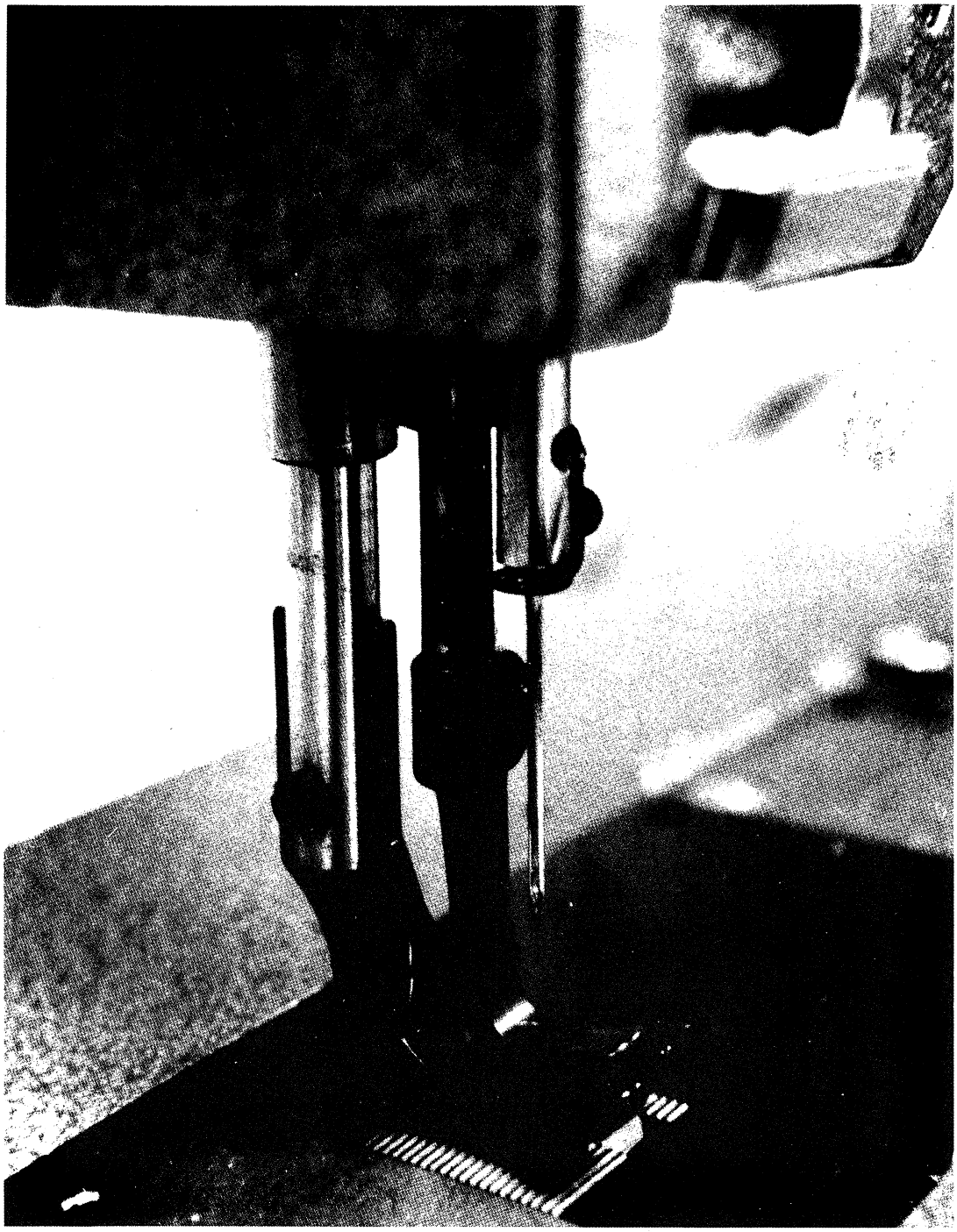
Compound Feed Walking Foot Machines



Maintenance - Repair - Troubleshooting

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Introduction

Most experts will agree that among the various types of professional and industrial lockstitch sewing machines, those with walking foot and needle feed mechanisms are the most universal types to be found. They can be used on most kinds of materials from lightweight wovens to heavy leather, plastics and laminates, not to speak of canvas and just about any material imaginable, provided it can be sewn.

At first sight, to be sure, their mechanisms with their levers, eccentrics, links and knobs and their multiple adjustments look a bit complex, and, to some people, even bewildering. However, a step-by-step analysis of the functions of their various components and devices will lift the veil of mystery from the how and why. It is the purpose of this primer to explain, clarify and create a good understanding of the operating modes of the walking foot/needle feed machines, their maintenance, adjustments and principal aspects of repair.

For tools and supplies to perform the repair and adjustment jobs outlined in these pages, it is suggested to have available the following:

- Screw Drivers with 3/32, 1/8, 3/16, 1/4 and 3/8 blade widths
- Allen Hexagon Socket Wrenches 2.5mm and 4mm
- 12 point Box Wrenches 7mm, 8mm, 10mm, 11mm
- 3″ C-clamp
- 320 grit Emery Cloth
- Rouge Cloth

It is thought to be advisable to briefly describe the operating mode of a plain drop feed lockstitch machine, so that the different operating cycles of the walking foot needle feed types can be appreciated.

On a plain drop feed lockstitch machine the material to be sewn is being transported past the needle after the needle leaves the material and rises to the highest point of its travel. The only machine component responsible for this feeding of the material is obviously the feed dog.

The stitching and material feeding cycle of the walking foot/needle feed machines are quite different. Close observation will show the following:

The feeding of the material occurs while the needle enters the feed dog on its forward or rearward travel and leaves the feed dog as it concludes the feeding cycle. Furthermore, these machines are equipped with *two* separate presser feet, either one within the other or one alongside the other. Turning the handwheel until the needle reaches its highest position and then lifting the presser feet, it can be observed that the center presser foot—the one directly behind or around the needle—rises higher than the outside foot. This is an important fact to remember, because this presser foot is the one that does the walking. The second presser foot, the one that straddles or locates alongside the walking foot, only rises and drops. Observation will show that this second presser foot rises above the material when the walking foot moves in unison with the needle to feed the material and rests on the material to hold it in place, as the needle and the walking foot have risen out of the material in preparation for the next stitch.

As one becomes aware of these facts, it can readily be understood that all these elements of the walking-foot/needle-feed machine must cooperate in perfect synchronism. This synchronism accomplishes the positive feeding action of even the heaviest and most difficult-to-sew materials. Thus, there is no shifting of the individual plies of material as they are being sewn.

Now that the mode of operation of walking-foot/needle-feed machines has briefly been reviewed, some sort of foundation has been created for the explanation in detail of the important components of these machines, their adjustments, settings one relative to the other; their maintenance, repair and replacement. Careful attention to these writings will go a long way towards keeping these machines in their best operating condition.

Author's Note: While many references in this primer concern themselves with specific models of walking-foot/needle-feed machines, the basic mode of operation is the same for all makes of machines of this type. Consequently, the fundamentals of adjustment and maintenance apply equally to those makes. A careful analysis will point out their minor individual differences.

Needles and Thread

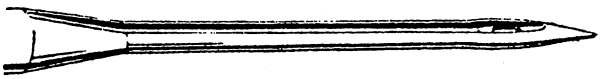
First off, let us consider needles and thread or rather *thread and needles*, as the size of thread is the controlling factor. The type and size of thread is always determined by the weight of the material to be sewn and for machines of the walking foot/needle feed variety, being heavy-duty types, thread finer than cotton size 36 or similarly sized nylon or polyester threads are hardly ever employed. Threads of that size normally do not require needles thinner than size 16 (metric size 100).

To select the correct size of needle, thread a needle before inserting it into the machine and determine whether the thread easily passes through the needle's eye. If even a small effort should be required to move the needle along the thread, select the next larger size of needle. Needles for walking foot/needle feed machines are usually available in sizes 16 through 26 (metric sizes 100 to 230).

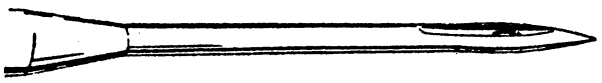
Also check the needle installed in the machine for blunt, broken or hooked points. Any of these defects may cause sewing problems.

Before inserting the needle into the needle bar, be certain to check the pertinent information in the instructions for that particular model of machine.

It is also imperative to take a careful look at the needle itself to determine which side has the long groove and which side has the short one (See Fig. 1). After this determination has been made, position the needle so that the side with the *short* groove is nearest to the point of the rotating hook or loop taker. This is an absolute MUST, as otherwise the machine, no matter how well adjusted, will not sew. Also be certain to push the needle upward into the needle bar as far as it will go and securely tighten the needle clamping screw. Be sure to use only needles of reliable quality.



LONG GROOVE



SHORT GROOVE

Fig. 1

Before concluding this chapter another word on the thread itself. Same must be smoothly finished and even in thickness without any knots, thickened areas or slubs. Also affecting the quality of the thread are its age, the way it has been stored and its exposure to heat, dirt and dust. Thread makers of repute are most emphatic in pointing out the effect of thread quality on sewing performance and often what is perceived as a machine problem, is resolved by using thread of a better quality.

Also be certain that the thickness of thread wound on the bobbin is equal to or thinner than the needle thread. In no case must the bobbin thread be thicker than the needle thread..

Thread Tensions

Next in line for consideration is the *thread tension.* This is one aspect of machine sewing whose importance should be thoroughly understood, since it, above all, controls the quality of the seam.

Often it is thought that very tight tensions produce a good stitch, but this is not quite true, because an excessively tightly-tensioned stitch places a great deal of unwarranted stress on the thread. A rather loose tension is, of course, equally undesirable. In a good lockstitch seam with correctly balanced upper and lower thread tensions the needle and bobbin threads are ideally twined midway through the material being sewn. Diagram 2A illustrates this condition. Note that both upper and lower threads should be drawn firmly and balanced as required and should never lie loosely along the surface of the material. Diagrams 2B and 2C show the appearance of seams where the upper thread (2B) or the lower thread (2C) is tensioned too tightly.

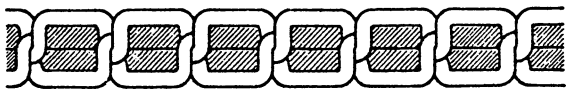


Fig. 2A

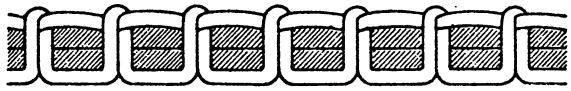


Fig. 2B

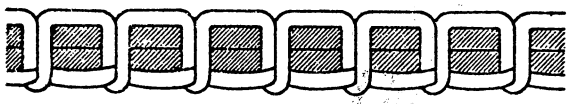
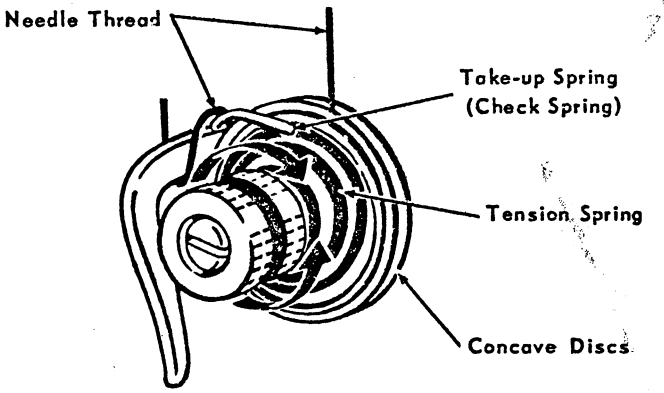


Fig. 2C

Three elements of the machine control the tension of the threads and the tightness of the stitch respectively. These are: (a) the needle thread tension device, (b) the bobbin case tension spring, and (c) the thread take-up spring. There are different configurations of the needle thread tension device and in the placement of the thread take-up spring.



NEEDLE THREAD TENSION ASSEMBLY

Fig 3

Illustration 3 pictures a tension device on which the thread take-up spring surrounds the tension discs. This is a rather simple type. Illustration 4 represents a tension assembly, where the thread tension device and the thread take-up spring are mounted separately.

There is no difference in the mode of their adjustment and in their respective effects on stitch quality. This latter type is one normally found on walking foot/needle feed sewing machines.

The take-up spring performs a very distinct function, exerting a tug upon the needle thread within the stitch, at the exact moment required to set the stitch. The tension of the take-up spring should just be sufficient to take up the slack of the needle thread until the eye of the needle on its downstroke reaches the material. To change the tension of the take-up spring of the type as shown in illustration 3, insert a screw driver of suitable size in the slot at the center of the tension nut and turn slightly clockwise to increase the tension and in the opposite direction to decrease same. The amount of tension required will vary with the type of thread being used.

Illustration 4 shows a tension device of the type usually found on heavy duty sewing machines. On this type of tension device the take-up spring action is adjusted by positioning the spring stop (18). Refer to illustrations figs. 4 and 5. Same is adjusted by loosening screw (19) and rotating the stop enough to allow the spring to hold slack out of the needle thread while the needle is descending. The tension of the take-up spring can be adjusted by loosening the set screw (19, Fig. 4) located in the arm casting behind the take-up spring device in a four-o'clock position. Rotate stud (13, Fig. 4) clockwise to increase spring tension and counterclockwise to decrease same. The amount of tension may vary, depending on the type of thread being used. It is important to stress that any adjustments made on any member of the stitch tightening device must be made carefully and gradually. Always check for results before making further corrections or adjustments.

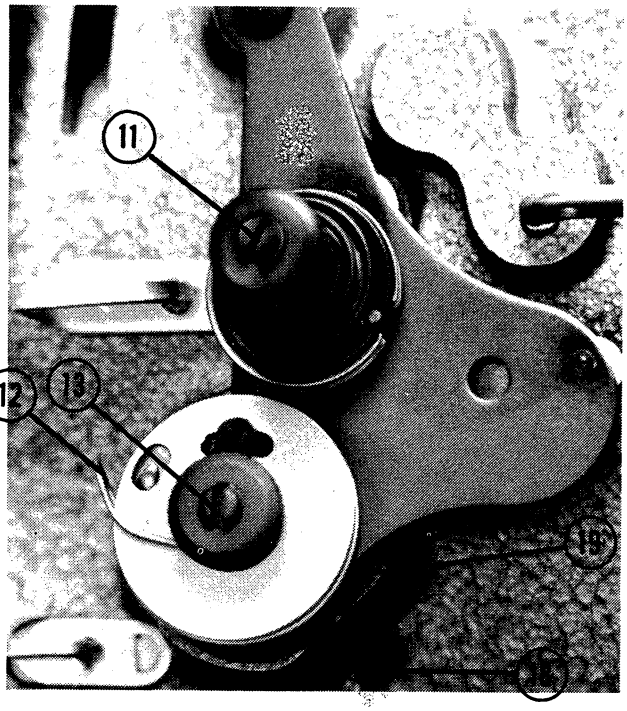
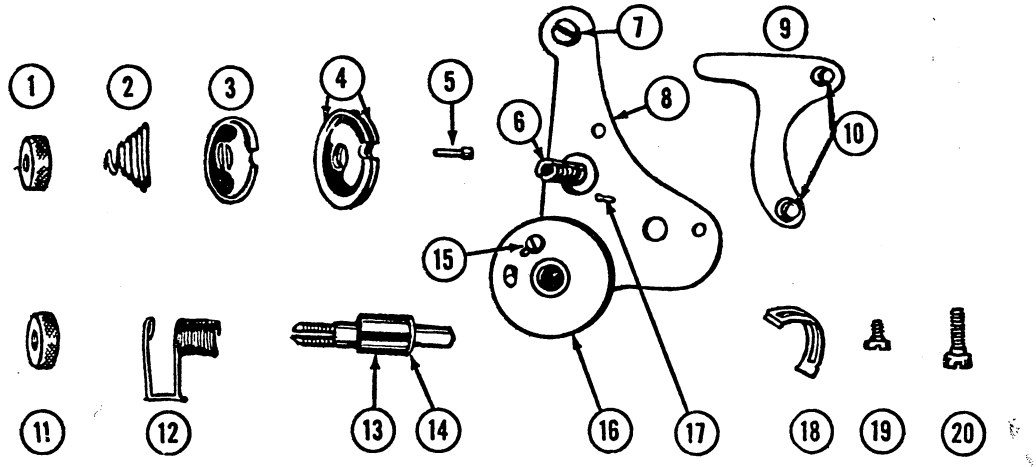


Fig. 4



REF. NO.		REF. NO.	
1	Tension thumb nut	11	Thread controller stud thumb nut
2	Tension spring	12	Thread controller spring
3	Tension release washer	13	Thread controller stud
4	Tension disks (two required)	14	Thread controller stud washer
5	Tension release plunger	15	Thread controller disk screw
6	Tension stud	16	Thread controller disk
7	Tension bracket screw	17	Tension disk position pin
8	Tension bracket	18	Thread controller spring stop
9	Tension release lever	19	Thread controller spring stop screw
10	Tension release lever screw	20	Thread controller stud setscrew

