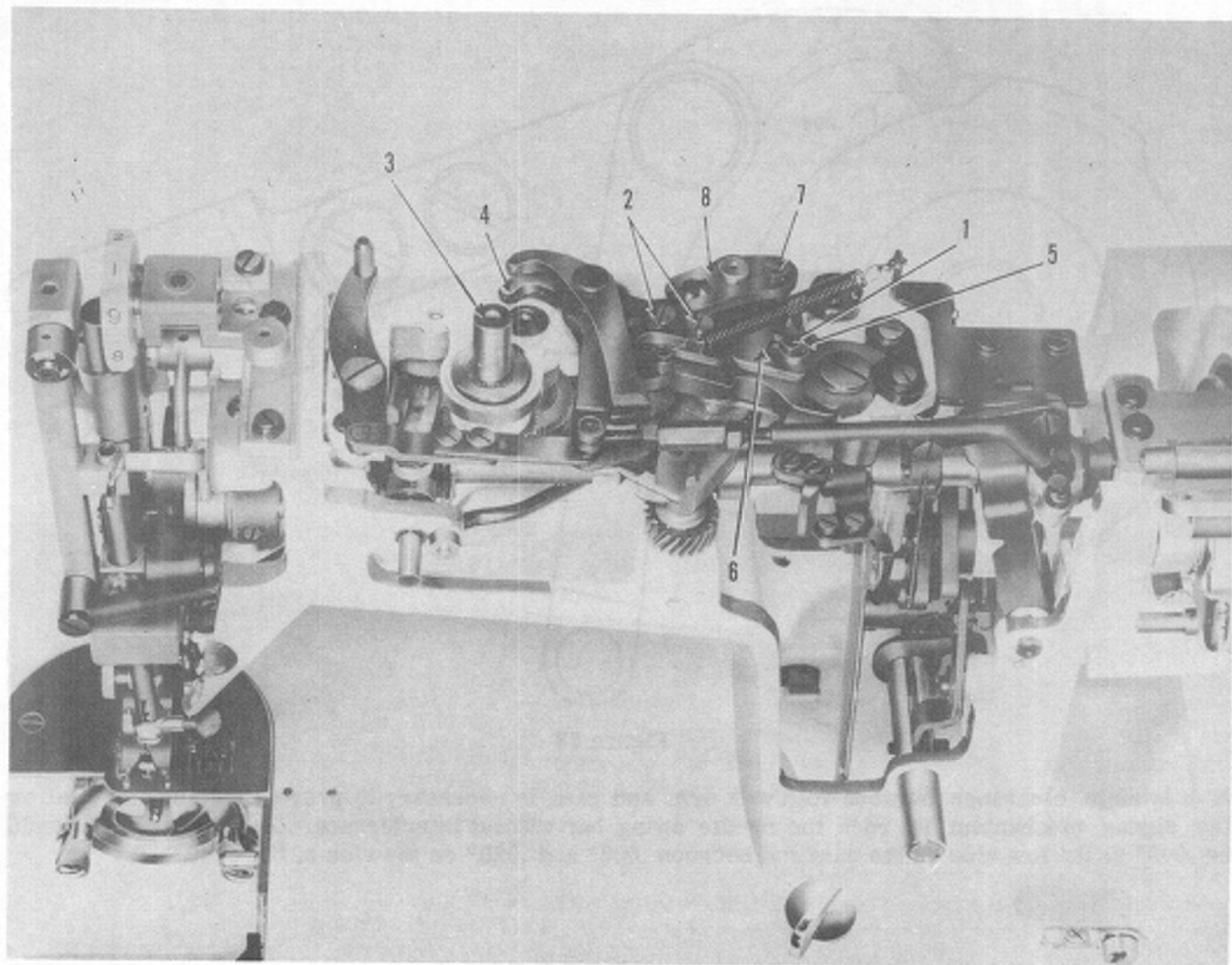


Figure 32

-3- is the cam drive shaft. -4- is the zigzag rocker follower which governs stitch width as controlled by cam, the adjustment at -2- is used for adjusting follower action at low point on cam No. 1 and eccentric -5- held by set screw -1- is used to adjust zigzag rocker engagement to follower fork -6- with follower at high point on cam No. 1. -7- is the adjustment set screw for the position control follower forked connection -8-. (See text).

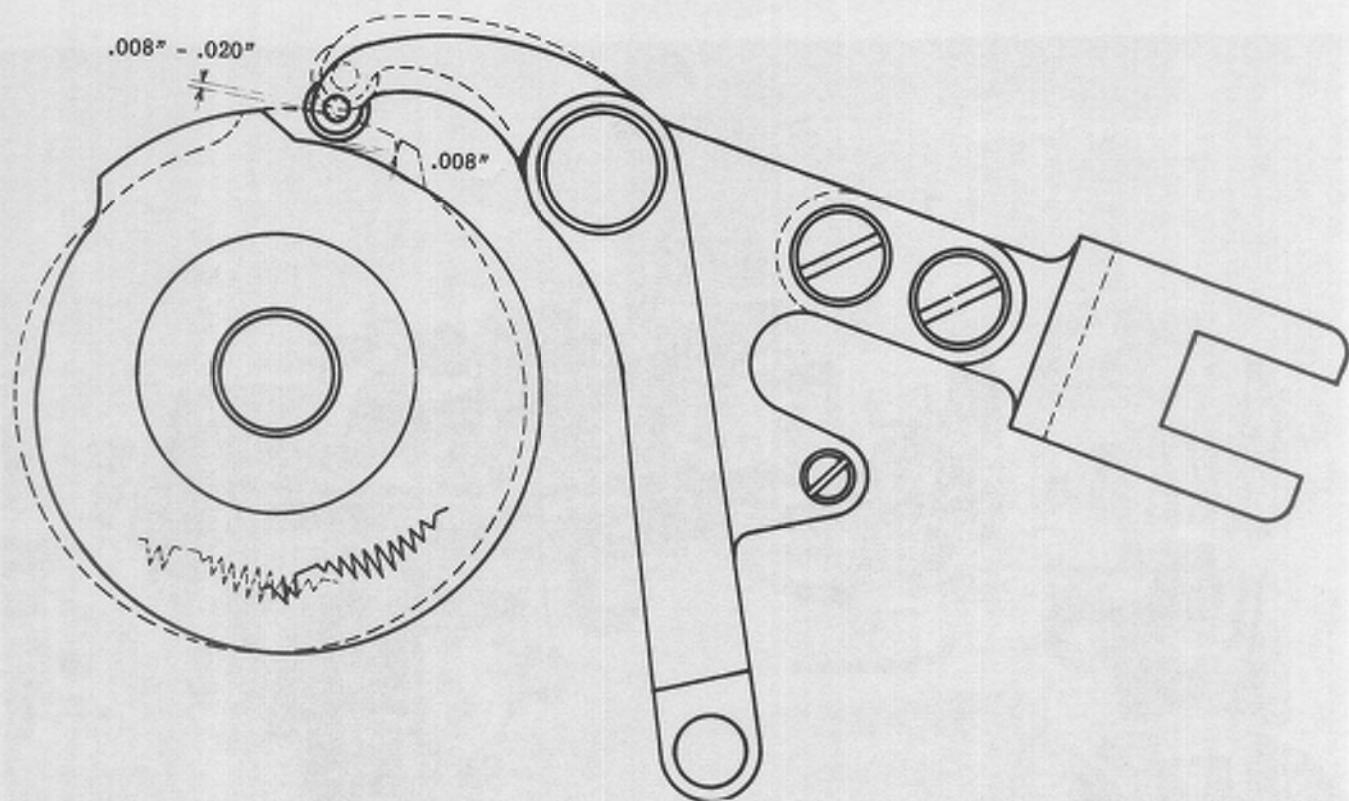


Figure 33

A minimum clearance between follower arm and cam is necessary to prevent binding and to allow the zigzag mechanism to rock the needle swing bar without interference. (See text). This should be .008" at the low side on the cam and between .008" and .020" on the rise of the cam.

