identify and maintain the different types of sewing machines

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- Figure 9-1.—The Lockstitch
- Oscillating Type Sewing Machines
- Timing The 31-15
- Figure 9-5.—0iling Points At The Base Of The Machine
- Timing The Needle With The Shuttle
- Table 9-1.—Troubleshooting Chart
- Adjusting The Thread Take-Up Spring
- Figure 9-10.—Sewing Machine Needle
- Threading The Machine
- Threading The Bobbin Case
- Replacing The Bobbin Case
- Regulating The Length Of A Stitch
- Needles And Thread
- Setting The Needle
- Removing The Bobbin
- Regulating The Length Of Stitch
- Rotary Sewing Machines
- 111 W 151 Sewing Machine
- Figure 9-25a.—Class 111 Sewing Machine, Side View
- Timing The 111 W Class Sewing Machines
- Lubrication Of The Class 111 Sewing Machines
- Figure 9-27.—Base Of Machine, Showing Oiling Points
- Threading The Machine
- Replacing The Bobbin And Threading The Bobbin Case
- Singer Sewing Machine 211 W 151
- Setting The Needle Bar
- Setting Sewing Hook To Or From Needle
- Adjusting Feed Eccentric
- Removing The Arm Shaft Connection Belt
- Regulating The Length Of Stitch
- Setting And Timing The Needle Bar Frame
- Raising Or Lowering The Feed Dog
- Consew 99r And 99r-3 Sewing Machine
- Regulating The Tension
- Straight And Zigzag Sewing
- Setting The Needle Bar At The Correct Height
- To Remove And Replace The Sewing Hook
- Timing The Movement Of The Needle Bar Frame

CHAPTER 9 SEWING MACHINES

Learning Objective:
Upon completion of this chapter, you will be able to identify and maintain the different types of sewing machines used in the process of repairing or fabricating survival equipment. Sewing machines are like any other tool you use. If you don't have the correct one, the task is harder or impossible to complete. The same applies to sewing machines. You need the right machine for the job; whether it be lightweight, medium weight, or heavyweight, there is a machine designed to perform each task. You work with various types of sewing machines in the process of repairing or fabricating items in the shop. You need to have all the knowledge and skill YOU can possibly acquire about these machines to fulfill your duty as a PR. If you don't know how to operate and maintain the sewing machines, they will stand idle, not operate properly, or not work at all. When you have a job to do, you need equipment that is operational. Without the proper knowledge of sewing machines, you will not have the confidence to perform necessary sewing machine repairs. Before you can learn to operate and maintain a sewing machine, you must learn the language of the sewing trade. Through your supervisor and this text, you should become familiar with this language. It is very important that you form a habit of referring to the parts of a sewing machine by their proper names. It would be difficult to communicate with other PRs and impossible to pass a rating exam if you do not know the proper names of the different parts of a sewing machine. Take time to study the illustrations in this chapter that show the important sewing machine parts and their names.

Sewing machines are classified as two types— **OSCILLATING and ROTARY.** Both types are operated by electric motors and are fitted with rheostats and special clutch arrangements that enable the operator to control the speed. When it comes to classifying sewing machines into oscillating and rotary, the important part is the rotary hook and oscillating shuttle. This is the device that is out of sight in the base of the machine, but does the very important job of forming each stitch after the needle has passed thread through the fabric.