Fig. 5

Trouble Shooting Guide

General

This section contains abbreviated trouble-shooting information which can be of help in determining and removing the causes of trouble that may develop in the machine. When the troubles covered by this section develop, they can be conveniently tracked down and readily corrected by consulting the following listing:

Specific Troubles—Their causes and correction.

a. *Needle breakage.*
(1) Needle is loose in clamp. Tighten clamp screw.
(2) Needle of incorrect class and variety is being used; compare needle with one of correct type.
(3) Presser foot is loose or out of line. Straighten and tighten it.
(4) Needle is too light for the fabric. Select the correct needle.
(5) Operator is pulling on fabric. DO NOT assist machine in feeding material.

b. *Needle-Thread Breakage.*
(1) Thread is too heavy for the needle. Insert thicker needle.
(2) Right-twist thread is being used. ONLY LEFT twist thread must be employed.
(3) Damp or defective thread is being used. Use dry, smooth thread.
(4) Machine is incorrectly threaded; follow threading diagram for specific machine involved.
(5) Needle is incorrectly set. Set the needle with the short groove closest to loop taker.
(6) Upper tension is too tight; adjust for correct stitch balance.
(7) Thread take-up spring is out of adjustment.
(8) There is a sharp edge on the rotating loop taker, bobbin case or tension controller; smooth with finest emery cloth (320 grit) or oilstone and polish with rouge cloth.
(9) Needle is rubbing against presser foot. Adjust and tighten the foot.
(10) Needle is defective, blunted or bent at the point. Use a good, new needle.
(11) Needle hole in feed dog is sharp-edged or burred. Smoothen offending areas.

c. *Bobbin-Thread Breakage.*
(1) Defective or damp thread is being used. Use dry thread of correct size.
(2) Bobbin case tension is too tight. Adjust to obtain well-balanced stitches as described under "Thread Tensions."
(3) Bobbin case is incorrectly threaded.
(4) Bobbin is wound too full to revolve freely. Take off thread to below the rim of the bobbin and adjust the bobbin winder to avoid winding bobbin with an excess of thread.
(5) Rounds of thread on the bobbin are lapped over one another; unwind bobbin manually and rewind evenly and uniformly.
(6) Bobbin case is sticky with gummy oil and/or lint. Clean the bobbin case and rotating loop taker with kerosene or naphtha and lubricate rotating loop taker with a few drops of oil.
(7) There is a sharp edge on the rotating loop taker, bobbin case, bobbin or needle. Smoothen same as per in the foregoing chapter.
(8) Bobbin sides may be bent, nicked or distorted and bobbin will not turn freely. Such bobbins should be discarded and replaced.

d. *Skipping Stitches.* If the needle thread fails to catch the bobbin thread, the machine will not sew or will leave skips in the stitches. To remedy this trouble, time the needle with the needle bar according to instructions.

e. *Drawing of Seam.* If the threads draw or pucker the seam, adjust the tensions.

f. *Stitches Uneven or Stitches Piled Up.* If the stitches pile up in one place, adjust the stitch length regulator for longer stitch. Also, if indicated, the presser foot pressure on the material should be increased. Check rise of teeth of feed dog above surface of needle plate. They should rise to the extent of their full depth.

g. *Feed Dog Striking Throat Plate.* If the feed dog *strikes the throat plate,* adjust the feed dog to rise above throat plate no further than the depth of the feed dog teeth. Also check travel of feed dog within slots in throat plate. Also observe whether, with machine set for longest stitch, the feed dog strikes either the front or the rear of the feed dog slots in the throat plate. The simplest remedy for this problem is a slight reduction in stitch length to avoid such striking. There is also the possibility of an accumulation of lint and debris from sewing between the feed dog and the underside of the throat plate. Remove throat plate from machine bed by loosening its screws and brush out from feed dog any foreign matter which may have become packed into its slots and between its teeth. Also, wipe clean the underside of the throat plate. Replace throat plate on machine bed, tightening its screws.

A more comprehensive coverage of "Causes and Solutions" can be found elsewhere in this volume. Please refer to Index.

Basic Adjustments

a. *Timing the Rotating Loop Taker (also called Rotating Hook) with the needle* (machines with vertical axis loop takers only). The point of the rotating loop taker (rotating hook) rotates past the needle in close proximity, but without ever touching it. When the needle is on its upstroke the point of the hook passes across the center of the needle about 1/16 inch (1.5mm) above the eye. To test the correct timing of the needle on machines with vertical axis hooks, turn the handwheel until the take-up lever is at its highest point. The timing arrow (Fig. 6) on the shaft collar must line up with the timing mark on the bushing and the point of the hook must cross the center of the needle as just described. If it should now be determined that the machine requires re-timing, proceed as follows:

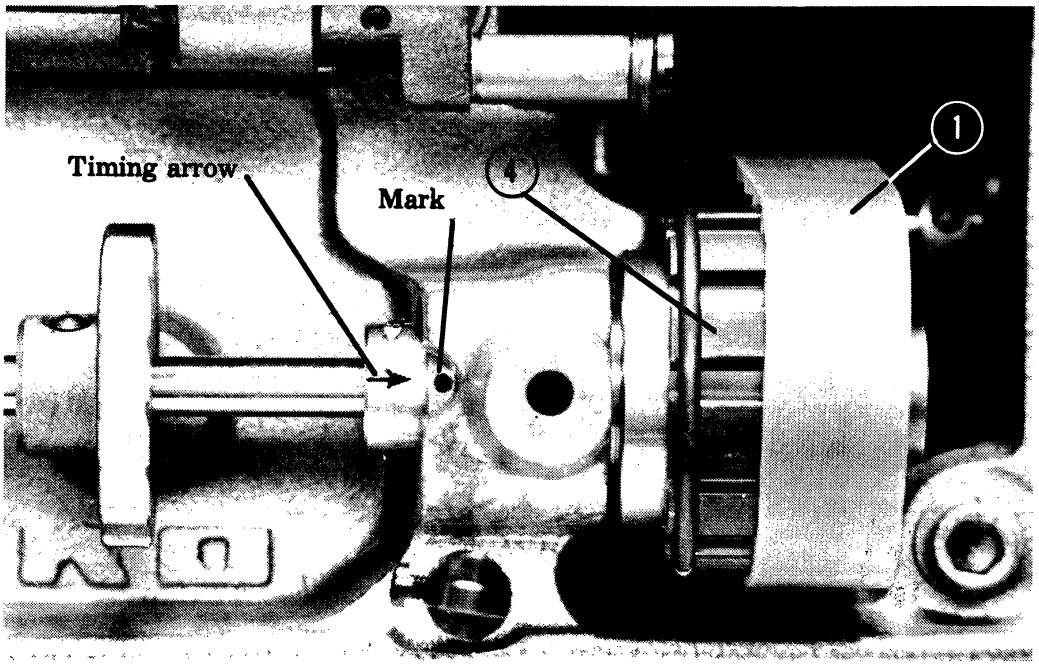


Fig. 6

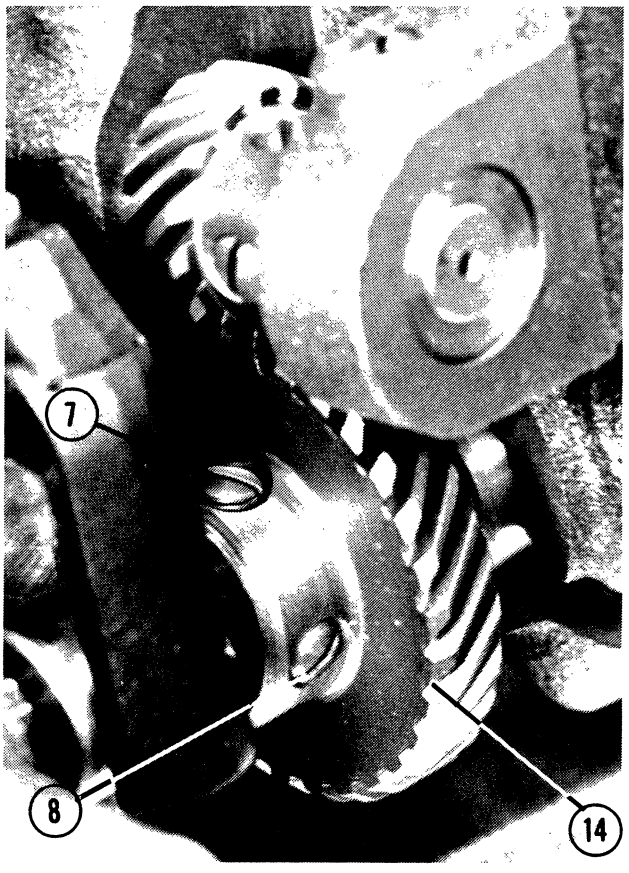


Fig. 7

(1) See that the needle is set up into the needle bar as far up as it will go.
(2) Remove the throat plate to get a good view of the needle.
(3) Remove the arm shaft connection belt to disconnect the needle mechanism from the hook driving shaft and safety clutch pulley. (For arm shaft connection belt removal, see separate chapter.)
(4) Turn the balance wheel towards you until the needle bar has descended to its lowest position and rises 3/32" (2.5mm). At this moment in time the hook point must cross the center of the needle approximately 1/16" (1.5mm) above the eye in the needle.
(5) Turn the lower shaft by hand until the two timing marks are matched, as explained above. During the remainder of the timing operation, keep these marks so matched.
(6) Loosen 2 or 3 turns the two screws (7 and 8, Fig. 7) in the hub of the hook driving gear (14). Be careful to keep the position screw (7) in the groove cut into the driving shaft.
(7) Tap the hook driving gear (14) along the shaft. If the hook is too slow, tap the gear to the right; if the hook is too fast, tap the gear to the left.

(8) When the hook point crosses the needle at a spot 1/16" (1.5mm) above the eye of the needle, securely tighten the two screws (7 and 8) in the hub of the gear (14).
(9) Be certain that the position screw (7) is in the groove in the shaft.
(10) Make sure that the timing marks mentioned in (5) above are matched when the hook is correctly timed. Then replace the arm shaft connection belt.

b. *Timing the Rotating Loop Taker-Hook*-(machines with *horizontal* axis loop takers only).

First, observe that needle bar is correctly set by referring to the instructions in a following chapter (page 8). To determine whether the hook is correctly timed, first remove from machine presser feet, throat plate, slide plate, feed dog, bobbin case and the position finger (P) for the bobbin case holder (Fig. 8). Insert a new needle into the needle bar, turn over handwheel until the needle bar is about to rise from its lowest point. Allow needle bar to rise 3/32" (2.5mm) from this lowest position. At this juncture the point of the rotating loop taker should cross the center of the needle 1/16" (2.5mm) above the eye.

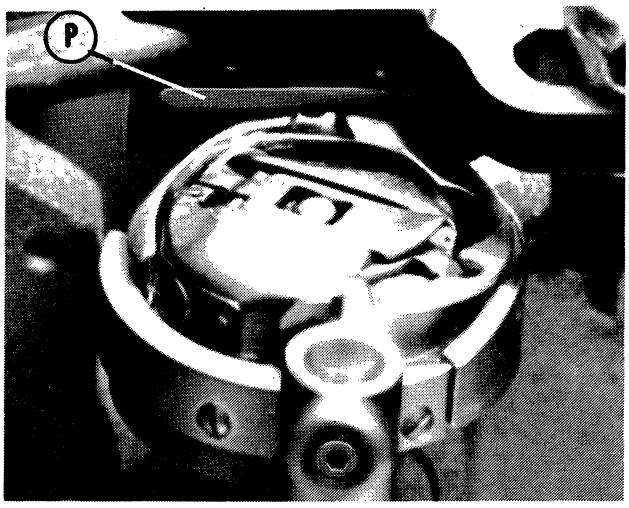


Fig. 8

If the timing of the rotating loop taker (hook) should be incorrect, loosen the three set screws (S) (Fig. 9) in the left hand hub of the safety clutch assembly and turn it on its shaft to bring the point of the loop taker into the correct timing. Tighten set screws (S) and re-check that the setting has not been disturbed.

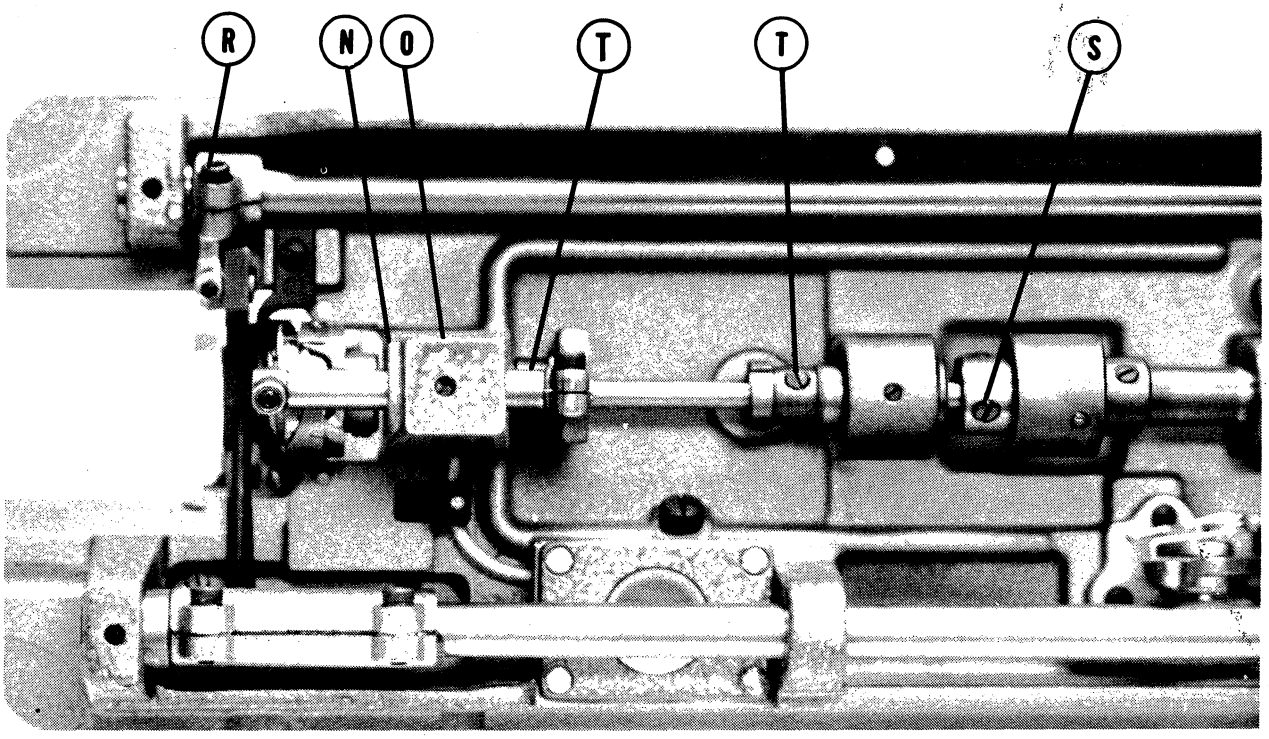


Fig. 9

The point of the hook should pass the needle as closely as possible without actually touching it. This is equal to about the thickness of a piece of ordinary note paper. The hook should be placed on the shaft as far in as it will go. If it is necessary to move the hook sidewise, proceed as follows:

a. Loosen set screws S about one turn (See Fig. 9).
b. Loosen set screws T approximately to the same degree.
c. Loosen set screw O, which locks into place bushing N.
d. Lightly tap bushing N with hook assembly and connected shafts to the right or to the left, as may be required, and check for correct clearance between needle and point of rotating loop taker (hook).
e. Tighten all set screws and recheck timing of hook.

Raising or Lowering the Needle Bar

See that the correct type of needle is inserted into the needle bar and make sure that it is placed as far up into the bar as it will go. Adjust stitch length to approximately 8 stitches per inch (3mm stitch). Take off throat plate, also feed dog, if necessary, so that the rotating loop taker (hook) becomes visible. Also remove face plate from arm of machine to expose the needle bar mechanism. Turn handwheel until needle bar reaches its lowest point, when the needle bar pinch screw (P, Fig. 10) will become visible behind the notch near the lower end of the needle bar frame. Loosen this pinch screw and raise or lower needle bar as required. The needle bar is in correct position when, after it has risen 3/32" (2.5mm) from its lowest point the point of rotary loop taker passes the center of the needle 1/16" (1.5mm) above the needle's eye. Tighten pinch screw after the needle bar is adjusted and replace all parts previously removed from machine.