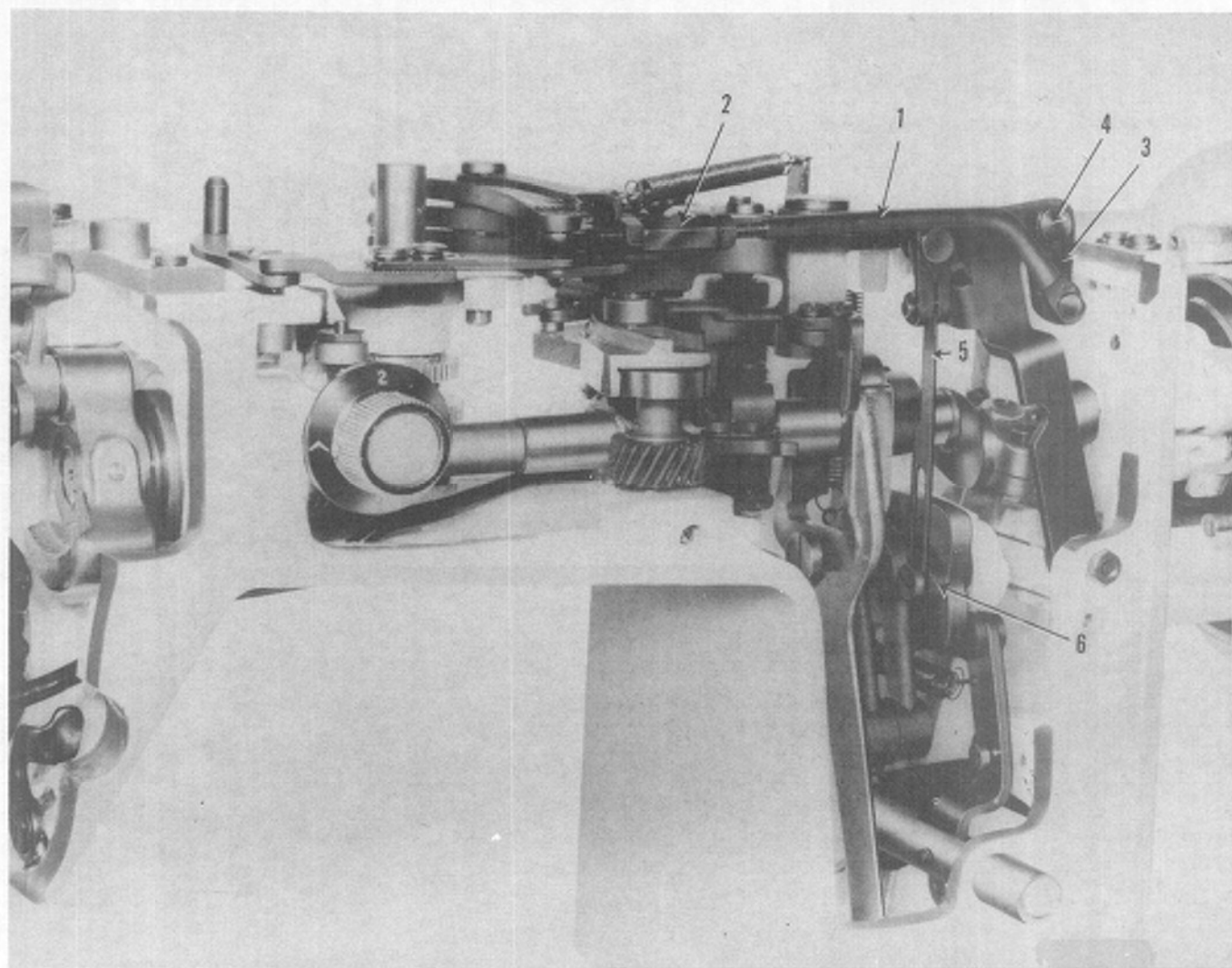


Figure 34

The top cam follower in conjunction with ten of the provided cams operates to change feed direction. This action is adjusted at the turnbuckle -2- which changes the effective length of the arm -1-. This engages the lever -3- which pivots at -4- to control the location of the stitch length control cam -6- thru the link -5-.