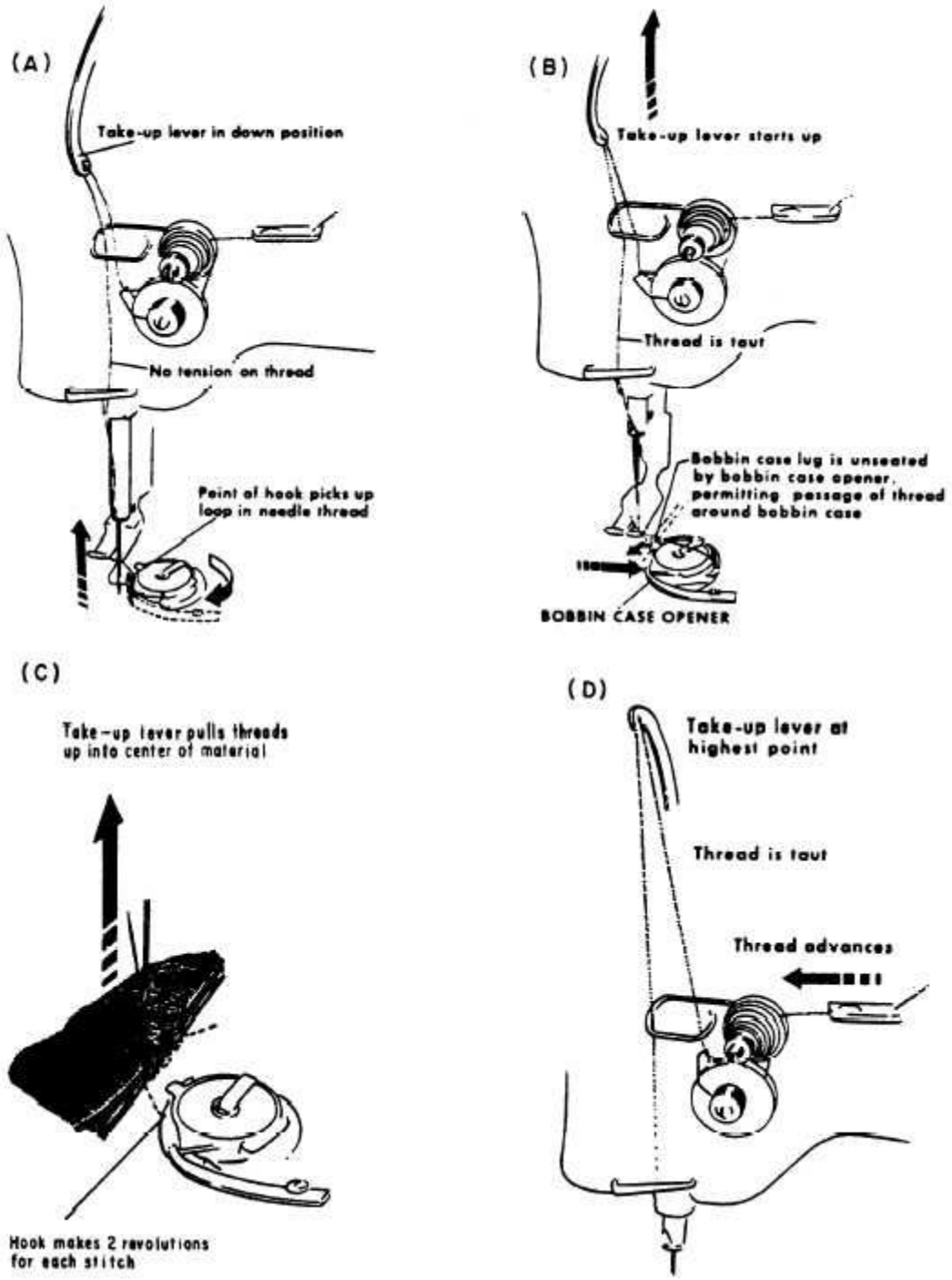
Oscillating sewing machines have a sewing hook that rocks back and forth through half of one revolution to complete one stitch.

Rotary sewing machines have a hook that makes two complete revolutions to complete one stitch. The type of stitch commonly used and made by sewing machines in repair work is the lockstitch.

The lockstitch makes use of two separate threads. One comes from the spool down through the eye of the needle, the other from the bobbin. In making the lockstitch, these two threads must become interlocked, as shown in figure 9-1. The thread passing through the eye of the needle is pushed down through the material being

sewn. As the needle travels downward to the material, a spring pulls tension on the needle thread to keep it taut to prevent any slack that might tangle the thread around the needle. After the needle reaches its lowest position and starts its upward movement, the process shown in figure 9-1 begins. A small loop of thread forms alongside the needle beneath the throat plate.

The sewing hook catches this loop and carries it around the bobbin, which floats in its track in the bobbin case (view B of figure 9-1). By locking the loop of needle thread around the bobbin thread, the sewing hook forms the stitch. As the needle completes its upward movement, the thread tension disks hold the needle thread firmly. The thread take-up lever, rising quickly, pulls on the loop that has been formed, and thus tightens the stitch. When the thread take-up lever