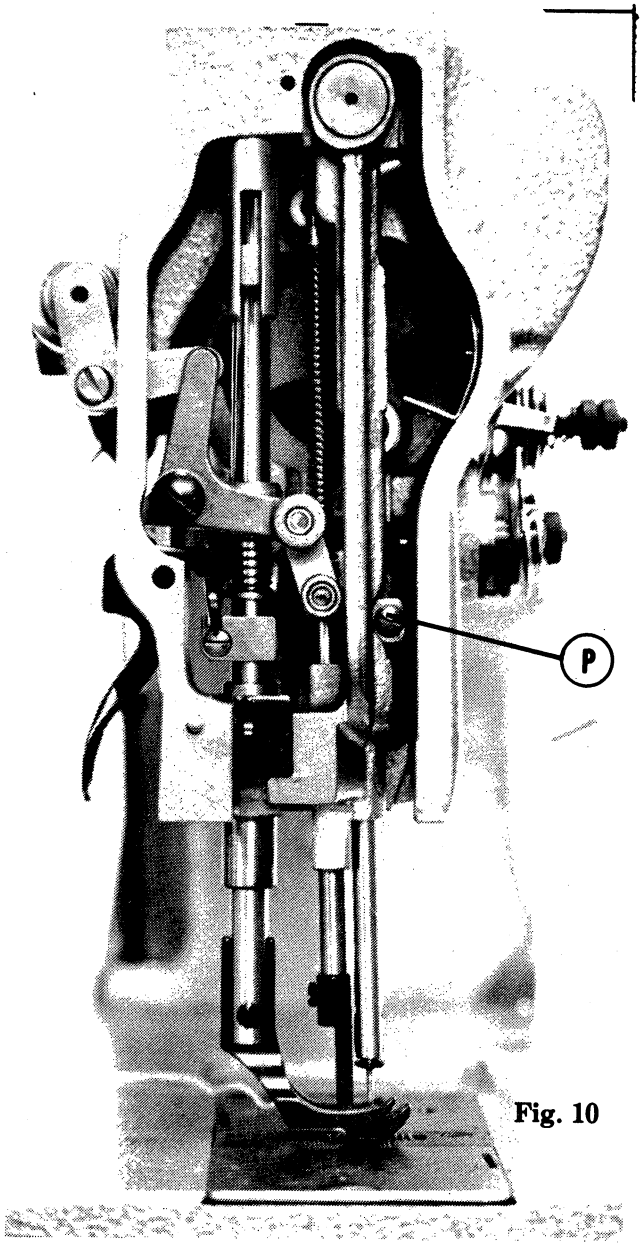


Fig. 10

Replacing the Arm Shaft Belt

Force belt (1, Fig. 6) to be replaced off the lower belt pulley (4) by turning the handwheel and pushing the belt outward at the same time. Then remove handwheel. Loosen arm shaft bearing sleeve set screw at rear of arm and after opening of Arm Top Cover, pull out bearing from handwheel side. Now draw up Arm Shaft Belt through opening in top of arm, pulling its end through the space previously occupied by the bearing.

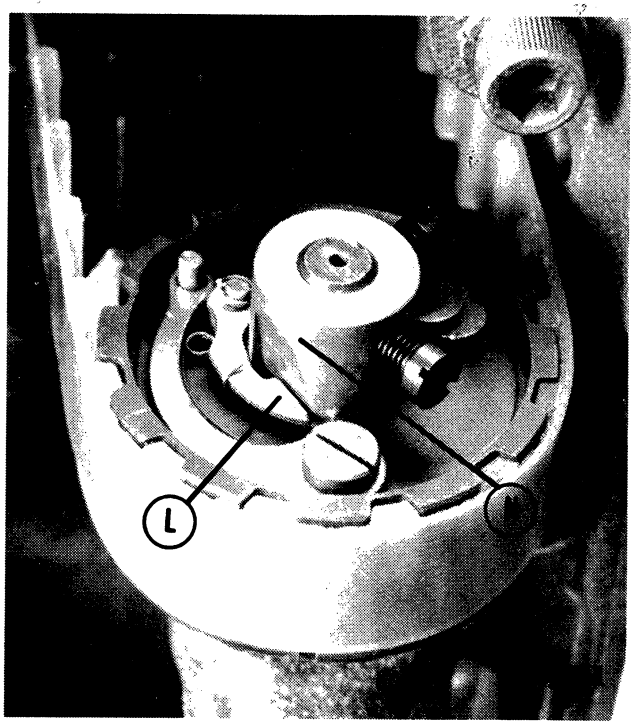
Important Note:

If it is desired to re-use the belt just removed or when installing a new belt, be careful not to pinch or crease it, as this will cause the steel wire reinforcements inside the belt to become distorted and thus to make the belt useless.

After installing the belt, replace arm shaft bearing and handwheel and tighten all set screws securely. Slip belt on to upper belt pulley and turn handwheel toward you until take-up lever reaches its highest position. Make sure arm shaft remains in this position and turn hook shaft (Lower Shaft) manually until the timing arrow on the shaft collar and the timing mark on the bushing (Fig. 6) are aligned. Make sure that arm shaft and hook shaft are held as described and carefully slip belt onto belt pulley "4." This will assure that needle bar and feed motion are timed properly.

Safety Clutch

When the machines are subjected to unusual strain, such as may occur when loose or tangled threads get caught inside the rotating loop taker, a safety clutching device goes into action to protect the various components of the mechanism from serious damage.

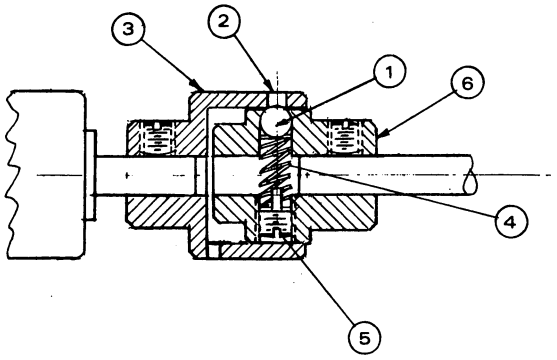


a. On machines with *vertical axis loop takers (hooks)* the safety clutching device is the type as seen in Fig. 11, where the arrow points to the locking latch ("L"). Undue strain will cause this latch to rise out of the notch in the belt pulley hub, thereby stopping rotation of the loop taker.

The locking latch "L" may also be lifted out of its notch manually, if it should become necessary to raise the needle without moving the rotating loop taker, as may be needed due to a clogged condition of the machine. To do this, a screw driver can be used to lift the latch, turning the machine handwheel to disengage the clutch from the hook driving shaft.

To re-engage the clutch, proceed as follows: On the machine bed locate the right hand one of the two buttons, depress same and, at the same time, turn the handwheel backward. The plunger will hold the hook shaft until the locking latch "L" reaches the notch "N" in the collar (Fig. 11) and drops into it. This maneuver will re-engage the clutch without disturbing the timing of the sewing mechanism. Release button.

b. On machines with *horizontal axis loop takers* the safety clutching mechanism is of a different design and is adjustable as far as the release force is concerned. Fig. 12 shows a detail of this clutch.



Sectional View of Safety Clutch Device

Fig. 12

To re-engage clutch, depress button at center of bed plate and turn handwheel until it is noticed that ball (1) has dropped into bore (2) (Fig. 12). This will automatically reset the rotating loop taker for correct timing.

If it is desired to disengage the clutch manually, turn handwheel until bore (2) in cup (3) comes into view. Depress button at center of machine bed for plunger to engage ratchet on hook shaft. Maintain force on handwheel and keep plunger engaged. At the same time, use a small screw driver to depress ball (1). Ball will disengage from bore in cup.

To adjust pressure of spring (4) carefully continue turning handwheel until hook shaft with clutch body (6) make about a half turn. This will bring into view at bore (2) the slot of the adjustment screw (5), which can now be adjusted. Make certain that adjustment screw does *not* ever extend above surface of clutch body.

Adjustment of the Height of the Feed Dog

The maximum height to which the feed dog should rise above the surface of the throat plate equals the depth of the teeth. Before adjusting to the correct height, remove all lint or foreign matter which may have accumulated between feed dog and throat plate and proceed as follows:

a. On machines with vertical axis rotating loop taker (hook), loosen the feed lifting eccentric fork screw (1, Fig. 13) and raise or lower the feed bar fork (2) as needed so that the feed dog in its highest position rises the height of a tooth above the throat plate. Be sure to again tighten feed fork screw.

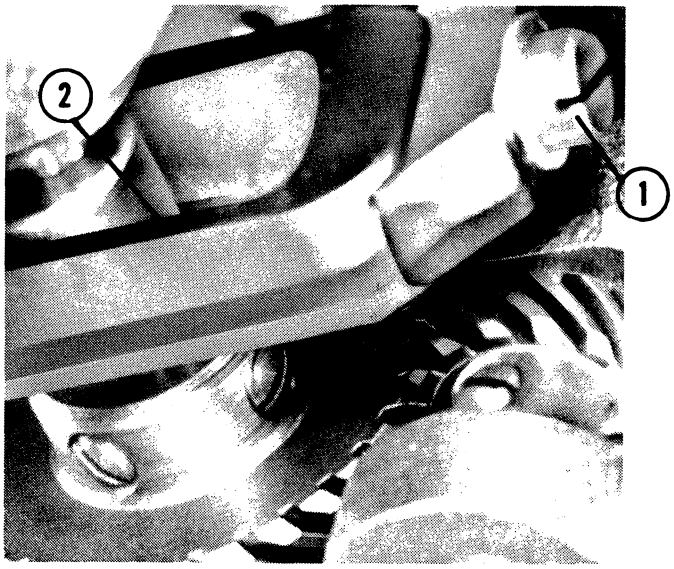


Fig. 13

b. On machines with horizontal axis loop takers (hooks), the feed dog may be raised or lowered by loosening clamp screw "R" (Fig. 9) in the feed lifting crank. Tap crank to position feed dog as stated (see preceding paragraph) and tighten clamp screw.

Adjusting the Bobbin Case Opener and/or Thread Release Finger

a. *Machines with vertical axis loop taker (hook).*

The bobbin case opener (L, Fig. 14) is operated by an eccentric attached to the hook shaft. It strikes the triangular projection "R" on the bobbin case, turning it slightly, thereby making an opening between the square projection "J" and the grooved stop at the underside of the throat plate to allow passage of the thread.

The bobbin case opener "L" can be adjusted after loosening screw "M" by sliding it back and forth.

This adjustment should be made so that the opening between the lever and the edge of the bobbin case is just perceptible when the bobbin case lever has opened the bobbin case all the way.

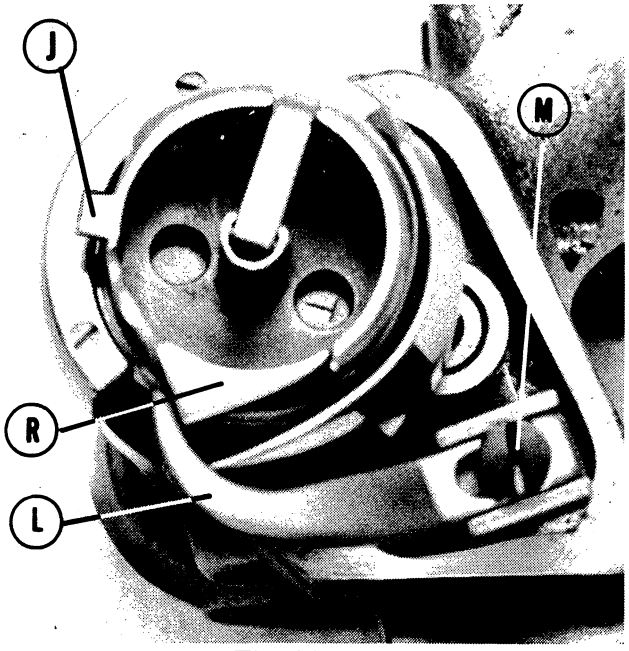


Fig. 14

b. *Machines with horizontal axis loop taker (hook).*

On machines of this type a separately adjustable cam "C" attached to the hook shaft operates the thread release finger. It is timed correctly when, facing the rotating loop taker with its hook point in a 9 o'clock position, the cam is positioned in its fork as shown in Fig. 15. For re-positioning of the cam, loosen the two set screws in its hub, tightening them after adjustments have been made as just described.

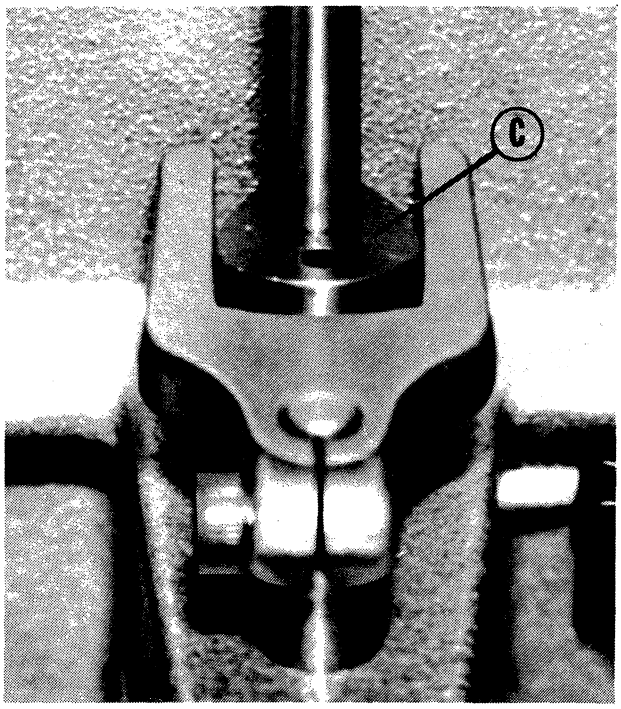
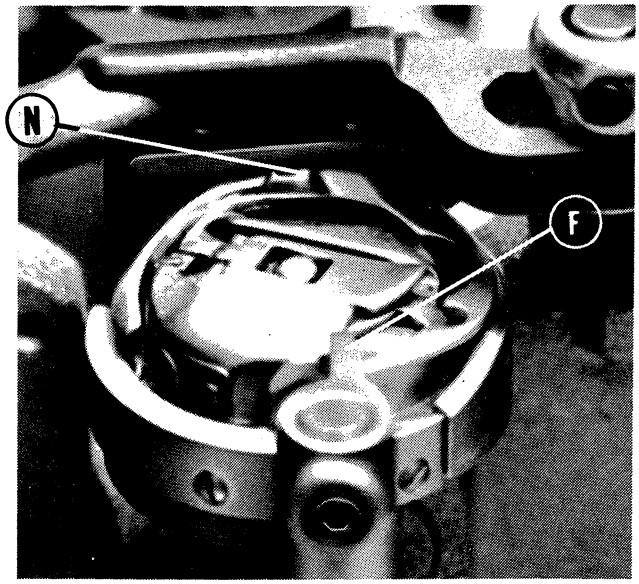


Fig. 15

As for the thread release finger "F", same must slightly nudge the bobbin case holder as the take-up lever completes its up-stroke, to allow the loop of the upper thread to pass freely between the bobbin case retaining finger and the notch "N" at upper portion of the bobbin case holder (Fig. 16.)



The clearance between the bobbin case retaining finger and the sides of this notch should be on the order of 0.012" to 0.015" (0.3-0.4mm). Same should be adjusted by turning the thread release finger "F" on its shaft after loosening the set screw at its underside. Tighten set screw upon making the required adjustment.

Setting the Needle Guard on the Sewing Hook

a. *Machines with Vertical Axis Loop Taker (hook)*

The function of the needle guard (B, Fig. 17), which is attached to the bottom of the sewing hook, is to prevent the point of the hook from striking the needle, should same be deflected as it passes through the material.

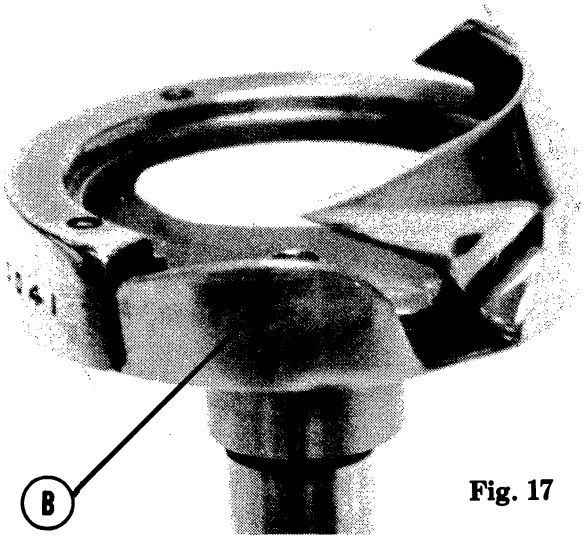


Fig. 17

To prevent the needle from striking the hook point, this guard can be bent with a small round-nose plier. Do not bend it outwardly so much that it will deflect the needle from its usual course.

b. *Machines with Horizontal Axis Loop Taker (hook).*

The function of the needle guard (Fig. 18) on the bobbin case holder is likewise to prevent the hook point from coming into contact with the needle at loop-taking time in case the needle is deflected sidewise toward the hook point.