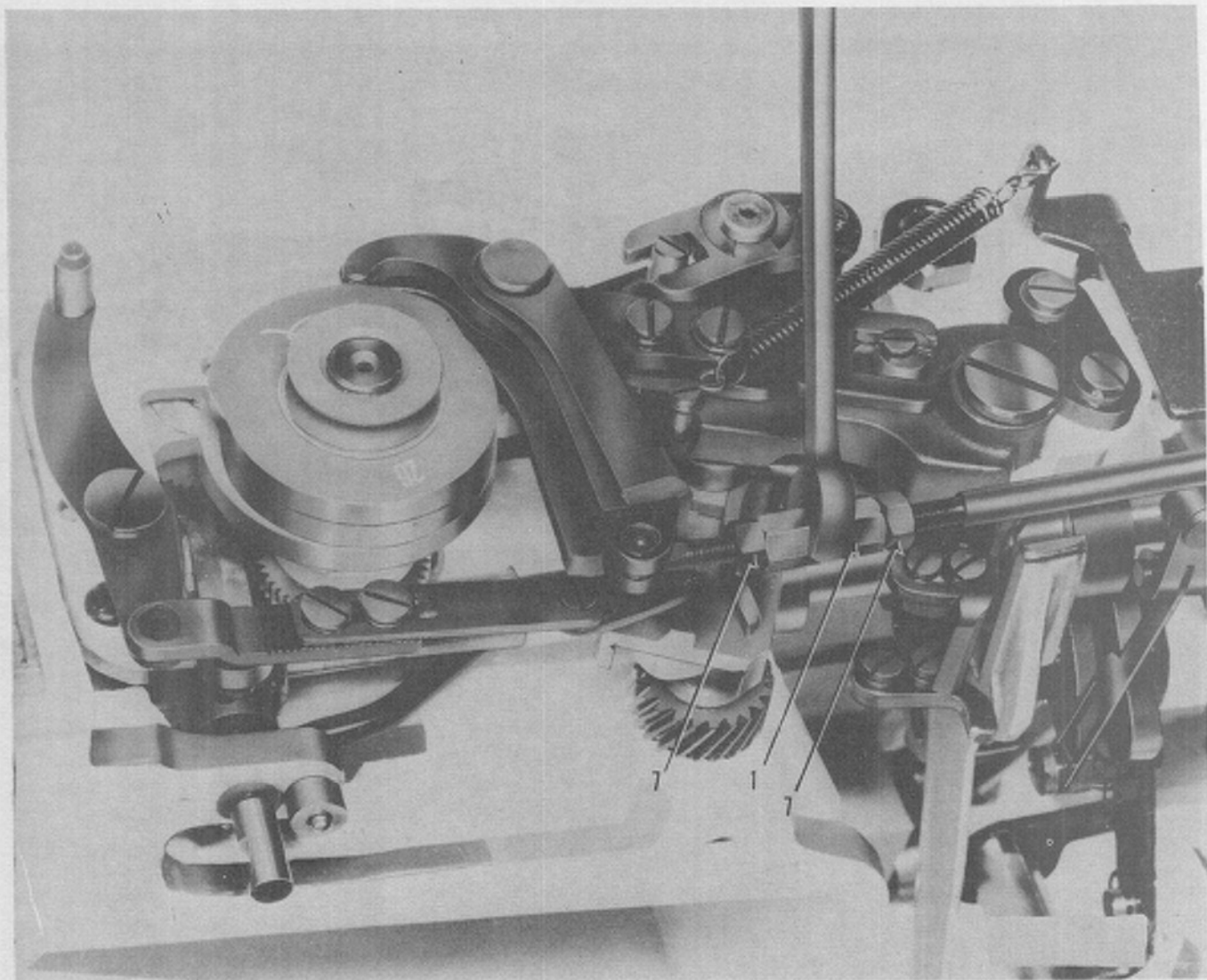


Figure 35

This figure simply illustrates the turnbuckle adjustment -1- and the two check nuts -7- to secure it. To check reverse stitch action in pattern use cam No. 26 set Position Control at -AR-, Width Control at -0-, Stitch Expander at -1- and Stitch Length Regulator at -3/4-. Compare pattern formed with pattern on disc, turn adjustment -1- towards you to increase length of reverse stitch and away from you to decrease reverse stitch formed in pattern.

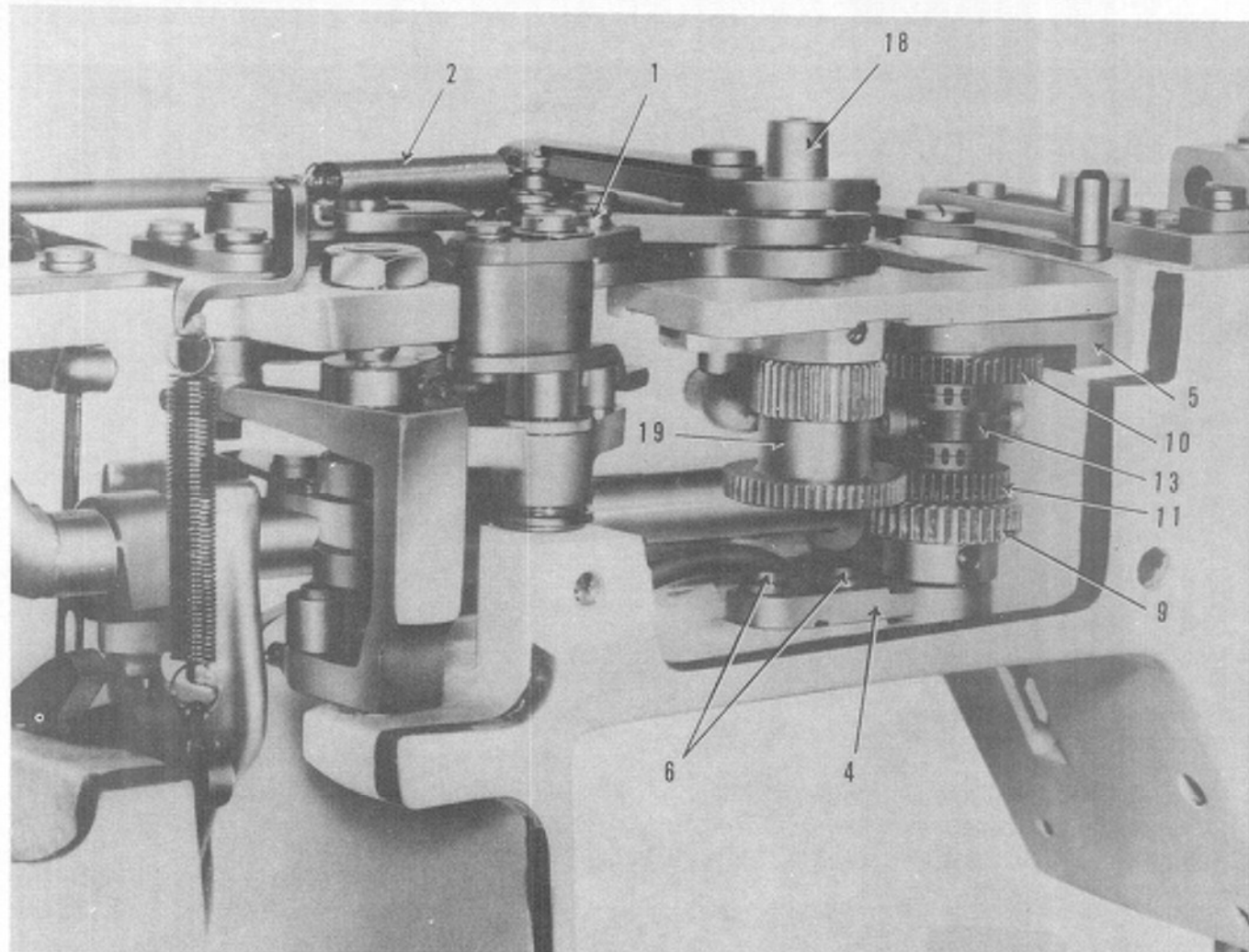


Figure 36

This illustrates the stitch expander gear and clutch arrangement located under the cam drive plate. Remove screw -1- on the end of the position control cam follower and disconnect spring -2- from the zigzag cam follower and the left hand threaded short rod from the turnbuckle connection. After this remove three screws in the cam drive plate and the plate assembly may be lifted off the casting. The speed change gears and clutch shaft is mounted in bearings supported by bracket arms -4- and -5-. Screws -6- on bracket -4- and -7- (in Figure 37) on bracket -5- allow adjustment of the main shaft worm -8- (in Figure 37) mesh with worm gear -9-. The small gear -11- and the large gear -10- are located on a shaft in common with clutch -13-. Dogs on each gear and the clutch allow the splined clutch to engage the selected gear to change cam drive speed.