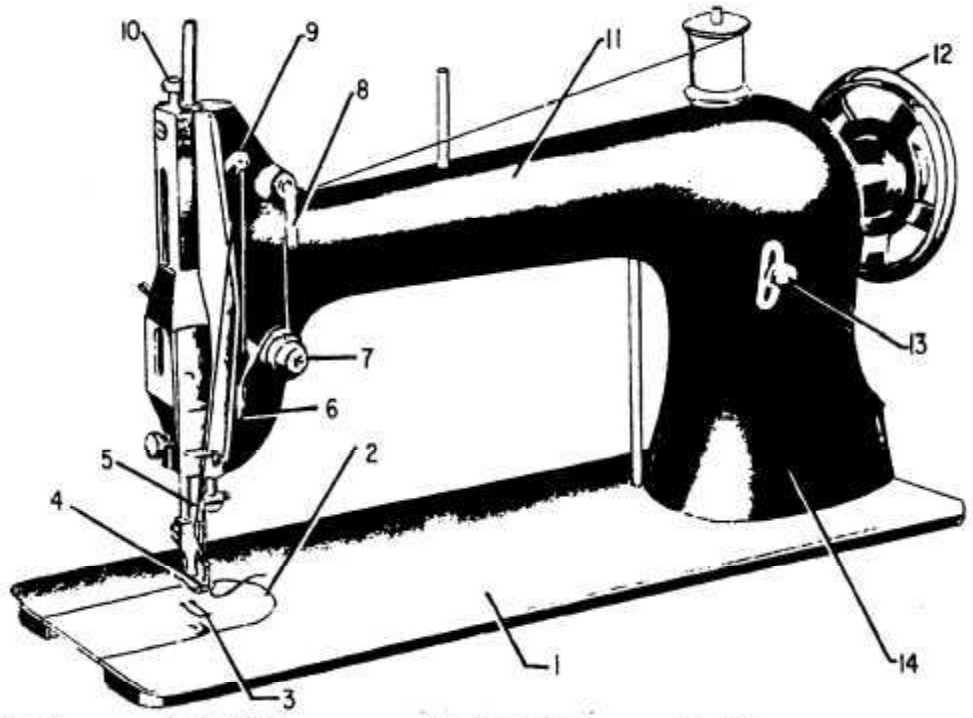


239.261 Figure 9-1.—The lockstitch.

reaches its highest position, the stitch is com- assembly; the UPRISE (14) houses the arm pleted. (See views C and D of figure 9-1.) shaft connection belt; the

BALANCE WHEEL

Now look at figure 9-2. The standard sewing (12) is connected to the arm shaft in the machine has four basic parts: bed, uprise, arm, ARM (11), which operates the needle bar and face. The BED (1) houses the linkage from mechanism in the FACE (6) of the ma- the safety clutch pulley to the sewing hook chine.



1. Bed
2. Throat plate
3. Feed dog
4. Presser foot
5. Needle bar
6. Face
7. Upper tension regulating thumb nut
8. Thread retainer
9. Thread takeup lever
10. Pressure bar pressure regulating thumbscrew
11. Arm
12. Balance wheel
13. Stitch regulator thumbscrew
14. Uprise

239.262 Figure 9-2.—Sewing machine 31-15.

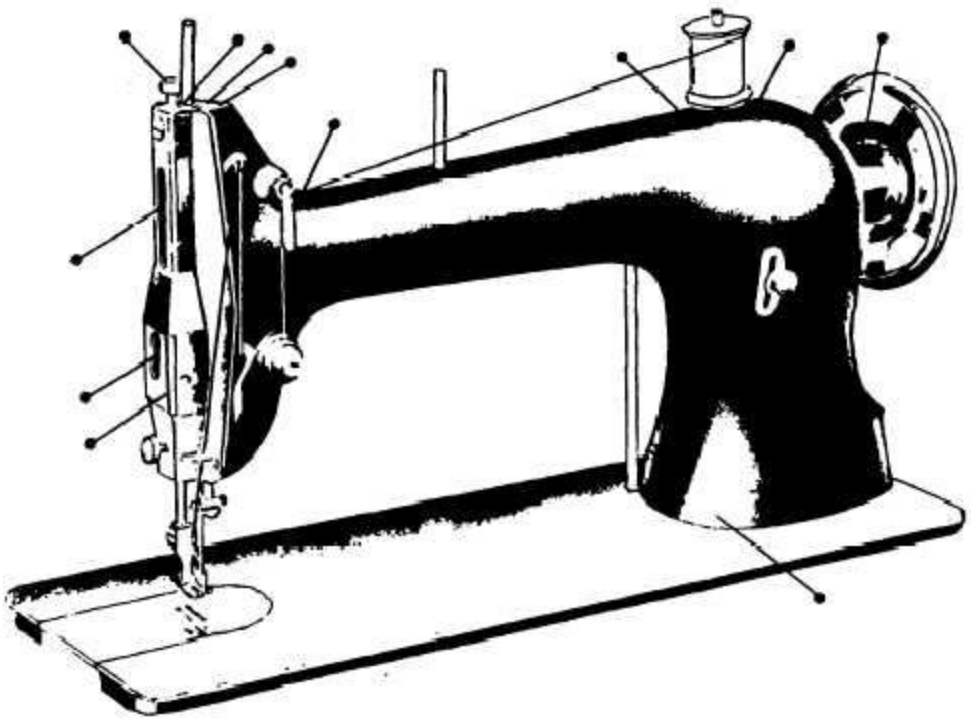
The machine is powered by an electric motor, which is connected to the motor driving pulley by a clutch. You connect the motor to the clutch by pressing the forward part of the foot treadle. The aft part of the treadle is the brake, which acts upon the clutch. The material to be sewn is held in position on the feed dog by the presser foot. The pressure of the presser foot upon the material enables the feed dog to push the material forward each time the needle goes up. The pressure of the presser foot on the material is released either by a knee lifter or a hand lifter. The presser foot can be raised by pushing the knee lifter to the right. The hand lifter is located behind the face of the machine. The presser foot may be lifted and locked into position by raising the hand lifter to its highest position.