When the needle guard is correctly related to the needle, it will deflect the needle very slightly to the left as the needle approaches its lowest position. It may sometimes be necessary to string out the needle guard, as shown in Fig. 19 to provide additional clearance for the needle.

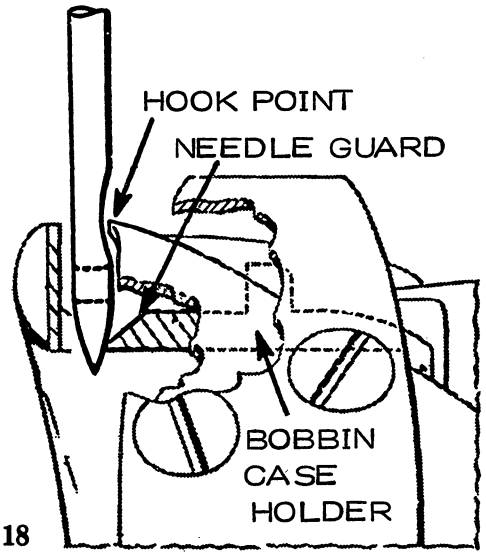


Fig. 18

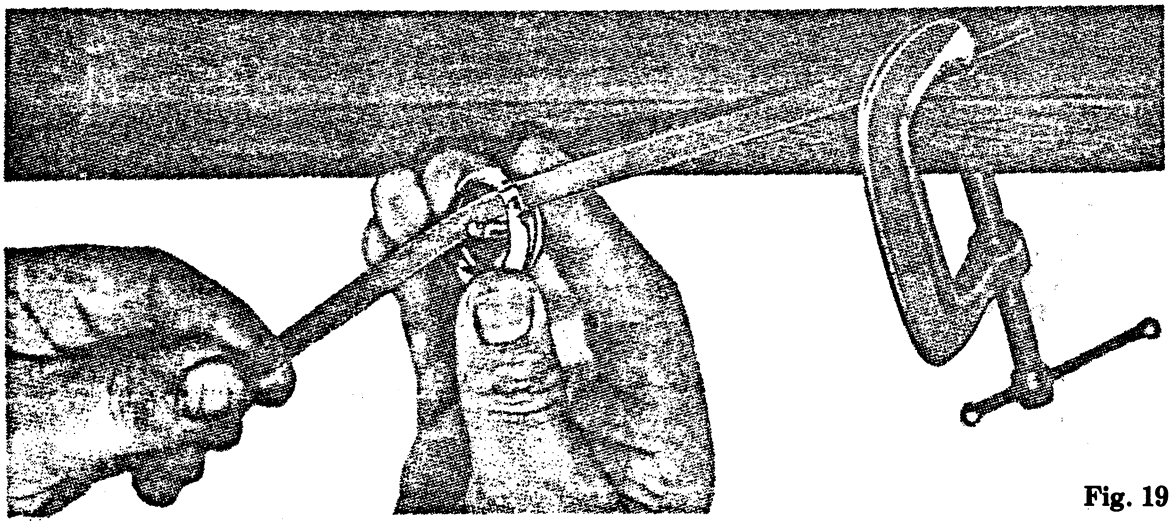


Fig. 19

(For details on this, refer to a following paragraph.) Before doing that, the machine should be properly adjusted as previously described. Check the settings in the following order:

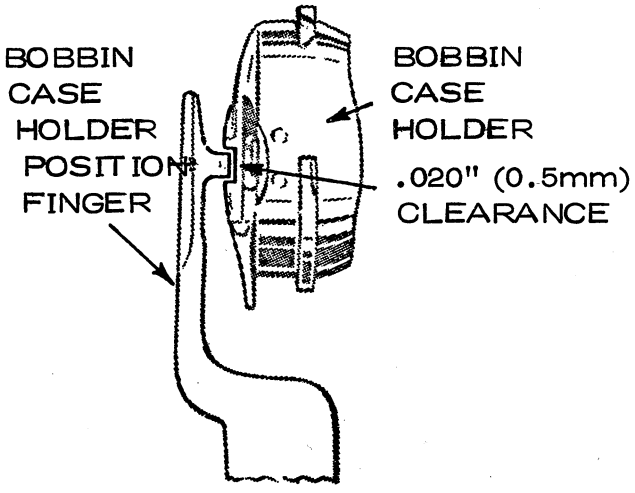


Fig. 20

1. See that needle bar is set at its correct height. See page 8.
2. Make sure that sewing hook is accurately timed. See pages 6 and 7.
3. See that clearance between sewing hook point and needle is correct. See page 7.
4. Rotate bobbin case holder to its normal position and replace position finger.
5. Check position of bobbin case holder position finger (Fig. 20). The clearance between position finger and bobbin case holder should be just sufficient to allow a thickness of thread to pass through easily. Normal setting calls for approximately .020 inch (0.5mm) clearance, as shown in Fig. 20. The tip of the position finger should also be level with the top of the bobbin case holder.

When it is necessary to provide more clearance for the needle, remove bobbin case holder from hook and remove a slight amount of metal from needle guard, by using a 1/8 inch (3mm) wide strip of very fine emery cloth (about No. 320), holding one end of the emery cloth in a vise and rubbing the edge of the needle guard along the strip, as shown in Fig. 19. Extreme care must be

taken not to remove too much metal, as this will allow the hook point to rub against the needle, causing wear or damage, and thus necessitate replacing the hook and the bobbin case holder. Removing too much metal from guard can also expose the bobbin and permit the needle to strike it as shown in Fig. 21, and become damaged or broken and to also damage bobbin.

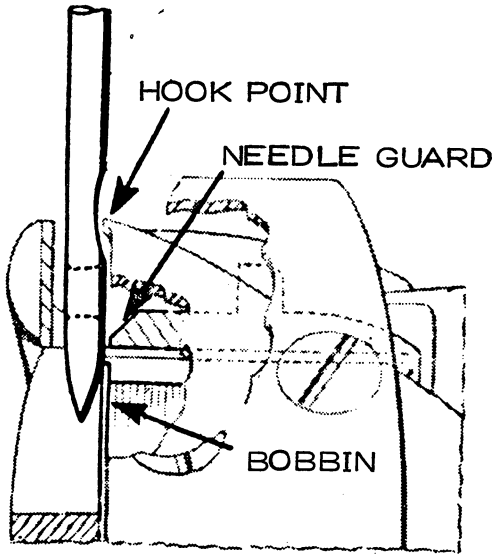


Fig. 21

Be sure to clean bobbin case holder thoroughly before replacing it.

Adjusting the Height of the Alternating Presser Feet

a. *Clearance between* outer *presser foot and throat (needle) plate.*

The maximum obtainable vertical clearance between the outer presser foot and the throat plate is 23/64" (9.1mm). To adjust for this clearance, reduce the pressure of the presser foot spring by loosening screw (1, Fig. 22). Note that this screw can be either a screw with a large knurled head or a headless screw submerged in the arm of the machine. Then raise presser foot with presser foot lifter (2, Fig. 22) and loosen clamp screw (3) on lifting collar. Adjust presser bar vertically to obtain clearance as indicated above.

Recheck adjustment and regulate the presser foot pressure by tightening screw (1, Fig. 22).

b. *Adjustment of the* center, *(vibrating or lifting) presser foot.*

If the lift of the outer presser foot should have been changed, the rise of the *center* presser foot must likewise be readjusted. For this purpose, raise the presser bar lifter (2, Fig. 22), turn handwheel and observe the rise and descent of the center presser foot, which should be about equal above and below the outside presser foot. To adjust, place stud with wing nut (4, Fig. 22) so that it is centered within its slot, then loosen hexagon screw (5) just carefully to allow arm (6) with its

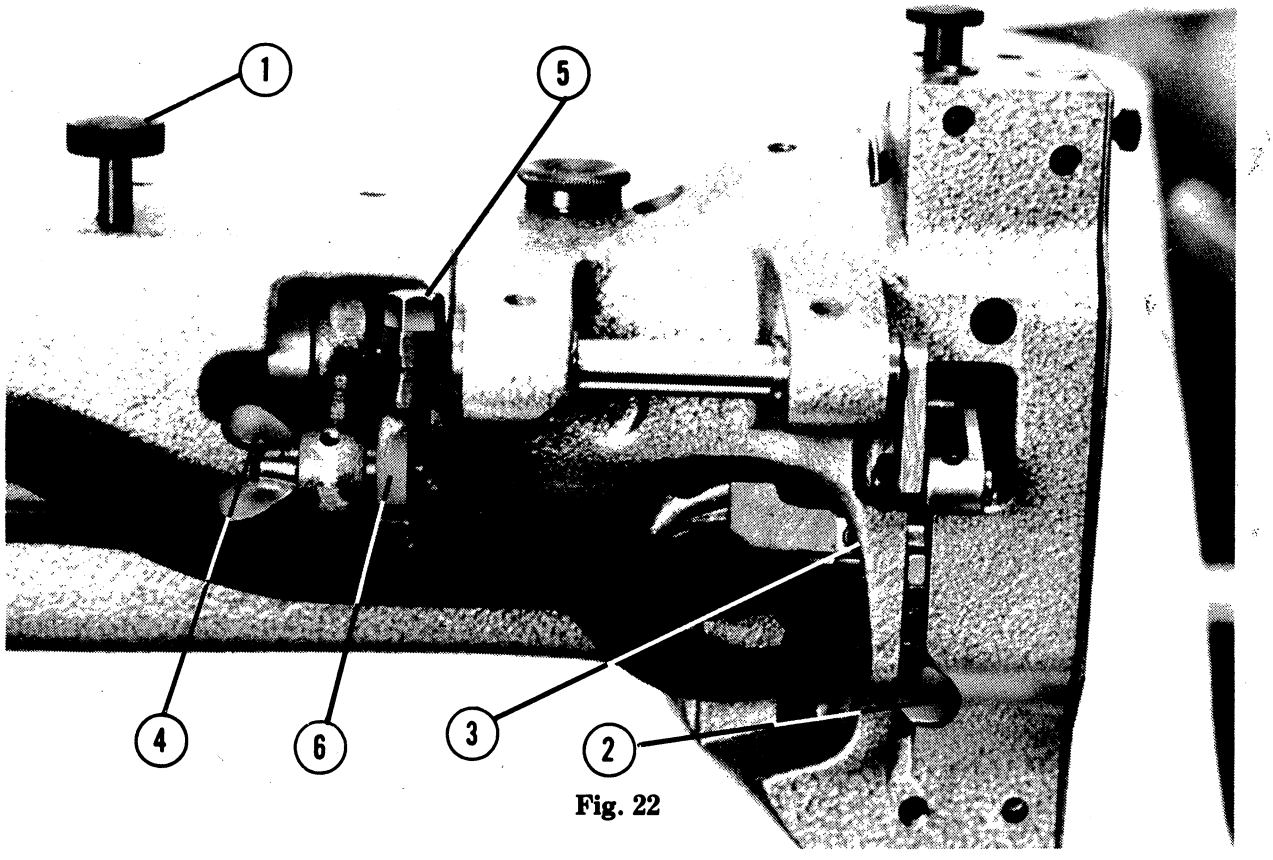


Fig. 22

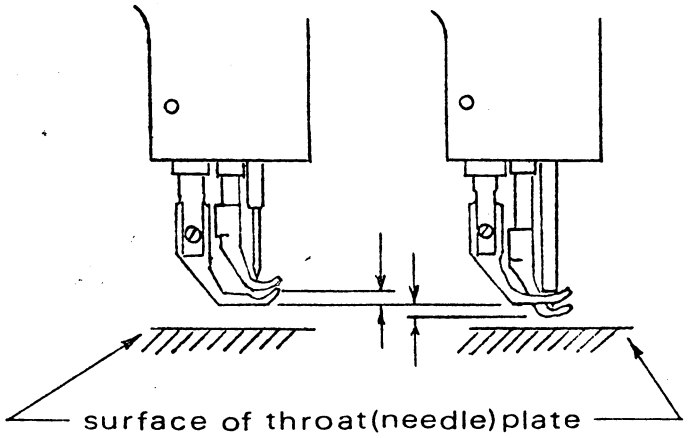


Fig. 23

shaft to be turned against resistance. Turn arm carefully for the center presser foot to rise and descend as described above and as shown in Fig. 23.

Timing of the Center Presser Foot Movement

The correct timing of the center presser foot movement is established when, with the outer presser foot resting on the throat plate, the center (vibrating) presser foot and the needle reach the throat plate at the same instant.

If adjustment should be indicated, turn handwheel until two screws (7, Fig. 24) on feed lifting eccentric come into view. Loosen these two screws just sufficiently to permit the feed lifting eccentric to be turned on its shaft with some resistance. Position this eccentric so that, when the handwheel is turned, the needle and the center (vibrating) presser foot reach the surface of the throat plate at the same time. In fact, there is no harm if the center presser foot should reach the throat plate slightly ahead of the needle to assure that the plies of material are held in place and kept from shifting. Be sure to tighten screws (7) and recheck adjustment.

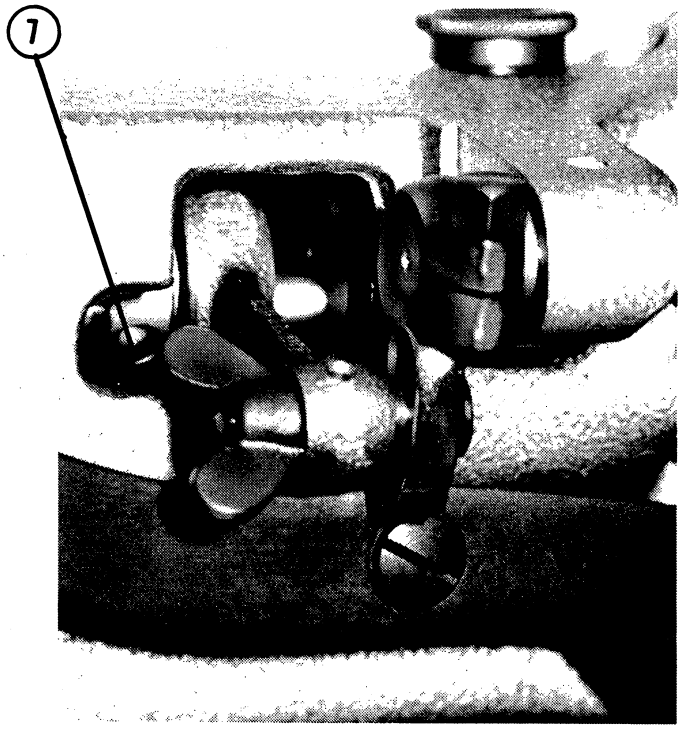


Fig. 24

Centralizing the Feed Dog

When set for the longest stitch, the feed dog must travel without striking the extreme ends of the feed dog slot in the throat plate, both in forward and reverse directions. Fig. 25 shows this requirement on a throat plate used on vertical axis loop taker machines.

Note that the location of the axis of the loop taker (hook) is in no way relevant to the movement of the feed dog and the same requirement applies equally to machines with horizontal axis loop takers (hooks)

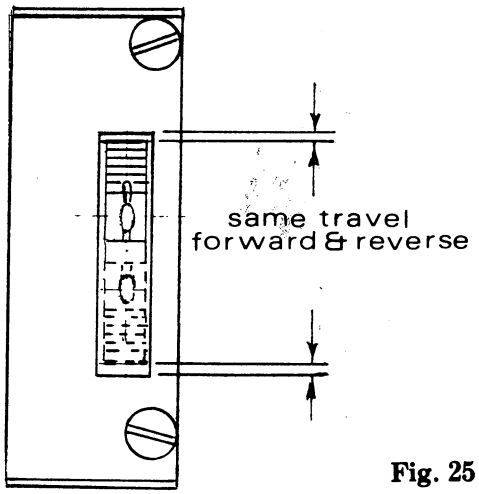


Fig. 25

To effect this adjustment on vertical axis loop taker (hook) machine, adjust machine for longest stitch, loosen clamping screws (C, Fig. 26) at the underside of the machine bed and adjust shaft (D) so that the feed dog ends its travel at the same distance from each end of the slot in the throat plate in both forward and reverse sewing directions. Recheck adjustment and securely tighten screws (C).