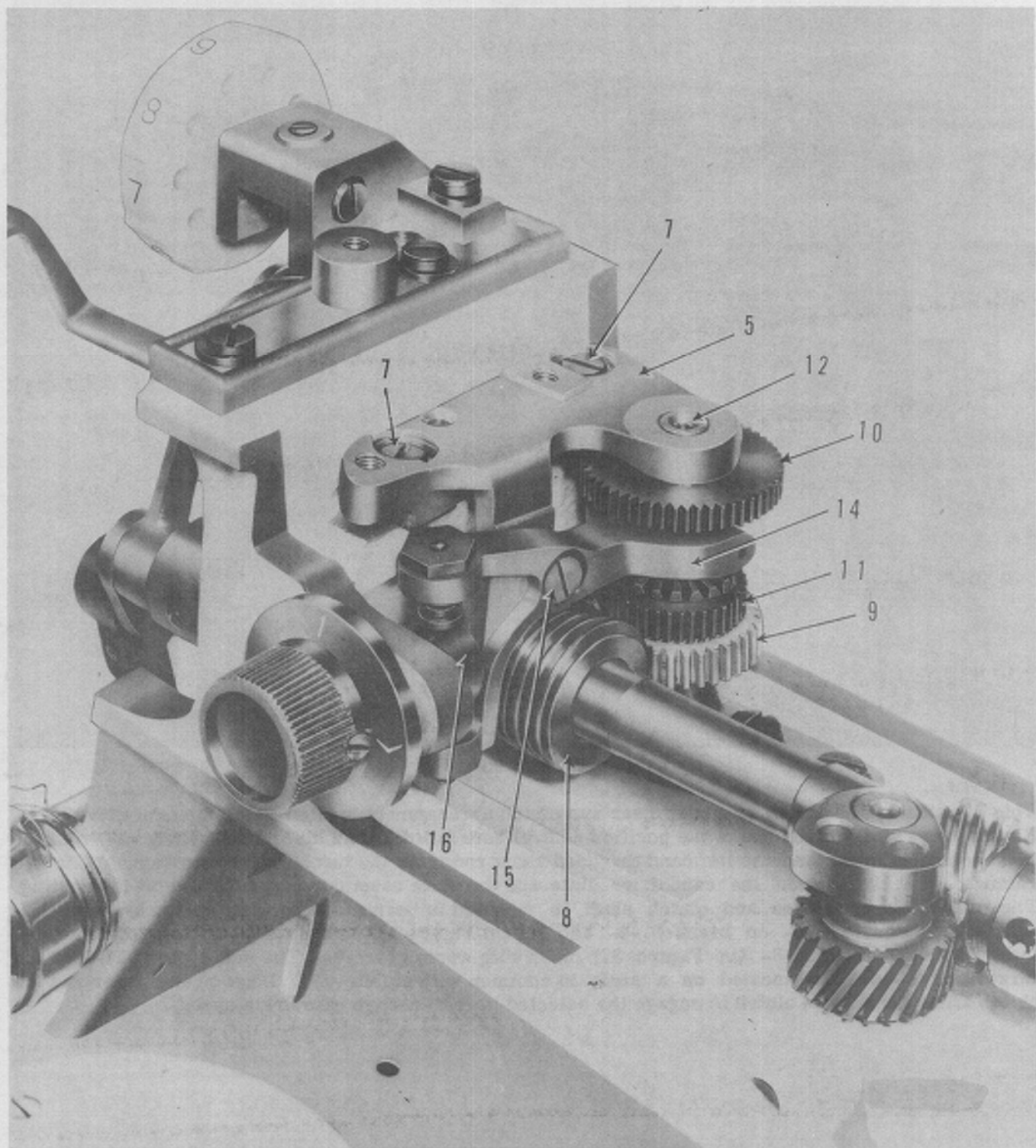
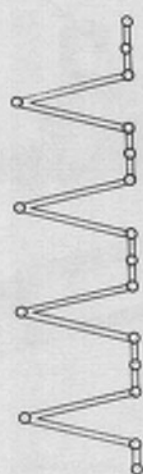
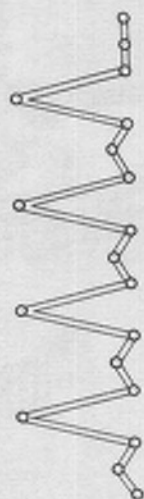


Figure 37

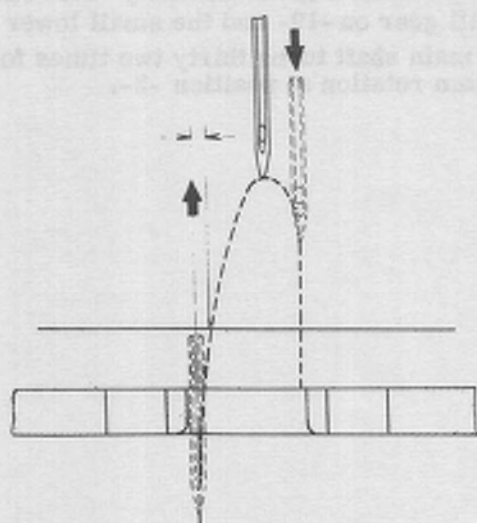
At Stitch Expander Position -1- the eccentric -16- locates the clutch control arm -14- pivoting at -15- to engage the clutch with the large gear -10-. At position -2- the clutch is engaged with the small gear -11- simultaneously releasing gear -10-. The speed changer shaft splined at the clutch is seen at -12-, the support bracket at -5- and adjustment screws at -7-. The cam drive worm -8- is located on the main shaft.



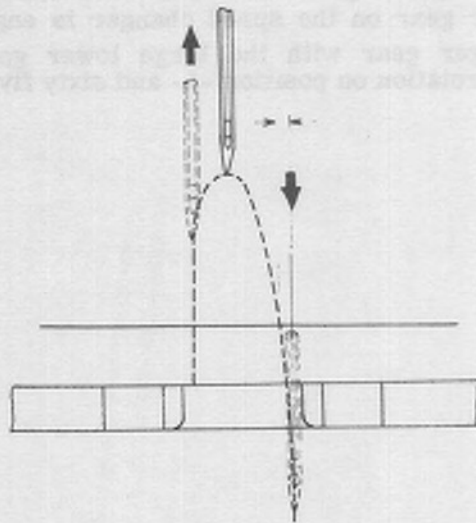
(1)



(2)



(3)



(4)

Figure 39

Proper synchronization of the cam drive with the zigzag mechanism is most important. Using blind stitch cam No. 20 and with Position Control at -R- a pattern as shown at -1- should be formed. If the stitching appears as at -2- needle bar motion is irregular, -3- shows that the needle side stroked in the fabric (test with bond paper) during its rise and -4- where needle side stroked while penetrating the fabric (or paper). (See text).