OSCILLATING TYPE SEWING MACHINES

Two of the most commonly used oscillating sewing machines are the 31-15 and 7-33, both of which are discussed in this chapter.

SINGER SEWING MACHINE 31-15

When starting out as a PR, the 31-15 sewing machine will probably be the one you'll like to use. This machine is smaller and lighter than most of the other machines used in the parachute loft. The manufacturer calls the 31-15 a tailoring machine. It is used to sew and repair clothing, uniforms, shirts, flying clothing, jackets, and lightweight protective covers. The 31-15 is an oscillating sewing machine that has a recommended speed of 2,200 stitches per minute and makes a lockstitch. It is very good for sewing nylon cloth, and can be used for sewing lightweight canvas up to 8 ounces. The number of stitches can be regulated from 7 to 32 stitches per inch. When the 31-15 machine is in operation, the balance wheel turns over toward the operator. When hand-turning the balance wheel, always rotate it in this direction. The components of the Singer Sewing Machine 31-15 are shown in figure 9-2.

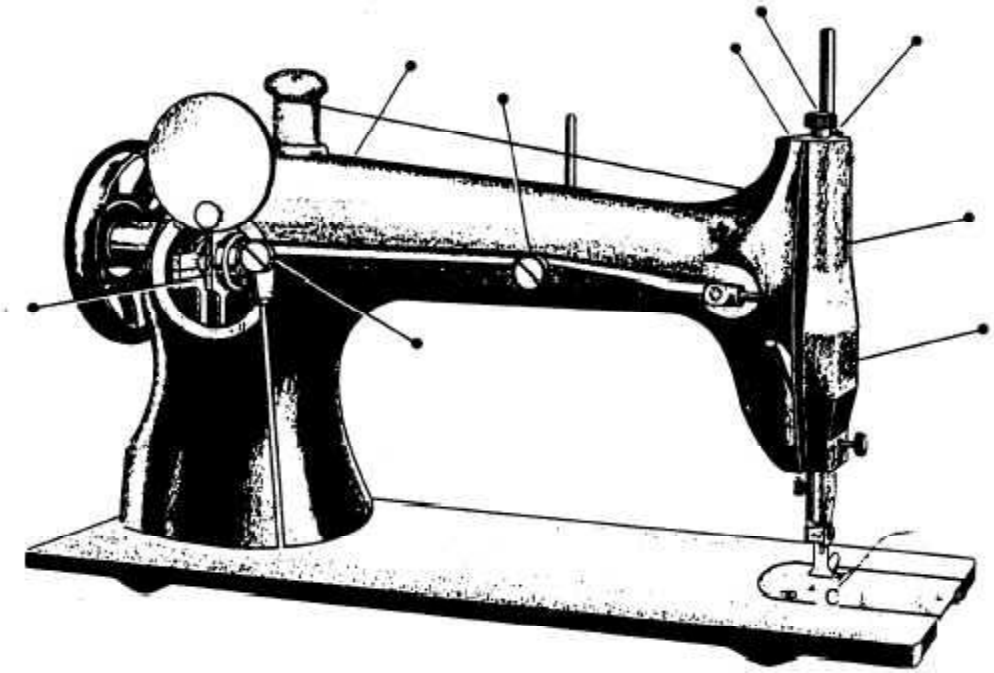


239.263 Figure 9-3.—Oiling points at the front of the machine.

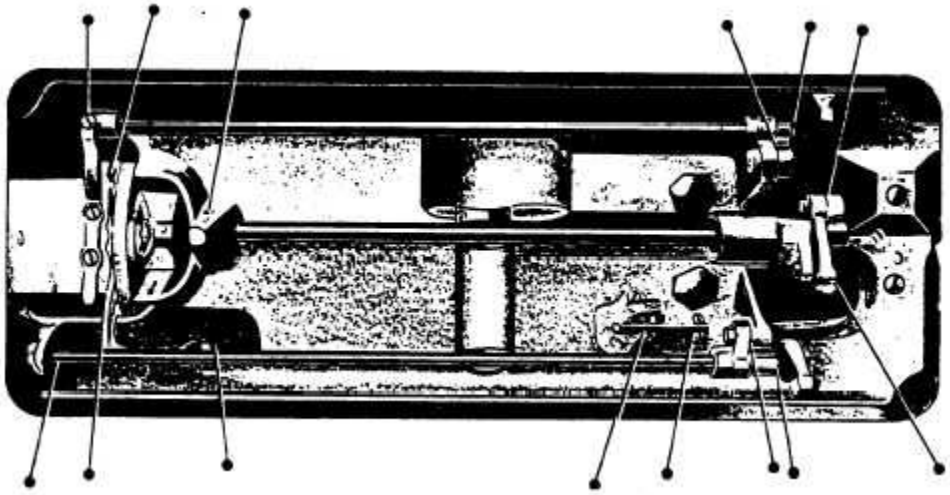
The following practices and procedures help to ensure safe and smooth operation of the sewing machine: 1. The balance wheel must always turn toward the operator. 2. Do not run the machine with the presser foot resting on the feed dog without material being under the presser foot. 3. Do not run the machine when both bobbin case and needle are threaded unless there is material under the presser foot. 4. Do not try to help the machine by pulling the material. You may bend or break the needle. If properly adjusted, the machine feeds the work without assistance. 