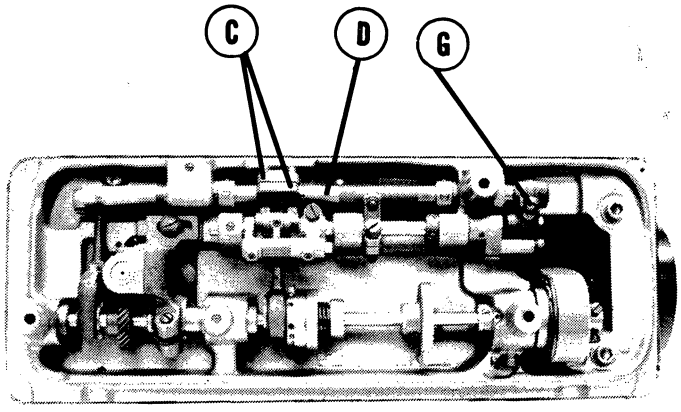


Fig. 26

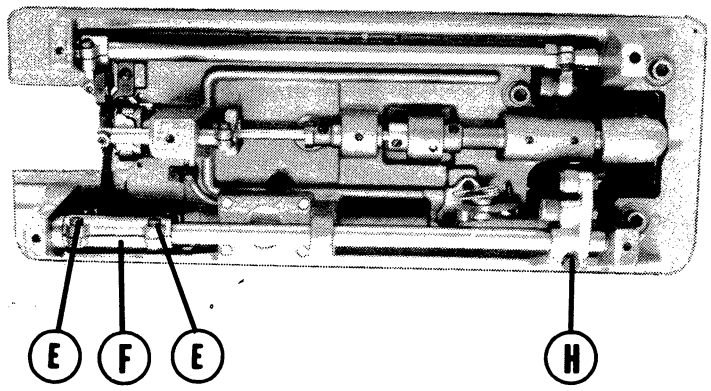


Fig. 27

On machines with horizontal axis loop taker (hook), loosen clamp screws (E) on crank (F, Fig. 27) and rotate crank on its shaft to obtain feed dog travel as described in the preceding paragraph. Be certain to tighten clamp screws upon completion of adjustment.

Centering the Needle within the Needle Hole

Insert a new needle into the needle bar and tighten needle set screw. Turn handwheel and watch needle enter needle hole in feed dog. Needle should pass through center of needle hole. To make adjustments, proceed as follows:

Set stitch length to 0 or shortest possible stitch and turn handwheel until needle is in a position immediately above the feed dog.

On machines with vertical axis loop takers (hooks), loosen clamp screw "G" (Fig. 26) and, while moving the handwheel, adjust needle bar frame until the needle is centered in the needle hole. Tighten clamp screw "G."

On machines with horizontal axis loop takers (hooks), proceed in same way except that clamp screw "H" (Fig. 27) fixes the position of the needle bar frame and hence that of the needle in the needle hole. Loosen this screw and, after properly positioning the needle within the needle hole, securely tighten clamp screw "H."

Oiling and Maintenance

Like any other precision-made equipment, sewing machines require a certain degree of attention and care to preserve their continued operating efficiency and to minimize wear and tear.

First of all, keep the machine clean, both at its outside and its underside. At certain intervals, or whenever an accumulation of lint or debris from the sewn material is noticed, wipe the machine with a dry and clean soft rag. Using a ½" wide paint brush, clean the accumulated foreign matter from the underside of the machine bed by tilting the head back on its hinges. On occasion, remove the face plate from the left end of the head and brush out the mechanism exposed beneath the face plate. Replace face plate, tightening its screws.

Oiling should be done at least once a day, preferably at the end of the work day, particularly when working on material which may get soiled by oil. Wipe off excess oil before starting with sewing. If the sewing operation should be continuous throughout the work day, more frequent lubrication is indicated, particularly of the mainshaft bearings and the rotating hook mechanism. A few drops of oil is all that is required, as an excess will only run off and will have to be wiped away.

Use only clear sewing machine oil, not motor oil or any other substances.

Maintenance Suggestion for the Clutch Motor

Clutch motors used for professional or industrial sewing machines generally require but a minimum of maintenance attention. While there are constructional differences between the various makes, certain basic details apply to all of them. Therefore, this text is most general in scope and may cover fully some types and may serve only as a guide to others, leaving it up to the reader to adapt this text to the necessary extent to the unit he desires to service.

Lubrication

Most clutch motors employ for motor and clutch permanently-lubricated sealed ball bearings. Consequently, the lubrication is neither possible nor required, as the sealed-in lubricant is considered sufficient for the life of the bearings, which can usually be counted in thousands of hours of operation.

Cleaning

Clutch motors are air-cooled, with the cooling air passing through the motor itself. Lint, dust, and sometimes debris from the sewing operation thus get sucked into the motor and, while some of this foreign matter gets expelled with the cooling air, portions of it get caught in the motor. There are available commercially blowers to rid the motors of such accumulations; however, a household vacuum cleaner, specifically of the tank type, will do a rather good job, using the vacuum hose with the lint brush or the crevice tool and applying it to all the ventilating openings at both ends of the clutch motor.

Clutch and Brake Adjustment

If clutch or brake adjustment should become necessary, this is indicated by an excessive travel of the clutch lever or of the foot pedal when starting to operate the sewing machine or upon stopping it.

To adjust clutch and brake, first loosen set screw (B, Fig. 28) about 2 turns, then loosen lock nut (C) and turn head of adjustment bolt (D) clockwise one half turn at a time; then test for results by pressing down the clutch lever. Tighten lock nut (C) and set screw (B) upon completing clutch and brake adjustment. *NOTE:* Do not turn in bolt (D) so far that there is no more clutch action, as this may jam both clutch and motor, causing damage to the motor in particular. Movement of the clutch lever at its very end should be *no less* than ¼".

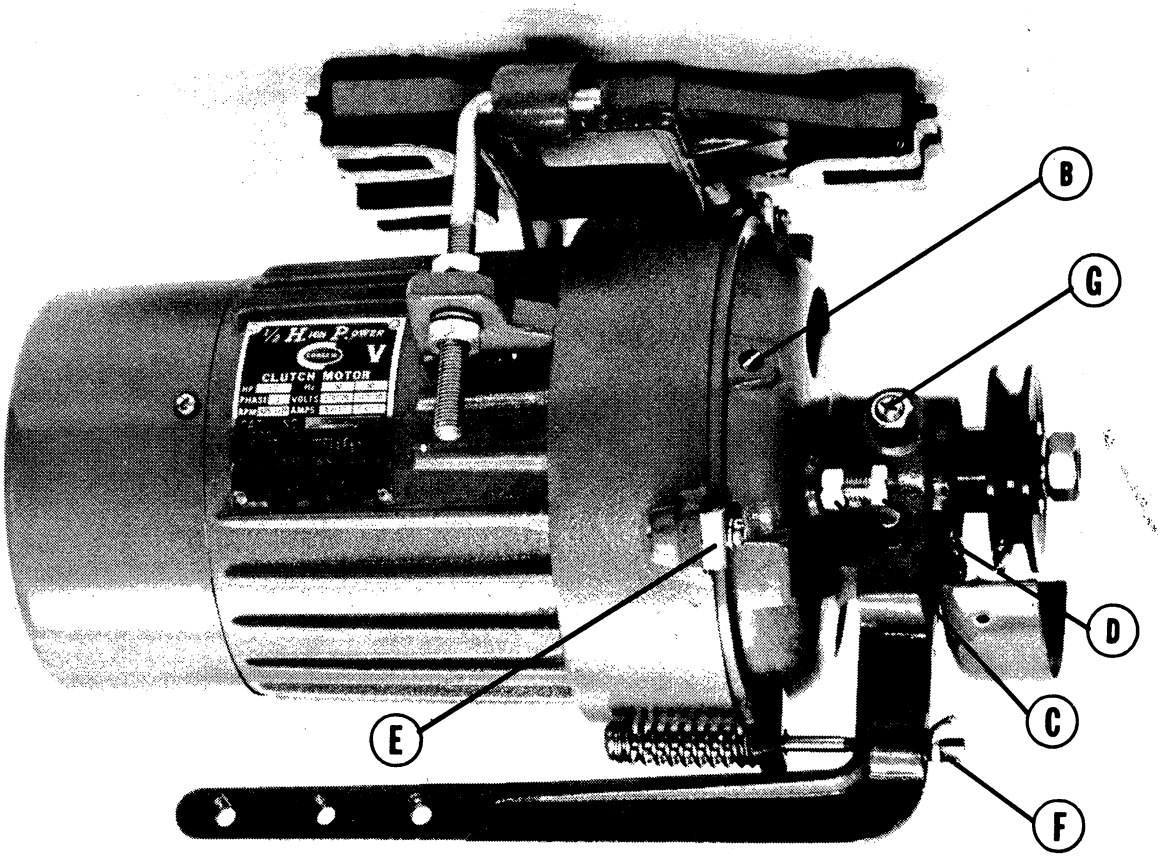


Fig. 28

Replacing the Clutch Lining

1. Remove belt guard and slip drive belt off belt pulley.
2. Note and mark position of treadle pitman rod and treadle and loosen the clamp, tying together the two component lengths of the treadle pitman rod. Unscrew from clutch motor housing three clamps (E, Fig. 28). This will permit clutch portion to become separated from motor. Before separating them, mark the position of the clutch portion with a scratch mark on both the motor housing and the clutch portion.
3. The flywheel of the motor is now exposed, as is the contact disc in the clutch portion. Depending on make and type of clutch motor, the cork clutch lining is bolted either to the flywheel or the contact disc. Loosen the bolts, usually four of them, by means of which the cork clutch lining is attached and, in its stead, attach the replacement. Be sure the bolts are fully tightened.
4. Replace the clutch head, the three clamps (E) with their screws and the treadle pitman, employing the reverse of the procedure outlined in paragraphs 1 and 2. Make certain clutch portion and motor are lined up according to the scratch marks made per paragraph 2.
5. Check clutch and brake adjustment for desired lever movement, following instructions outlined under the heading "Clutch and Brake Adjustment."

Replacing the Brake Pad

1. Remove belt pulley from clutch end of motor.
2. Follow instructions 1 and 2 in preceding chapter.
3. (a) Loosen wing nut (F, Fig. 28) as much as possible without unscrewing it altogether and remove two driver bolts (G) from forked end of lever. Pull out clutch plate with its sleeve and shaft .

   Some types of clutch motors do not employ such driver bolts, nor do they have a forked clutch lever. Instead, the lever extends into the underside of the thinner end of the clutch portion. On those types, the lever pivot pin must be knocked out *after* removal of one of the two retaining rings placed at either end of the pivot pin.

   (b) Loosen set screw (B) and remove brake block from its seat in the clutch housing.
4. Replace brake block, inserting it into the clutch housing so that the cork friction material faces the clutch disc and make sure that the cylindrical end of bolt (D) enters into the hole in the brake block.
5. Re-assemble clutch head, reversing the procedure outlined under 1, 2, and 3 above, and readjust clutch and brake for desired action.

Replacing the Clutch Bearings

1. Follow steps 1, 2, and 3 on page 16.
2. Use a bearing puller, engaging its jaws with the milled grooves (K) in the clutch bearing sleeve (Fig. 29) to pull the clutch bearing nearest the pulley end from the clutch shaft.

Now push bearing out from inside of bearing sleeve.

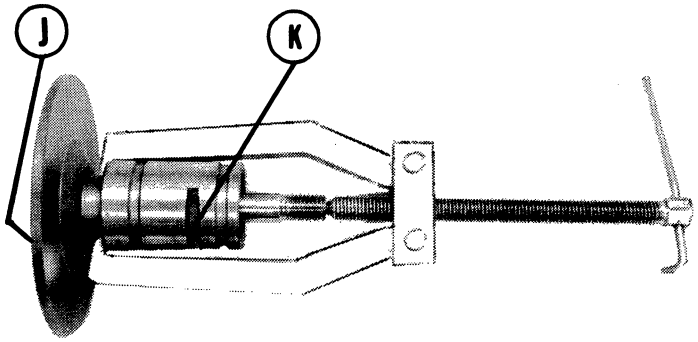


Fig. 29

3. Clamp thickest portion of clutch shaft with clutch disc attached in a bench vise, flatten out the safety washer (J) under nut (Fig. 29) and remove the nut. The clutch disc can now be removed from the clutch shaft; also remove the clutch disc key. Now the second ball bearing can be removed, using the bearing puller.
4. When installing new ball bearings, proceed in the reverse order outlined above, first placing the new ball bearing on the clutch disc end of the shaft. Re-assemble clutch disc, key, safety washer and tighten nut.

NOTE: Do not strike ball bearings directly when installing sleeve on the shaft; be sure to apply force only to the inner race. When placing the bearings into a bore, apply force only to outer race. Check bearing sleeve for burrs resulting from application of puller before re-installation into clutch head.

To Replace the Motor Bearings

1. Follow steps 1, 2 and 3 on page 16.
2. Remove three screws surrounding the flywheel inside the motor end bell and lightly tap flywheel with punch or similar tool, placed through ventilating slots located alongside the screws. This will cause the flywheel together with the *inner* motor endshield and the rotor to come out of the motor housing for easy removal.
3. Flatten the safety washer under the nut holding flywheel, remove nut, lift out flywheel and flywheel key.
4. Using bearing puller, remove ball bearings from the rotor shaft and replace with new ones.
5. Re-assemble motor endshield and flywheel with rotor, and place this assembly into the motor frame, making sure that the rubber washer is placed on the inside of the bearing bore in the motor housing at the side opposite the flywheel.
6. Reassemble clutch head assembly with motor, and re-assemble treadle pitman.
7. When installing NEW bearings on motor shaft apply force only to inner race of bearing as otherwise the bearing will be damaged beyond use.

CAUSES & SOLUTIONS OF INDUSTRIAL SEWING MACHINE PROBLEMS

Upper Thread (Needle Thread) Breaks

Cause	Solution
1. The tension of the upper thread is too tight.	1. Loosen the tension of the upper thread by turning the Tension Nut counter-clockwise.
2. The machine is not threaded correctly.	2. Check whether the upper thread runs correctly from the spool of thread to the Needle.
3. The upper thread is of poor quality. The thread may be too weak or it may be rotten due to improper-storage and does not withstand the tension imposed on it. The thread may also be too hard and does not possess the necessary elasticity.	3. Loosen the tension of the upper thread by turning the Tension Nut counter-clockwise. If possible, replace the inferior thread with one of good quality.
4. The upper thread is of irregular thickness and has small knots which cannot pass through the eye of the Needle.	4. Replace the inferior thread with one of good quality.
5. The upper thread has wrapped itself around the spool pin on top of the machine.	5. Unwind the thread from the spool pin. Eventually place a felt washer underneath the spool of thread. If necessary, remove some of the thread from the full spool.
6. The upper thread is held back somewhere on its way from the spool of thread to the Needle.	6. Examine the string of thread from the Spool to the Needle and eliminate any interference with the free motion of the thread.
7. The upper thread curls around itself before entering the Tension Discs.	7. Place a felt washer underneath the spool of thread. If necessary, remove some of the thread from the full spool.
8. The eye of the needle is rough or sharp.	8. Insert a new Needle.
9. The Needle is not straight.	9. Insert a new Needle.
10. The Needle has a blunt or bent point.	10. Insert a new Needle.
11. The Needle is too fine for the upper thread and for the fabric being sewn.	11. Consult the "Needle and Thread " chapter and insert a Needle of correct size.
12. The upper thread is too coarse for the size of Needle that is being used.	12. Consult the "Needle and Thread " chapter and select an upper thread of the correct thickness.
13. The Needle is not inserted correctly in the machine. The needle grooves do not line up correctly.	13. Insert the Needle so that the short groove of the Needle faces the point of the Hook.
14. The Needle is threaded incorrectly.	14. Thread the Needle so that the upper thread passes through the needle eye from the long groove to the short groove of the Needle.
15. A wrong type of Needle is inserted.	15. Replace with the type of Needle recommended for the machine.
16. The Needle is not straight and rubs against the edge of the stitch hole in the feed dog.	16. Check whether the Needle is bent and replace it, if necessary, with a new straight Needle.
17. The operator pulls the fabric in the direction of sewing. The Feed Dog cuts the upper thread.	17. The fabric must not be pulled during sewing. The machine alone must feed the fabric.
18. The machine is started at full speed.	18. Start the machine at low speed and increase the speed gradually.
19. The machine is started with the Thread Take-up not in its highest position.	19. Start the machine with the Thread Take-up Lever in its highest position.
20. The Bobbin is bent and cannot revolve freely in the Bobbin Case. It is also possible that the Bobbin is wound too full or that the thread is wound unevenly around the Bobbin.	20. Replace the defective Bobbin with a new one. If wound too full, remove some of the thread from the Bobbin. If unevenly wound, replace the Bobbin with one which is wound correctly.