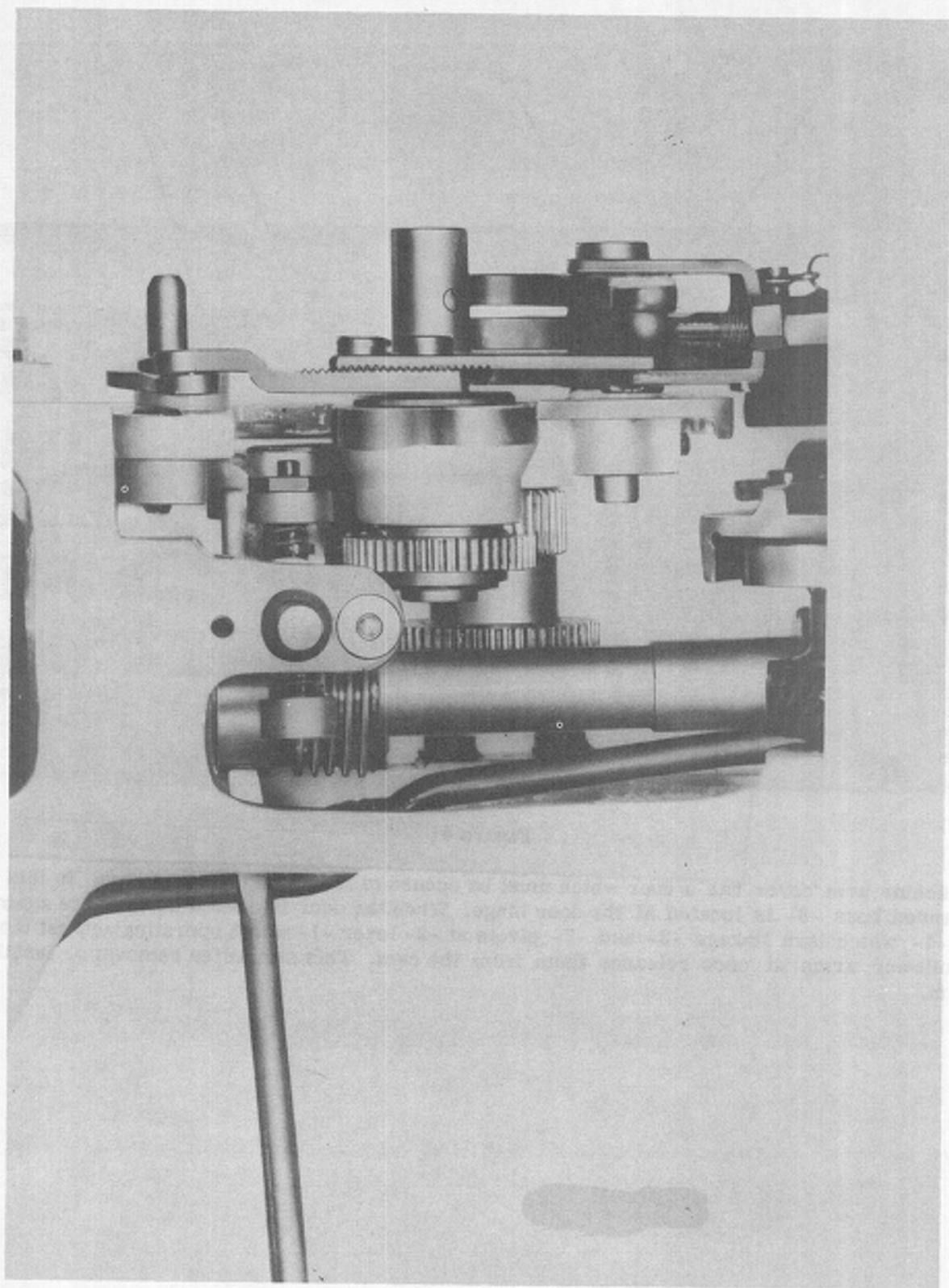


Figure 40

Relation between main shaft worm and speed changer drive gear controls synchronizing as shown in Figure 39. Using screw driver thru slot in bottom of arm casting loosen 3 set screws in worm. To correct condition shown in Figure 39 -3-, turn hand wheel 30 degrees to 50 degrees away from operator while holding worm, for condition as at Figure 39 -4-, turn handwheel 30 degrees to 50 degrees toward operator while holding worm. Retighten one set screw only until proper relation is found then tighten all securely. Do not allow worm to move along shaft.

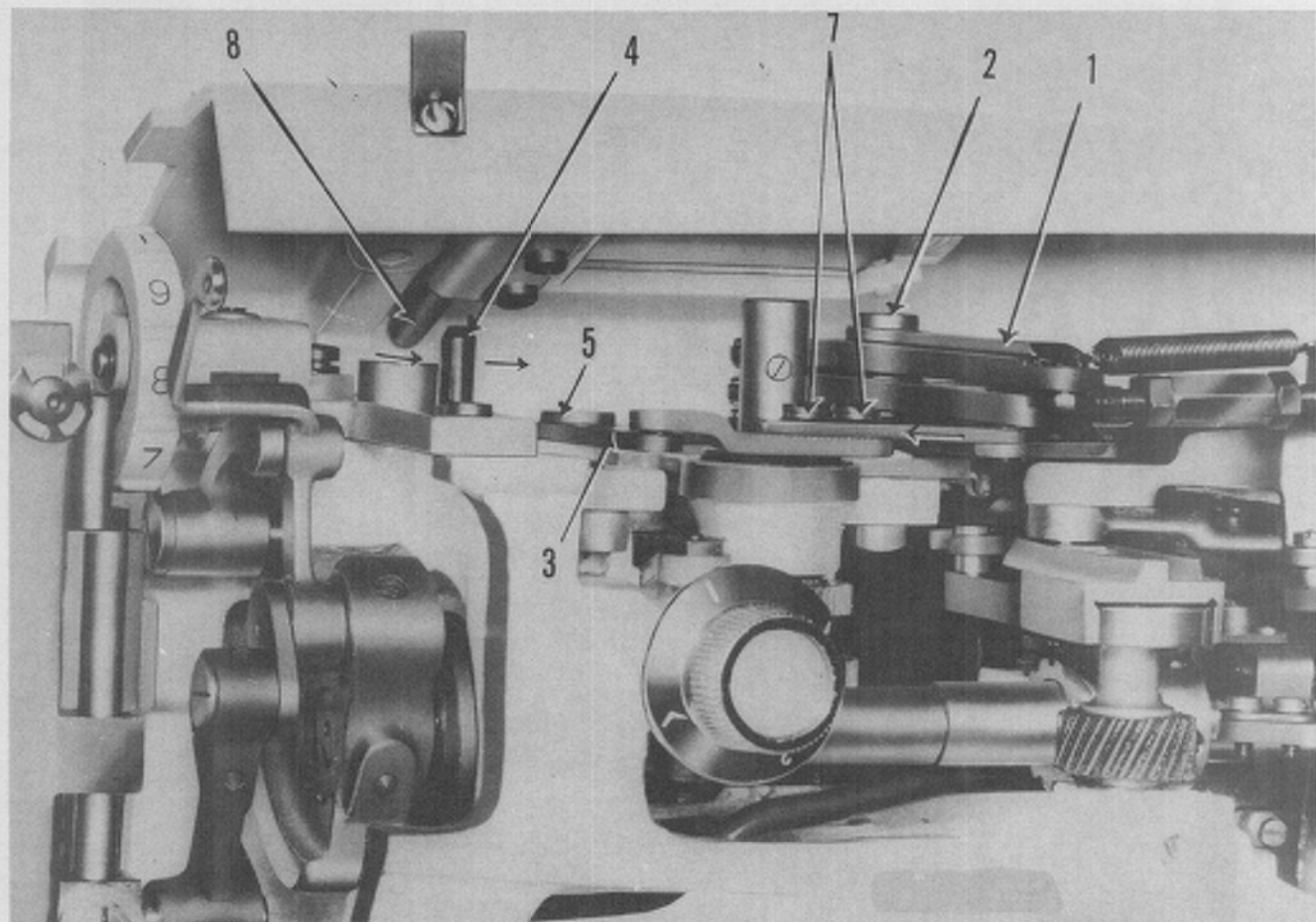


Figure 41

The Machine arm cover has a door which must be opened to insert or remove a cam. In this model an extended boss -8- is located at the door hinge. When the door is opened this strikes against the lever -4- which thru linkage -3- and -7- pivots at -2- lever -1- which operating against the three cam follower arms at once releases them from the cam. This simplifies removal or installation of a cam.

Figure 40

Relation between main shaft worm and speed changer drive gear controls synchronization as shown in Figure 38. Under screw driver this shaft in bottom of gear casting houses 3 set screws in worm. To correct condition shown in Figure 38-3, turn hand wheel 30 degrees to 30 degrees away from operator while holding worm for condition as in Figure 38-4, turn handwheel 30 degrees to 30 degrees toward operator while holding worm. Handwheel can set worm only with proper relation as shown then tighten all screws. Do not allow worm to move along shaft.