Upper Thread (Needle Thread) Breaks—continued

Cause	Solution
21. The lower end of the Needle Bar is bent. The The Needle strikes the Presser Foot, the Throat Plate, the feed dog or the Hook.	21. Turn the Balance Wheel by hand. If the machine turns easily, bring the Needle Bar to its lower end and tap lightly with a hammer until the Needle goes through the center of the stitch hole in the feed dog.
22. The Throat Plate is not held firmly in place and shifts around. The Needle strikes the Throat Plate or feed dog.	22. Tighten firmly the screws which hold the Throat Plate or feed dog to the machine.
23. The Needle is too high in the machine. The point of the Hook cannot properly catch the loop of the upper thread and breaks this thread.	23. Adjust the position of the Needle Bar in relation to the Hook by raising or lowering the Needle Bar, as required.
24. The Needle is not pushed up entirely in the Needle Bar or in the Needle Clamp.	24. Push the Needle as far as it will go. Tighten firmly the screw which holds the Needle.
25. The Needle is too long for the type of sewing machine being used.	25. Replace with a Needle recommended for the type of machine being used.
26. The Needle is not held securely in the Needle Bar; it shifts slightly up and down.	26. Make certain that the Needle is pushed up entirely in the Needle Bar, then tighten firmly the screw which holds the Needle.
27. In horizontal axis Rotary Hook Machines, the Latch Lever of the Bobbin Case does not close entirely due to accumulation of lint and dirt underneath the Latch Lever. The upper thread, therefore, is prevented from sliding freely around the Bobbin Case and breaks.	27. With a pointed pin remove the lint and dirt underneath the Latch Lever of the Bobbin Case. Clean the entire Bobbin Case thoroughly with a small brush dipped in kerosene.
28. In horizontal axis Rotary Hook Machines, lint or dirt have accumulated in the circular groove on top of the center post of the Bobbin Case Holder. The center post is the part upon which the Bobbin Case is placed. Due to the lint or dirt in the groove of this center post the Bobbin Case Latch does not close entirely. As a result, the Latch Lever of the Bobbin Case also does not close entirely. It remains loose and prevents the upper thread from sliding freely around the Bobbin Case. The upper thread breaks.	28. With a pointed pin remove the lint or dirt from the circular groove of the center post. Clean Bobbin Case Holder thoroughly with a small brush dipped in kerosene.
29. The Feed Dog is timed too early. Excessive tension of the upper thread will be required to eliminate the small loops of thread which appear on the fabric. The excessive tension will finally cause the thread to break.	29. See whether loops of thread appear on the underside of the fabric. If increased tension of the upper thread does not eliminate these loops, adjust the "timing" of the Feed Dog.
30. The Thread Take-up Spring (Check Spring), is not adjusted correctly and does not take up the slack of the upper thread. The Needle pierces and tears the upper thread.	30. Adjust the Thread Take-up Spring. There must be no thread under the point of the Needle when the Needle is about to enter the fabric.
31. The Thread Take-up Spring is bent out of shape or broken.	31. Bend the deformed spring back to its proper shape, if possible. Replace a badly defective or broken spring with a new one.
32. The loop of the upper thread twists around itself below the Throat Plate, thus forming two small loops. The point of the Loop Taker (Hook) enters both loops, causing the upper thread to break.	32. This trouble may be caused by the following reasons: a. The grooves in the Needle are too shallow. Replace the defective Needle with one of good quality. b. The point of the Loop Taker is too close to the Needle. Adjust the clearance between the Needle and the point of the Loop Taker. The point of the Loop Taker should be set as close as possible to the Needle without touching it. c. The upper thread is not of the required quality. Use a different quality of thread.

Upper Thread (Needle Thread) Breaks—continued

Cause	Solution
33. The Loop Taker (Hook) has burrs, rough spots or rough and sharp edges which cut the upper thread. The point of the Loop Taker may be worn blunt or be damaged.	33. Smoothen the defective portions of the Loop Taker with an oil stone or with fine emery cloth, then polish them with crocus cloth or on a buffing wheel. If the point of the Loop Taker is damaged to a minor degree only, sharpen it with a fine emery stone and polish it with crocus cloth or on a buffing wheel. The material must not be taken off from the side of the point which faces the Needle. All portions of the Loop Taker, which come in contact with the upper thread, must be perfectly smooth. If the point of the Loop Taker is broken off or if the Loop Taker is defective beyond repair, replace the old Loop Taker with a new one.
34. The head of the small screw, used for adjusting the tension of the Bobbin Case, protrudes too much beyond the Tension Spring. This causes the upper thread to be caught and to break.	34. Adjust this screw so that the upper thread can slide freely over it. If necessary, remove carefully some material from the head of this screw by grinding or filing. Polish the head of the screw after this correction. If a new screw can be obtained, replace the faulty screw with the new one.
35. In machines which are provided with a Bobbin Case, the top surface of the Bobbin Case is damaged and has burrs or rough spots. This will cause the upper thread to be caught and prevent it from sliding freely around the Bobbin Case. As a result, there will be loops of thread on the underside of the seam or the upper thread will break.	35. Smoothen the defective portions of the Bobbin Case with an oil stone or with fine emery cloth, then polish them with crocus cloth or on a buffing wheel.
36.* The small coil spring inside of the Bobbin Case, which presses against the Bobbin Case Latch, is either broken or has become too weak, too much compressed or clogged with lint and dirt. The Bobbin Case Latch, therefore, does not close entirely and the Latch Lever thus prevents the upper thread from sliding freely around the Bobbin Case. The thread breaks.	36. Take out the Latch and the Latch Lever from the Bobbin Case, then remove the defective small coil spring with a needle. Clean the spring with a needle, stretch it somewhat, if necessary, then replace it in the Bobbin Case. If the spring is broken, badly deformed or too weak, replace it with a new spring.
37. In horizontal axis Rotary Hook machines, the portions of the Bobbin Case Holder and of the Bobbin Case Holder Position Bracket, which engage each other, have rough spots or sharp edges which cut the thread.	37. Smoothen these portions with an oil stone or with fine emery cloth, then polish them with crocus cloth or on a buffing wheel.
38. The Hook or the Bobbin Case may possess an incorrect shape which does not permit the upper thread to slide freely around these parts.	38. Remove the Slide Plate from the bed of the machine, turn the Balance Wheel by hand and observe how the upper thread slides around the Hook or the Bobbin Case. Take the aforementioned parts out of the machine, and with fine emery cloth remove any excess material from those portions where the upper thread gets caught. Polish these portions with crocus cloth or on a buffing wheel. If not successful, replace the defective part with a correct one.
39. The Loop Taker (Hook) is not adjusted (timed) correctly in relation to the Needle.	39. Adjust the machine so that the point of the Loop Taker enters the loop of the upper thread at the correct time. For "timing," follow this general rule: The Needle must have risen about 3/32 of an inch from its lowest position at the moment the point of the Loop Taker is just at the center of the rising needle. At this moment the point of the Loop Taker must be about 1/16 of an inch above the eye of the Needle.
40. Some of the parts along which the upper thread passes (Thread Guides, Tension Discs, Thread Take-up Spring, Thread Take-up Lever, etc.) may have become rough or sharp and possess deep sharp grooves.	40. With fine emery cloth or with emery cord remove all rough or sharp portions and the grooves, worn by the upper thread into these parts. If these parts are too badly worn, replace them with new parts.

*Applies only to machines with horizontal axis hooks.

Uneven Thread (Needle Thread) Breaks—continued

Cause	Solution
41. The top edge and the inside of the stitch hole in the feed dog have become rough, sharp or chipped. This may be due to wear or to breaking of needles.	41. Smoothen the stitch hole with fine emery cord. If the damage is excessive, replace the defective feed dog with a new one.
42. The Needle is too close to the edge of the slot (or the stitch hole) in the Presser Foot and rubs against the Presser Foot.	42. Check the straightness of the needle and replace it, if necessary, with a new straight Needle. If the Presser Foot is not correctly aligned, adjust it as follows: Loosen the screw which holds the Presser Bar in position. This screw is located behind the Face Plate of the machine. Turn the Presser Bar until the Needle goes through the center of the slot (or the stitch hole) in the Presser Foot, then tighten the aforementioned screw firmly.
43. The Needle is too close to the Loop Taker (Hook) and rubs against the point of the Loop Taker.	43. Check the straightness of the Needle and replace it, if bent, with a new straight Needle. If the Needle still touches the point of the Loop Taker, adjust the clearance between Needle and Loop Taker by moving the Loop Taker somewhat from the Needle. The point of the Loop Taker should be set as close as possible to the Needle without touching it.
44. The portions of the Presser Foot, close to which the Needle passes, are rough, sharp or chipped.	44. Remove the Presser Foot and smoothen the defective portions with fine emery cloth. Polish them with crocus cloth afterwards.
45. The Balance Wheel revolves in the wrong direction.	45. The Feed Dog must move the fabric away from the operator. Observe the Feed Dog and change direction of motor so that the above requirement is met.
46. Sometimes the fabric to be sewn may cause breakage of the upper thread.	46. Experiment with various grades of thread and with different thread tensions. Eventually change tension and movement of the Thread Take-up Spring. It may also be necessary to change the timing of the Feed Dog if the same type of fabric is being sewn for a greater length of time.
47. A needle thread of the wrong twist is used, causing the thread to unravel or to break.	47. Use a needle thread with the twist recommended for the machine in use. Left twist thread is required for single needle machines.

Notes

Lower Thread (Bobbin Thread) Breaks

Cause	Solution
1. The tension of the lower thread is too tight.	1. Loosen the tension of the Tension Spring on the Bobbin Case by means of the Tension Adjusting Screw.
2. The Bobbin Case is threaded incorrectly.	2. Thread the Bobbin Case correctly.
3. The Bobbin is wound too full and cannot revolve freely in the Bobbin Case.	3. Remove some of the thread so that the Bobbin can revolve freely in the Bobbin Case.
4. Lint or dirt have accumulated in the Bobbin Case, thus preventing the Bobbin from revolving freely.	4. With a pointed pin remove lint and dirt from these parts. Clean with kerosene, then dry thoroughly.
5. The Bobbin (inserted in the Bobbin Case) is bent and cannot revolve freely.	5. Replace the defective Bobbin with a new one.
6. The edges of the bobbin flanges are rough, sharp, or have nicks.	6. Remove the Bobbin and smoothen the defective portion with an oil stone. If badly defective, replace the old Bobbin with a new one.
7. The edges of the Tension Spring on the Bobbin Case are rough or sharp. The thread has cut a groove into the Tension Spring.	7. Smoothen, if possible, the defective portion of the spring with an oil stone. If the damage is too severe or if the thread has worn a deep groove in the underside of the Tension Spring, replace the old spring with a new one.
8. Lint, dirt or a piece of thread have accumulated underneath the Tension Spring of the Bobbin Case.	8. Remove the Tension Spring. Clean all parts with kerosene, then dry them thoroughly. Replace the Tension Spring and adjust it correctly.
9. The pressure upon the fabric is too heavy.	9. Reduce the pressure upon the Presser Foot.
10. The lower thread runs incorrectly from the Bobbin Case up through the stitch hole of the feed dog. This causes the lower thread to be caught and torn by the point of the Loop Taker (hook). This may happen if either the Bobbin Case is damaged and cannot be seated correctly in the machine, or if the Hook is damaged in a manner so as to prevent the Bobbin Case from being seated correctly.	10. Remove the Slide Plate and observe how the lower thread runs from the Bobbin Case to the underside of the feed dog. Replace the defective part (Bobbin Case), if the damage cannot be repaired.
11. The lower thread runs incorrectly from the Bobbin Case up through the stitch hole of the feed dog and is caught and pierced by the Needle.	11. Remove the Slide Plate and observe how the lower thread runs from the Bobbin Case, to the underside of the feed dog. Check also whether the Needle is of correct length and whether it is inserted properly in the Needle Bar. Eliminate any interference of the Needle with the lower thread by either exchanging the wrong Needle with a correct one, by pushing the correct Needle entirely up in the Needle Bar or by adjusting the Needle Bar upward in the machine, if it is set too low.
12. The stitch hole in the feed dog has rough spots or sharp edges.	12. Smoothen the stitch hole in the feed dog with fine emery cord.
13. The end of the small screw, inside of the Bobbin Case, presses against the Bobbin and prevents it from revolving freely.	13. If this small screw has become loose, tighten it firmly. If the trouble still persists, remove the screw and carefully file or grind off part of the material from the end of this screw until the Bobbin revolves freely. If necessary, replace the defective screw with a new one.
14. There may be rough or sharp spots at any of the holes, slots and edges of the Bobbin Case, where the lower thread passes.	14. With fine emery cloth or with emery cord smoothen these defective portions, then polish them with crocus cloth or on a buffing wheel.
15. The Feed Dog is adjusted too low. The lower thread catches somewhere on the Feed Dog and breaks.	15. Adjust the Feed Dog to its correct position by raising somewhat the Feed Bar to which the Feed Dog is attached.
16. The Feed Dog has a rough or sharp spot somewhere at its underside. The lower thread, sliding over this defective portion, breaks.	16. Smoothen the defective portion of the Feed Dog with an oil stone or with fine emery cloth. Polish with crocus cloth.

Lower Thread (Bobbin Thread) Breaks—continued

Cause	Solution
17. The teeth of the Feed Dog are too sharp and cut the lower thread.	17. With a flat oil stone or with a strip of fine emery cloth, which is folded over a flat file, gently remove the keen sharpness from the teeth of the Feed Dog.
18. There are rough spots or sharp edges somewhere below the bed of the machine where the lower thread passes.	18. Examine all parts along which the lower thread passes. Smoothen any defective portions with fine emery cloth and polish them with crocus cloth.
19. The lower thread is of poor quality. The thread may be too weak or rotten due to improper storage. The thread may have small knots which cannot pass underneath the Tension Spring of the Bobbin Case.	19. Replace the inferior thread with one of good quality.

The Needle Breaks

Cause	Solution
1. The operator pulls the fabric during sewing. The Needle strikes an obstacle and bends or breaks.	1. The fabric must not be pulled during sewing. The machine alone must feed the fabric.
2. Some portions of the fabric are too hard or too thick. The Needle bends or breaks.	2. Sew SLOWLY over such hard or thick portions of the fabric. If necessary, use a heavier Needle.
3. The Needle has a blunt point and cannot penetrate the fabric.	3. Replace the blunt Needle with a new one which is pointed correctly.
4. The Needle is held loosely in the Needle Bar.	4. Insert a new Needle and make certain to tighten the needle clamping screw firmly.
5. The Needle is bent and strikes the Presser Foot or the feed dog.	5. Replace the defective Needle with a new straight Needle.
6. The Needle is too long and hits the Bobbin Case.	6. Replace the wrong Needle with one of correct length.
7. The Needle is set too low.	7. Insert a new Needle and push it entirely up into the Needle Bar. If the Needle Bar is set too low, adjust it correctly.
8. The stitch hole in the Feed Dog is too small for the Needle in use.	8. Select a Feed Dog with a sufficiently large stitch hole. The Needle must go through the center of the stitch hole.
9. The Throat Plate is not held firmly in place. Its screws are not tightened securely. The Throat Plate shifts around and is being hit by the Needle.	9. Locate the Throat Plate correctly and tighten firmly the throat plate screws.
10. The Presser Foot is not attached firmly to the Presser Bar and shifts sideways. The Needle hits the Presser Foot.	10. Tighten firmly the Presser Foot Screw.
11. The Presser Foot is not lined up correctly in the machine and is being struck by the Needle.	11. Line up the Presser Foot as follows: Loosen the screw which holds the Presser Bar in position. This screw is located behind the Face Plate of the machine. Now turn the Presser Bar until the Needle goes through the center of the slot (or of the stitch hole) in the Presser Foot. Tighten firmly the above screw after this adjustment.
12. The Hinge Type Presser Foot, when installed, is worn excessively. The lower portion (plate) of the Presser Foot has too much looseness and shifts sideways, causing the Needle to strike it.	12. Replace the worn Presser Foot with a new one.
13. The upper thread is too heavy for the Needle in use. The Needle bends, strikes the Throat Plate or Feed Dog and breaks.	13. Replace the wrong Needle with a correct one, or change the size of the upper thread. Consult the Needle and Thread" chapter.
14. The upper thread has knots which cannot pass through the eye of the Needle.	14. Replace the inferior thread with one of good quality.