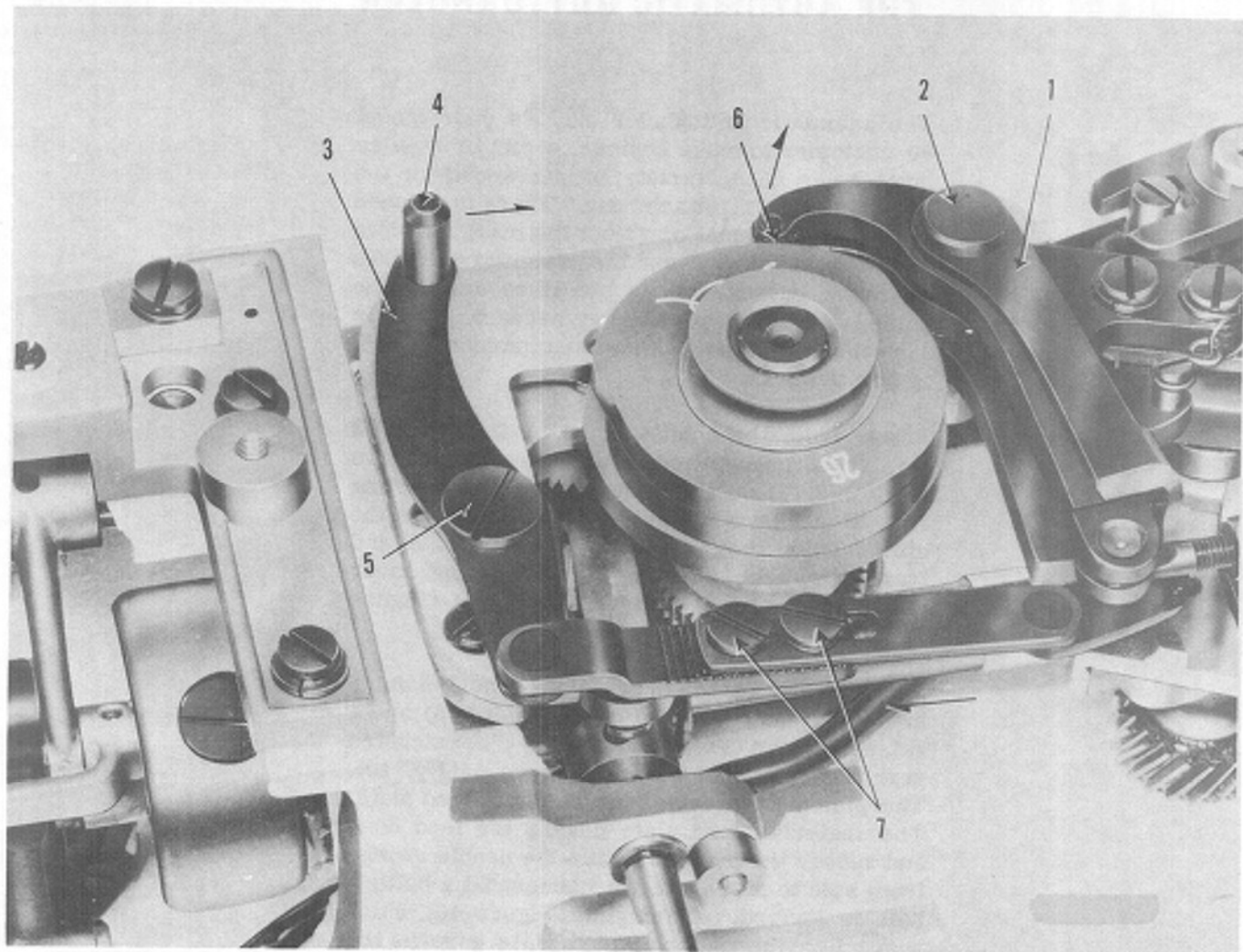


Figure 42

A top view of the linkage operated by the cam door is seen here. -4- is pushed by the boss on the cam door hinge to pivot lever -3- at -5-. The connecting linkage pivots the follower release lever -1- at -2- to release the follower arms from the cam at -6-. Adjustment for proper clearance is made at -7-. The machine arm cover position when screwed to the arm casting will also effect this adjustment.

THE AUTOMATIC BUTTONHOLER

The automatic buttonholer enables your Model 90 customer to make keyhole, eyelet or regular buttonholes in a variety of sizes without the use of a special attachment. There is no need to turn the material or adjust the machine while making a buttonhole, and the customer can make as many buttonholes as she likes exactly the same size - no measuring necessary. It is a real time saver for any seamstress - here is how it works.

Power from the shuttle drive shaft (Figure 43 No. 1) is transmitted to an eccentric (Figure 43 No. 2) from the eccentric to a connecting rod to a clevis (Figure 43 No. 4) from the clevis to a rock shaft (Figure 43 No. 5) and from the rock shaft to an oscillating lever (Figure 44 No. 6) and its knock pin (Figure 44 No. 7).

A special hand hole cover plate is provided which has a ratchet lever (Figure 44 No. 8) and a ratcheted gear (Figure 44 No. 9). The ratcheted gear drives a pinion gear (Figure 45 No. 10). The pinion gear drives the material feed plate. The material feed plate covers the feed dogs and moves the material while the needle swings from side to side in such a manner that a buttonhole is formed. A template Figure 46, which snaps into the material feed plate governs the size and shape of the buttonhole. Ten templates for various size and shapes of buttonholes are provided.

ADJUSTMENTS TO THE AUTOMATIC BUTTONHOLER

1. The automatic buttonhole cover plate must be firmly positioned at all times. The cover spring (Figure 44 No. 13) may be repositioned if the cover plate does not fit properly.
2. If the ratcheted gear becomes sticky, it may be lubricated through the opening in the ratchet housing (Figure 44 No. 9).
3. If the stroke of the oscillating lever is too short the pinion gear will rotate in an irregular manner. The eccentric on the shuttle drive shaft (Figure 43 No. 2) may be rotated to increase the stroke of the oscillating lever, however, since the entire mechanism is set and pinned at the factory this adjustment is RARELY necessary.

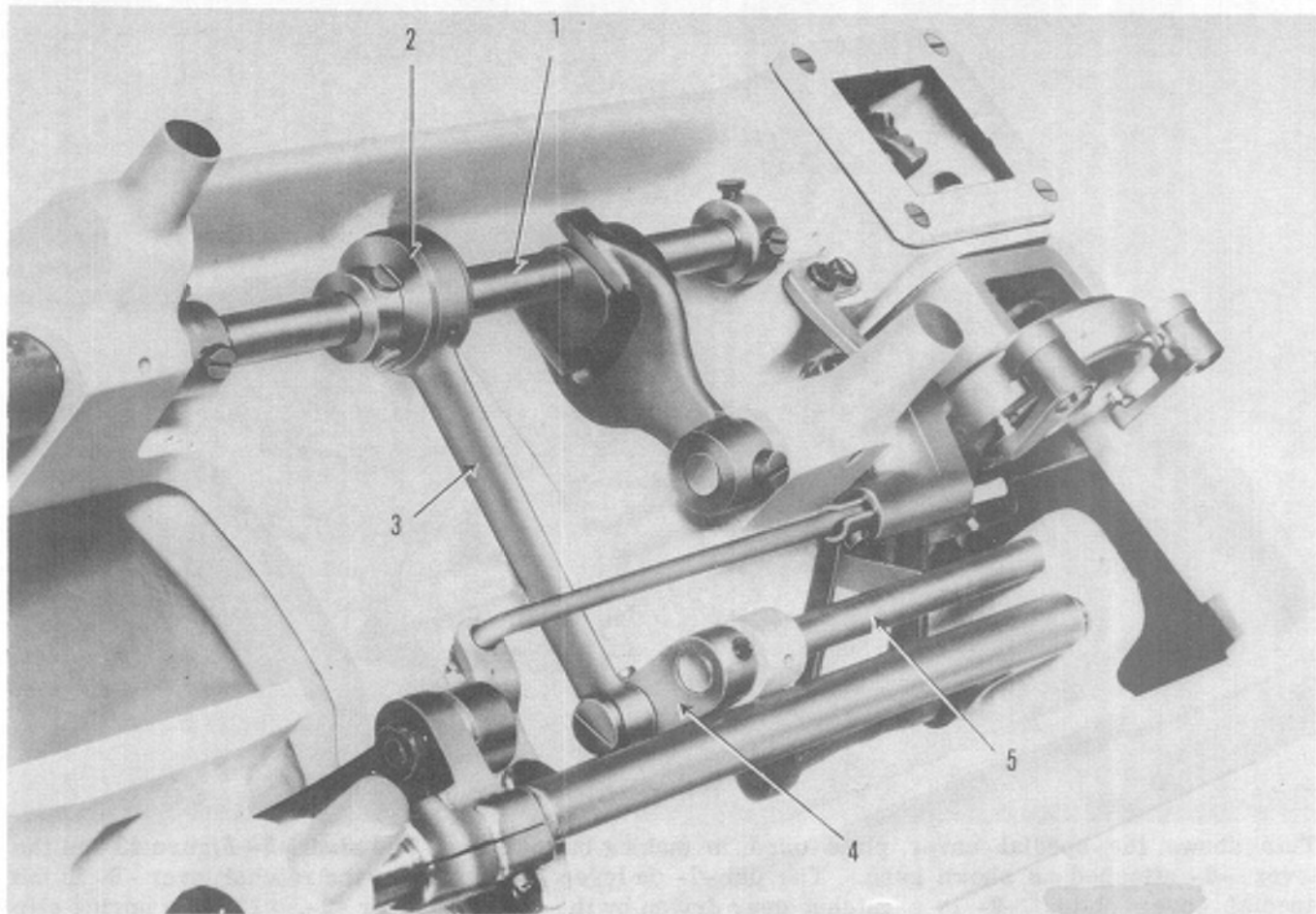


Figure 43

Figures 43, 44, 45, 46 and 47 illustrate the new buttonhole making device. In Figure 43 -1- is the shuttle drive shaft and -2- an eccentric attached to it. It can be seen that the crank -3- thru the clevis -4- rocks the shaft -5-. Properly timed the crank motion is at it closest relation to the back of the machine when the needle bar is in the bottom of its stroke. At this time the set screw in the eccentric will locate directly over the shaft. Actually this is a pinned connection so should not require adjustment.

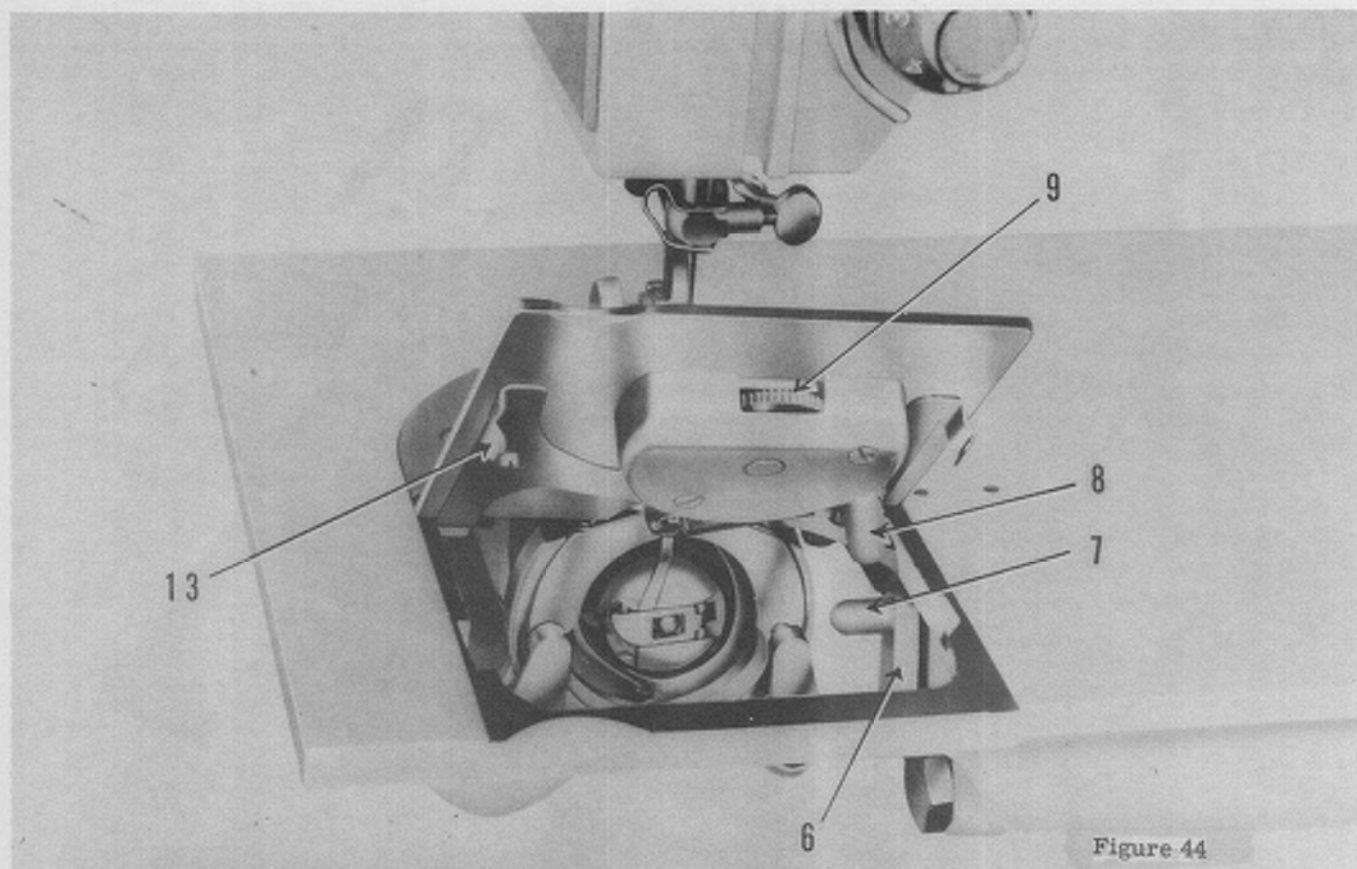


Figure 44

This shows the special cover plate used in making buttonholes. The shaft -5- Figure 43 has the lever -6- attached as shown here. The pin -7- on lever -6- motivates the ratchet lever -8- in the special cover plate. -9- is a ratchet gear driven by the action of lever -8-. -13- is a spring clip to secure the plate.