The Needle Breaks—continued

Cause	Solution
15. There is not sufficient pressure on the Presser Foot while sewing heavy fabrics.	15. When sewing heavy fabrics, increase the pressure on the Presser Foot.
16. The user of the machine removes the fabric from underneath the Presser Foot without releasing the upper thread tension.	16. Every time the fabric is withdrawn from the machine, the Presser Bar must be raised to its highest position by means of the Presser Bar or knee Lifter. This will release the tension of the upper thread. The fabric must always be withdrawn AWAY from the operator.
17. The Needle is still in the fabric while the operator tries to remove the material from the machine.	17. The Needle must always have risen ABOVE the fabric before the material is removed from the machine.
18. Dirt in the Needle Clamp prevents the Needle from stitching straight into the fabric.	18. Remove all dirt from the Needle Clamp, insert a new straight Needle and tighten firmly the screw which holds the Needle.
19. The lower end of the Needle Bar is bent. The Needle, therefore, does not stitch straight into the fabric.	19. If the machine still turns easily, bring the Needle Bar up to its highest position and tap its lower end lightly with a hammer until the straight Needle goes through the center of the stitch hole in the feed dog. If the machine turns heavily, remove the bent Needle Bar and replace it with a new one.
20. The Needle Bar or the Bearings of the Needle Bar, are worn excessively. The Needle Bar sways sideways, the Needle strikes the Presser Foot, the Feed Dog or the Throat Plate and breaks.	20. Replace the worn Needle Bar or the worn Needle Bar Frame with new parts.
21. The Thread Take-up Spring (Check Spring) is not adjusted correctly. It exerts too much pull on the upper thread at the moment the Needle enters the fabric. The Needle bends, strikes the feed dog, etc. and breaks.	21. Adjust the Thread Take-up Spring. The loop of this spring must have finished its upward motion at the moment the Needle enters the fabric.
22. The Thread Take-up Lever is not adjusted correctly and pulls the upper thread at the moment the Needle enters the fabric. The Needle bends, strikes the feed dog, etc. and breaks.	22. Adjust the Thread Take-up Lever. This lever must move downward and "give" thread when the Needle enters the fabric.
23. The point of the Loop Taker is too close to the Needle.	23. Adjust the clearance between the Needle and the Loop Taker by moving the Loop Taker somewhat away from the Needle. The point of the Loop Taker should be set as close as possible to the Needle without touching it.
24. There is no material between Presser Foot and Throat Plate during sewing. The thread gets entangled below the Throat Plate and the Needle breaks.	24. Make certain that there is always material between Presser Foot and Throat Plate during sewing.

Skipping Stitches

Cause	Solution
1. The machine is not threaded correctly.	1. Check whether the upper thread runs correctly from the spool of thread to the Needle. See illustration showing threading of the machine being used.
2. An incorrect Needle is used in the machine. The Needle may be too short or too long.	2. Remove the wrong Needle and insert a Needle recommended for the machine in use.
3. The Needle is inserted incorrectly in the Needle Bar. The eye of the Needle is turned in the wrong direction.	3. Insert the Needle so that its eye is at a right angle with the direction of sewing and the short groove of the Needle faces the point of the Loop Taker (Hook).
4. The Needle is bent and does not stitch straight into the fabric.	4. Replace the bent Needle with a new straight needle.
5. Lint or dirt in the Needle hole prevent the Needle from stitching straight into the fabric.	5. Remove lint and dirt from the Needle Clamp, insert a new straight Needle and tighten firmly the screw which holds the Needle.

Skipping Stitches—continued

Cause	Solution
6. The Needle is too close to the edge of the stitch hole in the Feed Dog and even strikes the edge of this hole.	6. Check whether the Needle is bent. Replace a bent Needle with a new straight Needle. Check also whether the Feed Dog Screws are loose and tighten these screws firmly, if necessary.
7. The stitch hole in the Feed Dog is too large.	7. Replace the Feed Dog with one which has a smaller stitch hole.
8. The grooves in the Needle are clogged with dirt and do not permit the loop of the upper thread to form properly.	8. Clean the Needle with a soft rag. Be careful not to bend the Needle.
9. The slot (or the stitch hole) in the Presser Foot is too wide (or the stitch hole is too large). This causes the rising Needle to carry the fabric with it when sewing over thin fabrics, thus preventing the loop of the upper thread to form properly.	9. Replace the incorrect Presser Foot with one having a correct slot (or stitch hole).
10. If a one-piece Presser Foot is used, the foot, when sewing from thick to thin fabrics, or conversely, does not hold the fabric down firmly.	10. Hold the fabric down by hand while sewing, or replace the one-piece Presser Foot with a Hinged Presser Foot.
11. The pressure of the Presser Foot upon the fabric is insufficient. The fabric is not held down firmly.	11. Hold the fabric down by hand while sewing, or replace the one-piece Presser Foot with a Hinged Presser Foot.
12. The pressure of the Presser Foot upon the fabric is insufficient. The fabric is not held down firmly.	12. Increase the pressure upon the fabric.
13. The Needle is too close to the edge of the slot (or of the stitch hole) in the Presser Foot.	13. Line up the Presser Foot as follows: Loosen the screw which holds the Presser Bar in position. This screw is located behind the Face Plate of the machine. Now turn the Presser Bar until the Needle goes through the center of the slot (or of the stitch hole) in the Presser Foot. Tighten firmly the above screw after this adjustment.
14. The Bobbin is empty.	14. Replace with a filled Bobbin.
15. The end of the lower thread, which extends from the Bobbin, is too short and cannot be carried along and brought above the Feed Dog by the upper thread.	15. Pull more thread (about four to five inches) out of the Bobbin Case.
16. The upper thread is too heavy for the Needle in use.	16. Replace the Needle with one of the correct size. Consult the "Needle and Thread" chapter.
17. The Needle is too heavy for the thread in use. The thread has too much space in the eye of the Needle.	17. Replace the Needle with one of the correct size. Consult the "Needle and Thread" chapter.
18. The thickness of the upper thread is not uniform. The thread has knots or heavy and thin portions.	18. Replace the inferior thread with one of uniform thickness.
19. The upper thread may be too soft and does not form a proper loop underneath the Throat Plate.	19. Replace the thread with one of proper quality. Use a somewhat stiffer thread.
20. Oil on the upper thread prevents proper formation of the loop underneath the Throat Plate.	20. Remove the oily portion of the thread and prevent the upper thread from getting soaked with oil. Carefully wipe oil from Needle, Throat Plate and Loop Taker (Hook) and feed dog.
21. The Thread Take-up Spring (Check Spring) is not adjusted correctly. It has too much tension or releases the upper thread too late.	21. Adjust the Thread Take-up Spring. The upper thread must become loose at the moment the Needle enters the fabric.

Cause	Solution
22. The Loop Taker (Hook) is timed too early or too late in relation to the Needle. If timed too early, the loop of the upper thread is still too small to be caught and entered by the point of the Loop Taker. If too late, the loop of the upper thread is already too large and twists sideways, thereby being missed by the point of the Loop Taker.	22. Make certain that the Needle is pushed all the way up into the Needle Bar. Also check whether the Needle is timed correctly in relation to the Loop Taker. For "Timing" follow this general rule: The Needle must have risen about 3/32 of an inch from its lowest position at the moment the point of the Loop Taker is just at the center of the rising Needle. At this moment the point of the Loop Taker must be about 1/16 of an inch above the eye of the Needle (see page 00).
23. The clearance between the Needle and the point of the Loop Taker (Hook) is too large.	23. Bring the point of the Loop Taker closer to the Needle. The point of the Loop Taker should be set as close as possible to the needle without touching it.
24. The point of the Loop Taker (Hook) is blunt, damaged or broken off.	24. If the point of the Loop Taker is worn or damaged to a minor degree only, sharpen it with a fine emery stone or with fine emery cloth, then polish it with crocus cloth or on a buffing wheel. The material of the Loop Taker must not be taken off from that side of the point which faces the Needle. If the point of the Loop Taker is broken off or if the Loop Taker is defective beyond repair, replace the old Loop Taker with a new one.
25. The lower end of the Needle Bar is bent. The Needle, therefore, does not stitch straight into the fabric.	25. If the machine turns easily, bring the Needle Bar to its highest position, then tap the Needle Bar lightly with a hammer until the Needle goes through the center of the stitch hole in the Feed Dog.
26. The Needle Bar or Needle Bar Frame is badly worn. The Needle Bar is too loose in its bearings and sways sideways.	26. Replace the worn Needle Bar with a new one. Replace also worn Needle Bar Frame.
27. The Needle Bar has play (lost motion) in vertical direction. This may be due to the Needle Bar linkage being badly worn.	27. Replace the worn and defective parts with new ones.
28. The Throat Plate is not flat, but is slightly bent downward due to repeated dropping of the Presser.	28. If facilities for repairs are available, place the old Throat Plate, top surface down, on a flat surface (surface plate) and straighten it by tapping it carefully with a hammer. If badly defective, replace the old Throat Plate with a new one.
29. The bottom surface of the Presser Foot does not rest fully (flush) upon the fabric.	29. Check whether there is lint or dirt between the Presser Foot and the Presser Bar. Remove lint or dirt and tighten firmly the Presser Foot Screw. Check whether the Presser Foot rests upon the machine. If the Presser Foot is defective, replace it with a Foot which rests with its entire bottom face upon the machine.
30. The type of fabric to be sewn makes the formation of the loop of the upper thread difficult. The fabric may also be sticky and, therefore, does not permit the proper formation of the loop of the upper thread.	30. Experiment with various grades of threads and needles, until a proper stitch can be obtained. It may also be necessary to adjust the Loop Taker (Hook) in relation to the Needle in such a manner that a proper stitch can be obtained. Sometimes it will help to give a different tension to the upper thread or to the Thread Take-up Spring (Check Spring).
31. A needle thread of the wrong twist is used. The thread unravels and forms an improper loop above the needle eye, thereby being missed by the point of the Loop Taker (Hook).	31. Use a needle thread with left twist.

Loops or Knots on Top Surface of Fabric.

The upper thread lies straight on the top surface of the fabric and the lower thead appears there in form of small knots.

Cause	Solution
1. The tension of the upper thread is too tight or the tension of the lower thread is too weak.	1. Loosen the tension of the upper thread or tighten the tension of the lower thread, until the tensions of both threads are correctly balanced.
2. The Tension Spring of the Bobbin Case is bent out of its proper shape. This condition does not provide sufficient tension of the lower thread.	2. Try to correct the deformed spring by carefully reshaping it with a small round-nosed pliers. If not successful, replace the defective spring with a new one.
3. Lint, dirt, or pieces of thread have accumulated underneath the Tension Spring of the Bobbin Case.	3. Remove the Tension Spring. Clean the spring and the Bobbin Case, then replace the spring and adjust it correctly.
4. Rusty or rough spots between the Tension Discs.	4. Remove rusty or rough spots with fine emery cloth and polish with crocus cloth. Replace badly defective Tension Discs with new ones.

Loops or Knots on the Underside of the Fabric

The lower thread lies straight on the underside of fabric and the upper thread appears there in form of loops or small knots.

Cause	Solution
1. The tension of the upper thread is too weak or the tension of the lower thread is too tight.	1. Tighten the tension of the upper thread, or loosen the tension of the lower thread, until the tensions of both threads are correctly balanced.
2. There are dirt, lint or pieces of thread between the Tension Discs.	2. Take apart the upper tension, clean the Tension Discs thoroughly, then replace the upper tension and adjust it correctly.
3. The upper thread has cut deep grooves into the Tension Discs.	3. Replace the defective Tension Discs with new ones.
4. The Bobbin Case is not threaded correctly. The The Bobbin unwinds itself in the wrong direction.	4. Thread the Bobbin Case correctly.
5. The head of the Tension Adjusting Screw of the Bobbin Case protrudes too much and catches and retards the upper thread.	5. Adjust this screw correctly. If this condition continues to persist, smoothen the head of this screw with fine emery cloth or replace the defective screw with a new one.
6. The stitch hole in the Throat Plate or Feed Dog is too small.	6. Replace the Throat Plate or Feed Dog with one which has a larger stitch hole.
7. The point of the Needle is bent over ("hooked point").	7. Replace the defective Needle with a new one.
8. The Bobbin is not evenly wound. It unwinds itself irregularly.	8. Replace the Bobbin with one which is wound evenly.
9. The Bobbin is damaged or bent and does not revolve freely and evenly.	9. Replace the defective Bobbin with a new one.
10. Lint or dirt in the Bobbin Case prevent the Bobbin from revolving freely.	10. With a pointed pin remove all dirt from this part. Clean with kerosene and dry thoroughly before replacing in the machine.
11. The needle is not correctly timed in relation to the Loop Taker (Hook).	11. Make certain that the Needle is pushed all the way up into the Needle Bar and held there firmly. Adjust the point of the Loop Taker in relation to the Needle. For "Timing" follow this general rule: The Needle must have risen about 3/32 of an inch from its lowest position at the moment the point of the Loop Taker is just at the center of the rising Needle. At this moment the point of the Loop Taker must be about 1/16 of an inch above the eye of the Needle.

Loops or Knots on the Underside of the Fabric—continued

Cause	Solution
12. There is insufficient clearance between the Bobbin Case Holder and the Bobbin Case Holder Position Bracket in horizontal axis Rotary Hook Machines. On vertical axis rotating hook types may be insufficient clearance between tab extending from Bobbin Case to the left and the notch at the underside of the Throat Plate.	12. Turn the machine by hand and observe where the upper thread gets caught. Increase the clearance, where required, by carefully removing material from the component parts of the machine (by means of fine emery cloth). Smoothen the repaired portions with crocus cloth. The heaviest thread to be used must pass freely between these parts.
13. The mechanism for releasing the upper thread tension is incorrectly adjusted. It releases the tension of the upper thread too early.	13. Adjust this mechanism so that the tension of the upper thread is released only during the last moment of the upward motion of the Presser Bar Lifter.
14. The upper thread gets caught somewhere below the Throat Plate.	14. Examine Hook and Bobbin Case with regard to rough spots which may catch the upper thread and retard it, thus causing the loops on the underside of the fabric. Eliminate all rough spots with the aid of an oil stone or with fine emery cloth, then polish these portions with crocus cloth or on a buffing wheel.
15. The Thread Take-up Spring (Check Spring) is not adjusted and does not work properly.	15. Adjust the Thread Take-up Spring until it has the correct tension and its upward motion is just finished at the moment the Needle enters the fabric.

Uneven and Loose Stitches

Cause	Solution
1. The machine is not threaded correctly.	1. Check whether the upper thread runs correctly from the spool of thread to the Needle. See illustration showing threading of the machine being used. Consult instruction book.
2. The upper thread is somehow prevented from unwinding itself from its spool.	2. Free the upper thread so that it can unwind itself easily.
3. Some of the parts of the tension mechanism for the upper thread are incorrectly assembled or are defective.	3. Examine and adjust the tension mechanism for the upper thread. Replace defective parts or repair them, if possible.
4. The upper thread is of irregular thickness and has also small knots.	4. Replace the inferior thread with one of good quality.
5. The Needle is too heavy or too fine for the upper thread.	5. Select a Needle of proper size for the thread in use. Consult "Needle and Thread" chapter.
6. The upper thread is too coarse for the type of work.	6. Use an upper thread suitable for the type of fabric in work. See "Needle and Thread" chapter.
7. The upper thread is too heavy or too thin in relation to the lower thread.	7. It is desirable that both threads are of equal thickness. The lower thread may be somewhat thinner (but not heavier) than the upper thread.
8. Some of the Thread Guides through which the upper thread passes are rough or have deep grooves.	8. Remove rough portions or grooves with fine emery cloth or emery cord. Replace badly defective parts with new ones.
9. The stitch hole in the Feed Dog is too small or too large.	9. Replace the feed dog with one which has the correct stitch hole.
10. The edges of the stitch hole in the Feed Dog, along which both threads slide, are not sufficiently smooth and retard the threads.	10. With fine emery cord round off those portions of the stitch hole along which both threads slide.
11. The edges of the slot (or of the stitch hole) in the Presser Foot are not smooth.	11. With fine emery cloth or emery cord round off these edges of the Presser Foot.

Uneven and Loose Stitches—continued

Cause	Solution
12. The lower thread gets caught somewhere underneath the Tension Spring of the Bobbin Case.	12. Remove the Tension Spring. Examine the spring, or the Bobbin Case. Clean these parts thoroughly and remove any rough spots with fine emery cloth. If badly defective replace the old Tension spring with a new one.
13. The mechanism of the Thread Take-up Lever is worn. The Thread Take-up Lever cannot properly tie up the stitch.	13. Examine the mechanism of the Thread Take-up Lever and replace worn or defective parts with new ones.