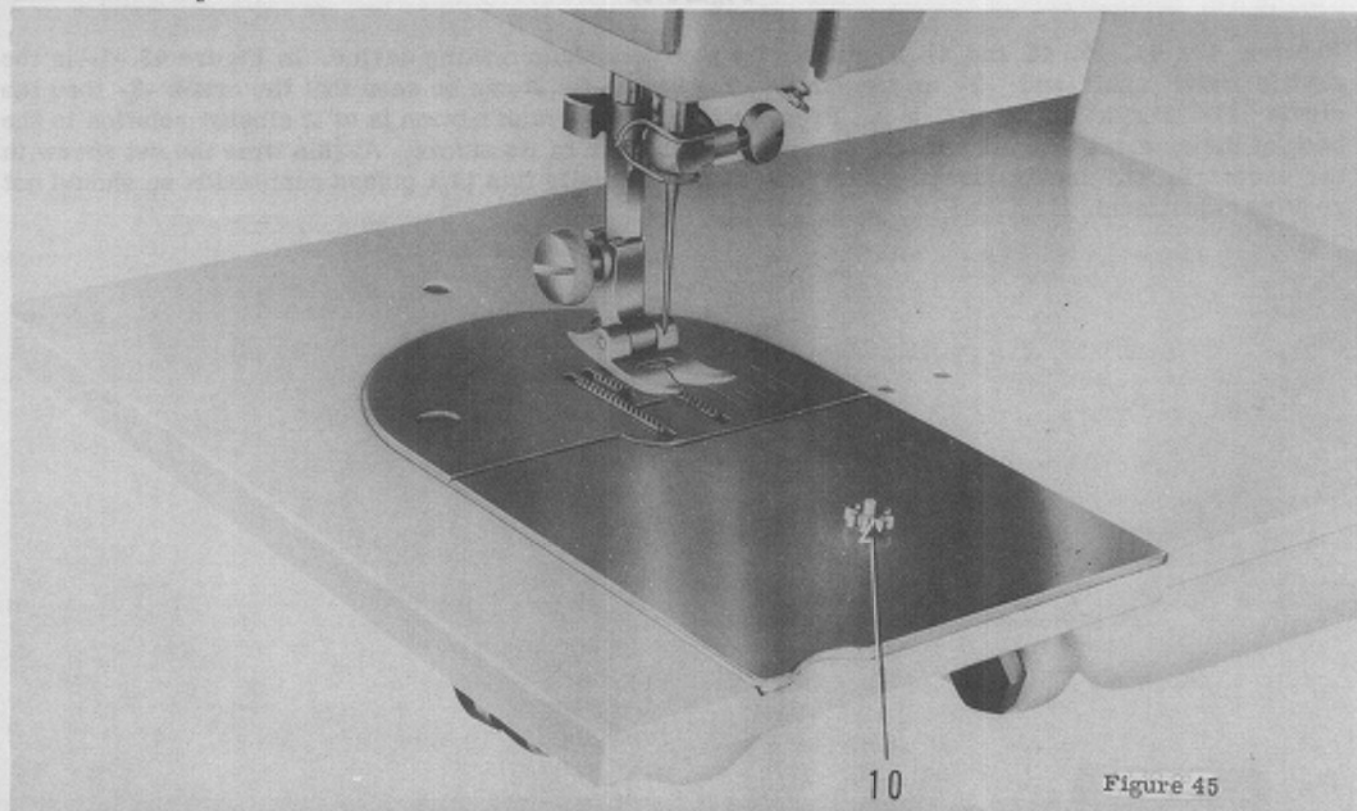


Figure 45

Pinion gear -10- is driven by the previously described mechanism and because of the timing mentioned in Figure 43 rotates only when the needle is out of the material sewn.

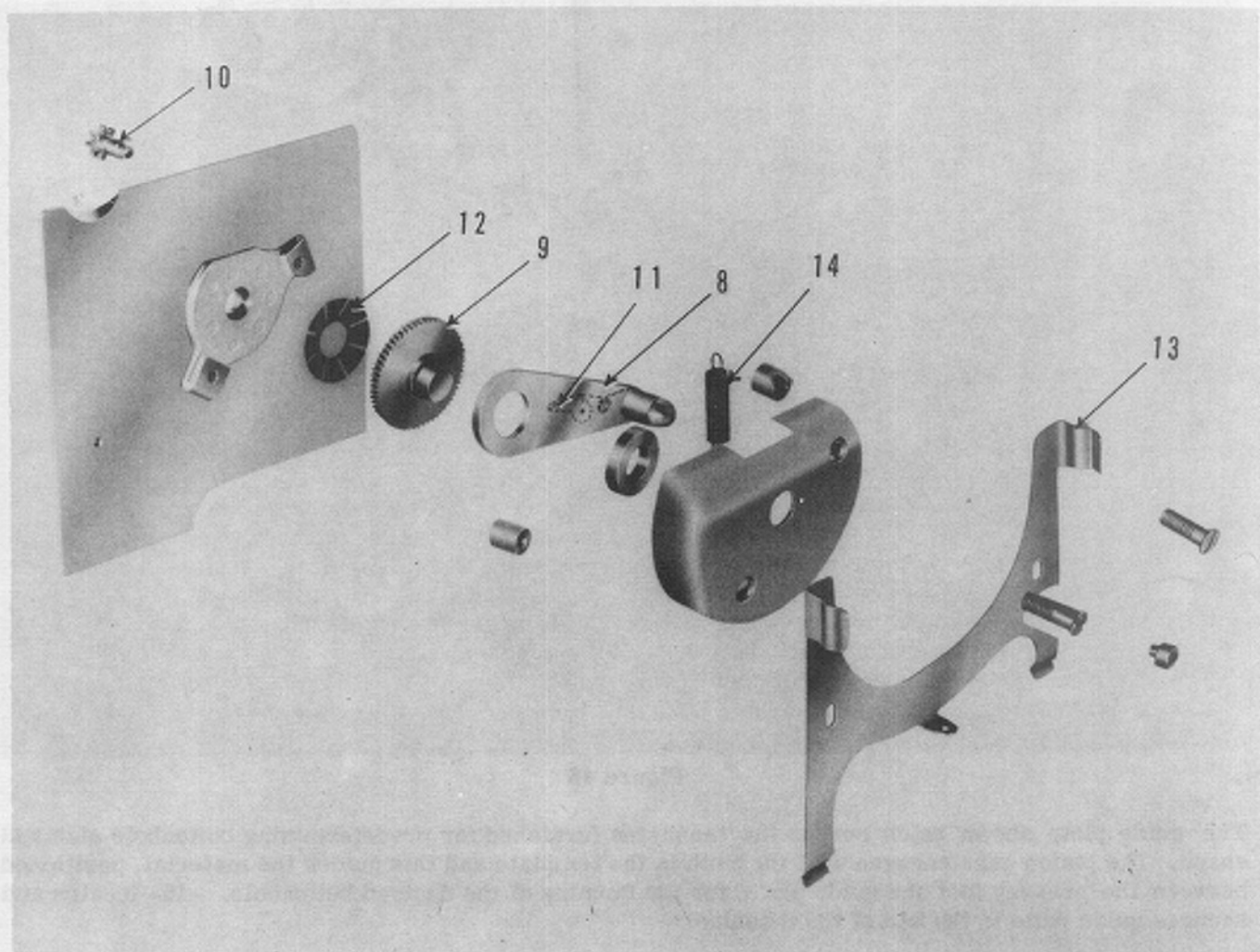


Figure 47

This is an exploded view of the special coverplate assembly. A pawl -11- is attached at the back of the lever -8- this operates on the ratchet gear -9-. This gear has 60 teeth thus 60 revolutions of the handwheel produces one complete revolution of the gear -9-. Spring -12- maintains tension between the ratchet gear -9- and pinion gear -10-. Gear -10- is screwed counterclockwise into gear -9- thus will not loosen. Spring -14- produces the return action of the ratchet lever -11-. The cover plate retaining spring is -13-.