Stitches are of Uneven Length

Cause	Solution
1. The pressure of the Presser Foot is insufficient. The fabric slips.	1. Increase the pressure of the Presser Foot.
2. The Presser Bar, due to gummed oil, cannot move freely up and down and sticks in the machine.	2. Remove the Presser Bar. Clean the bar and its bearings in the machine with kerosene, then replace the Presser Bar.
3. The Presser Foot is not firmly attached to the Presser Bar.	3. Tighten firmly the screw which holds the Presser Foot to the Presser Bar.
4. The Feed Dog is not firmly attached to the Feed Bar.	4. Tighten firmly the screws which hold the Feed Dog to the Feed Bar.
5. The teeth of the Feed Dog, and the portions around it, are clogged with lint and dirt.	5. Remove the Throat Plate and the Feed Dog, clean both parts thoroughly in kerosene, then replace them in the machine.
6. The Stitch Regulator Screw is loose—horizontal axis Rotating Hook Machines only.	6. Tighten the Stitch Regulator Screw firmly in the position desired.
7. The machine is adjusted for too short a stitch.	7. Increase the length of the stitch by means of the Stitch Regulator.
8. The bottom face of the Presser Foot does not rest fully (flush) on the Feed Dog.	8. Test the Presser Foot to find out how it rests on the Feed Dog. If facilities for repairs are available, bend the shank of the Presser Foot until the bottom face of the Foot rests fully (flush) on the Feed Dog. Test the Presser Foot again after this correction. If the Presser Foot cannot be corrected, replace it with a new Foot.
9. The lower end of the Presser Bar is bent. The Presser Foot, therefore, does not rest fully (flat) on the Feed Dog.	9. Bring the Presser Bar up to its highest position, then straighten the lower end of the bar by tapping it lightly with a hammer. Do not damage or distort the lower end of the bar during this straightening operation. Test the Presser Foot again after the correction of the Presser Bar.
10. The teeth of the Feed Dog do not rise sufficiently high above the Throat Plate during the feeding of the fabric.	10. Adjust the Feed Dog by raising somewhat the Feed Bar to which the Feed Dog is attached. The full depth of the teeth should be above the Throat Plate during the feeding of the fabric.
11. There is looseness or wear somewhere between the various parts of the feeding mechanism.	11. Check for looseness of connections, shafts and bearings. Adjust these parts so that no noticeable looseness can be observed. The various parts of the feeding mechanism must not bind after this adjustment. Replace badly defective parts and adjust them correctly.
12. The Feed Dog is set too high. As a result, during the backward movement of the Feed Dog (toward the operator) the teeth do not sink below the top surface of the Throat Plate. The fabric moves jerkily.	12. Adjust the Feed Dog by lowering somewhat the Feed Bar to which the Feed Dog is attached. The teeth of the Feed Dog must be below the top surface of the Throat Plate during the backward movement of the Feed Dog.
13. The teeth of the Feed Dog are worn and dull.	13. If the Feed Dog is worn excessively, replace it with a new Feed Dog.

Staggered Stitches

Cause	Solution
1. The pressure of the Presser Foot is insufficient. The fabric is not held down firmly.	1. Increase the pressure of the Presser Foot.
2. The Presser Foot is not firmly attached to the Presser Bar.	2. Tighten firmly the screw which holds the Presser Foot to the Presser Bar.
3. The Feed Dog is not firmly attached to the Feed Bar.	3. Tighten firmly the screws which hold the Feed Dog to the Feed Bar.
4. The Feed Dog is not adjusted straight in the machine.	4. Loosen somewhat the screws which hold the Feed Dog to the Feed Bar, then adjust the Feed Dog so that it is in line with the direction of sewing. Tighten the above screws firmly after this adjustment.
5. The Thread Take-up Spring (Check Spring) may be defective. It is also possible that it is not adjusted correctly and that its tension is too weak.	5. Replace a defective spring with a new one. Adjust the movement and the tension of the spring. The upward movement of the loop of the spring must have stopped at the moment the Needle is about to enter the fabric.
6. The loop of the Thread Take-up Spring is bent sideways.	6. Bend back the loop of this spring to its correct shape. If badly defective, replace the spring with a new one.
7. The color of upper and lower thread, being different from the color of the fabric, will make staggered stitches more obvious.	7. If possible, choose threads of the same color as that of the fabric to be sewn.

Improper Feeding of the Fabric.

Cause	Solution
1. The pressure of the Presser Foot is insufficient. The fabric slips and is not fed in a straight line. As a result, the seam may be curved.	1. Increase the pressure of the Presser Foot.
2. The Presser Bar is set too high in the machine. The Presser Foot does not rest firmly or does not rest at all upon the fabric.	2. Loosen the screw which holds the Presser Bar in position. This screw can be found behind the Face Plate of the machine. Push down the Presser Bar until the Presser Foot rests firmly on the Feed Dog. Make certain that the Presser Foot is lined up correctly with the Needle. Tighten the above screw securely.
3. The Presser Bar, due to gummed oil, cannot move freely up and down and sticks in the machine.	3. Remove the Presser Bar. Clean the bar and its bearings in the machine with kerosene, then replace the Presser Bar.
4. The Needle is bent. The fabric does not move in a straight line.	4. Replace the defective Needle with a new straight Needle.
5. The Stitch Regulator may be in the neutral position (on zero). The machine does not feed at all.	5. Set the Stitch Regulator to the desired length of stitch.
6. The Presser Foot is not firmly attached to the Presser Bar.	6. Tighten firmly the screw which holds the Presser Foot to the Presser Bar.
7. The bottom face of the Presser Foot is too short and, as a result, there is too much pressure on the fabric. The Feed Dog shifts the lower ply of the fabric against the upper ply.	7. Reduce the pressure of the Presser Foot. If possible, use a Presser Foot with a longer bottom plate.
8. The teeth of the Feed Dog are clogged with lint, dirt, and gummed oil. The fabric, therefore, cannot be moved properly by the Feed Dog.	8. Remove the Feed Dog, clean it thoroughly with a pointed pin or with a small stiff brush, frequently dipped in kerosene. Replace the Feed Dog in the machine.
9. The Feed Dog is not attached firmly to the Feed Bar.	9. Tighten firmly the screws which hold the Feed Dog to the Feed Bar.
10. An accumulation of lint, dirt and gummed oil, below the Throat Plate and between the rows of teeth of the Feed Dog hampers the free motion of the Feed Dog.	10. Remove the Throat Plate and Feed Dog. Clean them thoroughly with a small stiff brush and kerosene, then replace them in the machine.

Improper Feeding of the Fabric-continued

11. The Feed Dog is adjusted too low. Its teeth do not rise sufficiently high or do not rise at all above the Throat Plate.	11. Adjust the Feed Dog higher by raising the Feed Bar to which the Feed Dog is attached. The teeth of the Feed Dog, when in highest position, should be fully above the top surface of the Throat Plate.
12. The Feed Dog is adjusted too high. The Feed Dog hits against the underside of the Throat Plate and cannot move freely.	12. Adjust the Feed Dog by lowering the Feed Bar to which the Feed Dog is attached. After this adjustment, make certain that the full height of the teeth is still visible above the Throat Plate when the Feed Dog is in its highest position.
13. The teeth of the Feed Dog are worn blunt.	13. If the Feed Dog is worn excessively, replace it with a new Feed Dog.
14. The bottom face of the Presser Foot rests with one side only on the Feed Dog.	14. There may be several causes for this defect: a. The bottom face of the Presser Foot is not square with the shank of the Foot. Lower the Presser Foot and test how the entire bottom face rests on the Throat Plate or the Feed Dog. If facilities for repairs are available, bend the shank or grind the bottom face of the Presser Foot until it rests fully (flush) on Throat Plate and Feed Dog. If the defective Presser Foot cannot be corrected, replace it with a new Foot. b. The lower end of the Presser Bar is bent. Bring the Presser Bar to its highest position and straighten its lower end by tapping it lightly with a hammer. Do not damage the end portion of the Presser Bar during this procedure. c. The teeth of the Feed Dog are worn down too much on one side. Replace it with a new Feed Dog.
15. The toes of the Presser Foot are not bent up sufficiently, causing the material to get caught when sewing from thin to thick fabrics.	15. Bend up the toes of the Presser Foot.
16. The Throat Plate is bent downward due to repeated dropping of the Presser Foot. As a result, the fabric is not held firmly between Presser Foot and Throat Plate and slips.	16. If facilities for repairs are available, place the old Throat Plate, top surface down, on a flat surface (surface plate) and straighten it by tapping it carefully with a hammer. If badly defective, replace the old Throat Plate with a new one.

The Fabric Puckers

Cause	Solution
1. The tension of the upper thread or that of the lower thread (or the tensions of both threads) are too tight and not correctly balanced.	1. Loosen the tensions of both threads and adjust them until they are correctly balanced. Try to sew with light tension only.
2. The stitch is too long for the type of fabric in work.	2. Reduce the length of stitch by means of the Stitch Regulator, especially when sewing fine fabrics.
3. The Feed Dog is set too high for the type of fabric in work.	3. Adjust the Feed Dog by lowering the Feed Bar to which the Feed Dog is attached.
4. The point of the Needle is blunt.	4. Replace the defective Needle.
5. The Feed Dog does not rise with all its teeth simultaneously above the Throat Plate, and the teeth are not parallel to the top surface of the Throat Plate.	5. Adjust the Feed Dog so that all its teeth rise at the same time above the Throat Plate and the tips of all the teeth are parallel to the top surface of the Throat Plate. This is being done by adjusting the Feed Bar to which the Feed Dog is attached.
6. The fabric being sewn is thin and the pressure of the Presser Foot is too heavy.	6. Reduce the pressure of the Presser Foot. Loosen both thread tensions.
7. The bottom plate of the Presser Foot, which rests on the Feed Dog, is too short, or the heel portion of the Presser Foot is not correctly rounded off.	7. Replace the old Presser Foot with one which has a longer bottom plate. The entire bottom plate must rest fully (flush) on the Feed Dog. Round off the heel portion of the Presser Foot on a fine emery wheel or with a strip of fine emery cloth, folded over a flat file.

The Machine Turns Heavily or Jams

Cause	Solution
1. Sewing Thread has wedged itself between the Balance Wheel and the arm of the machine.	1. Remove the Balance Wheel, and eliminate the thread with a sharp knife or a pointed pin.
2. The Balance Wheel is forced too tight against the arm of the machine.	2. Loosen the close contact between the Balance Wheel and the arm of the machine. This can be done by *lightly* tapping the Balance Wheel away from the arm of the machine with a hammer. Revolve the Balance Wheel by hand during this procedure.
3. There is too much pressure on the fabric.	3. Reduce the pressure of the Presser Foot.
4. The Feed Dog rubs against the edges of the slots in the Throat Plate.	4. Loosen somewhat the screws which hold the Feed Dog to the Feed Bar, then adjust the Feed Dog so that it can move freely in the slots of the Throat Plate. Tighten the Feed Dog Screws firmly after this adjustment. Replace the Throat Plate if the slots in it are badly defective.
5. Due to an accumulation of dirt and gummed oil between Throat Plate and Feed Dog, the Feed Dog presses against the underside of the Throat Plate.	5. Remove Throat Plate and Feed Dog. Clean these parts thoroughly in kerosene and replace them in the machine. Also clean the portions of the machine to which these parts are attached.
6. The belt, running to the Balance Wheel, is too tight.	6. Place a belt of correct length on the machine. The belt should have just enough tension so as not to slip.
7. Dirt, pieces of thread, or broken off pieces of steel have wedged themselves between Bobbin Case Holder and Rotary Hook.	7. Disassemble these parts, clean them thoroughly and replace them in the machine.
8. The bearings of the machine are tight due to rust or the use of improper oil. The oil in the bearings may be gummed. There may also be dirt in the bearings.	8. With an oil can squirt clean kerosene into all bearings and run the machine for a while. Oil the machine afterwards with good sewing machine oil. Do not use thick oil or vegetable oils. If the machine cannot be made to run easily, as suggested above, it will be necessary to disassemble the machine, to clean its parts thoroughly in kerosene and to assemble it again.
9. One or several parts inside of the machine are tight. This may be due either to improper assembly, lack of oil or some other reasons, such as bent parts, etc.	9. Disassemble the machine systematically, always trying whether it turns already freely or not. Stop disassembling the machine once you can turn it freely. Examine all parts which were removed from the machine. Repair them, if necessary, and replace badly defective parts with new ones. Clean all parts thoroughly in kerosene. Assemble now carefully the machine again, making certain that it turns freely every time a part has been inserted. Oil the machine properly after it has been assembled.
10. The Thread Take-up Lever is bent.	10. Remove the Thread Take-up Lever and straighten it, if possible. Replace with a new Thread Take-up Lever if the old one is badly defective.
11. The Throat Plate is bent downward due to repeated dropping of the Presser Foot. The Feed Dog rubs against the underside of the Throat Plate.	11. If facilities for repairs are available, place the old Throat Plate, top surface down, on a flat surface (surface plate) and straighten it by tapping it carefully with a hammer. If badly defective, replace the old Throat Plate with a new one.
12. The Needle Bar is bent.	12. Remove the Needle Bar, then turn the Balance Wheel by hand. If the machine turns easily now, it indicates that the Needle Bar is bent. Straighten the bent Needle Bar on a flat surface, if possible. Insert a new Needle Bar in the machine, if the old bar is defective beyond repair.

The Machine Turns Heavily or Jams—continued

Cause	Solution
13. The Arm Shaft of the machine is bent.	13. See whether the Balance Wheel wobbles or throws. This usually indicates that the Arm Shaft is bent. If the Arm Shaft is bent only slightly, turn the Balance Wheel by hand until its rim comes closest to the arm of the machine. Wedge a piece of hard wood between the arm of the machine and the Balance Wheel. Now hit carefully with a hammer against the wood in the direction toward the Balance Wheel, until the Balance Wheel revolves freely and perfectly round (without wobbling). If the Arm Shaft is bent badly, remove it from the machine and straighten it, or replace it with a new Arm Shaft.
14. There is no material between Presser Foot and Throat Plate during sewing. The thread gets entangled below the Throat Plate and jams the Hook.	14. Turn the Balance Wheel slowly by hand to bring the Needle above the Throat Plate. Remove the Throat Plate, then eliminate the entangled thread below the Throat Plate. Replace the Throat Plate. Make certain that there is always material between Presser Foot and Throat Plate during sewing.

The Machine Runs Noisily

Cause	Solution
1. The machine is not sufficiently oiled.	1. Oil the machine wherever lubrication is required.
2. The point of the Needle is blunt and causes a "knocking" noise when penetrating the fabric.	2. Replace the defective Needle with a new one.
3. There is an accumulation of lint, dirt and gummed oil between the underside of the Throat Plate and the Feed Dog.	3. Remove Throat Plate and Feed Dog. Clean them thoroughly with a small stiff brush and kerosene, then replace them on the machine.
4. The Face Plate, Throat Plate, Feed Dog, Presser Foot, etc. may be loose on the machine.	4. Eliminate any looseness by tightening firmly the screws which hold these parts to the machine.
5. The Feed Dog is set too high and knocks against the underside of the Throat Plate.	5. Remove the Throat Plate and adjust the Feed Dog by lowering the Feed Bar to which the Feed Dog is attached.
6. The Throat Plate is bent downward due to repeated dropping of the Presser Foot. The Feed Dog knocks against the underside of the Throat Plate.	6. If facilities for repairs are available, place the old Throat Plate, top surface down, on a flat surface (surface plate) and straighten it by tapping it carefully with a hammer. If badly defective, replace the old Throat Plate with a new one.
7. Some of the bearings or some of the parts inside the machine are loose or worn excessively.	7. Examine all bearings and connections of movable parts (shafts, needle bar, thread take-up lever, etc, and eliminate excessive looseness by inserting new bearing bushings, tightening loose connections or replacing worn machine parts with new ones.
8. There is too much clearance between the Bobbin Case Holder and the Bobbin Case Holder Positioning Bracket.	8. Replace the Bobbin Case Holder or the Positioning Bracket or replace both worn parts with new ones, if necessary.
9. In horizontal axis Rotating Hook Machines the Bobbin Case fits improperly on the post of the Bobbin Case Holder.	9. Replace the incorrect part (Bobbin Case or Bobbin Case Holder) with a correctly fitting part.
10. The Bobbin Case Holder is too loose in the Rotating Hook.	10. Replace the worn Bobbin Case holder with a new one. If necessary, replace also the worn Rotating Hook with a new one.
11. The Thread Take-up Lever is too loose on its bearings.	11. If the Thread Take-up Lever is badly worn, replace this lever with a new one.

The Machine Runs Noisily —continued

	Cause	Solution
12.	In a gear-equipped machine, the gears are not lined up correctly and do not mesh properly.	12. Adjust the gears so that they are in correct contact with each other. New gears should be run in for a while with a paste of oil and oilstone powder. The gears and the portions of the machine close to the gears must be thoroughly cleaned with kerosene after this procedure. Lubricate the gears after cleaning. Use grease as a lubricant.

The Fabric is Damaged During Sewing

	Cause	Solution
1.	There is too much pressure on the fabric. The Feed Dog, therefore, cuts into the fabric.	1. Reduce the pressure of the Presser Foot.
2.	The teeth of the Feed Dog are too sharp and cut into fabric.	2. Remove the knife-like sharpness from the teeth with a flat oil stone or with a strip of fine emery cloth which is folded over a flat file.
3.	The edges of the slots in the Throat Plate are sharp and burry, thus catching and damaging the fabric.	3. With a strip of fine emery cloth, folded over a flat file, remove the burrs and the sharp portions on top of the Throat Plate. Smoothen the top surface of the Throat Plate with crocus cloth.
4.	The bottom face of the Presser Foot is damaged and rough.	4. Smoothen the bottom face of the Presser Foot with a strip of fine emery cloth which is folded over a flat file. Polish with crocus cloth. If the Presser Foot is badly defective, replace it with a new foot.

A PRIMER
FOR THEIR MAINTENANCE AND REPAIR
WITH
EXTENSIVE TROUBLE SHOOTING GUIDANCE

This book has been written by Werner Schwartz, Technical Director of Consolidated Sewing Machine/Consew, an engineer with close to 50 years experience with industrial equipment.