5. The slide over the bobbin case should be kept closed when the machine is in op- eration. 6. Keep your head away from the thread take- up lever and needle bar at the top of the sewing machine face. 7. When running the machine, do not take your eyes away from the needle and presser foot. 8. Keep your fingers from under the needle. 9. When running the machine, keep your fingers away from the belt and pulley areas. 10. Never attempt threading the needle when the machine is turned on.
Lubrication To ensure easy operation and to prevent unnecessary wear of the moving parts, all sewing machines need oiling. When a machine is in constant use, it should be oiled twice a day. Anew machine should be oiled more frequently when in constant use. Use only one drop of oil at each oiling point. A 10W mineral oil is recommended. Oiling points for the 31-15 machine are shown in figures 9-3, 9-4, and 9-5. Oil should be applied regularly to the shuttle bearing in the shuttle race. Occasionally, remove the faceplate and apply oil to the bearings and points that are uncovered.

Timing the 31-15

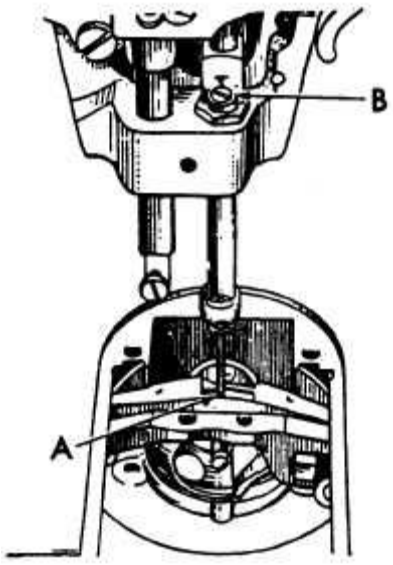
There are two distinct timing operations for the 31-15 machine. One operation times the needle with the shuttle; the other timing operation times the feed dog with the needle. Both the needle with the shuttle and the feed dog with the needle must



239.264 Figure 9-4.—Oiling points at the back of the machine. 239.265
9-4



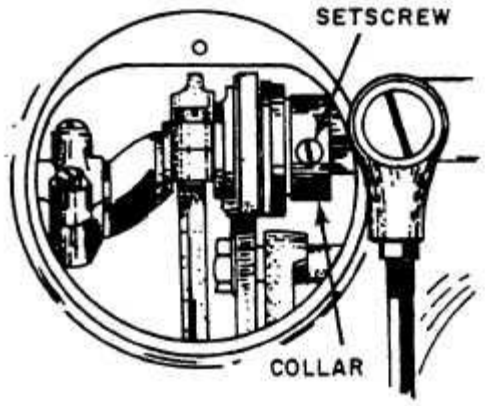
239.265 Figure 9-5.—0iling points at the base of the machine



239.443 Figure 9-6.—Timing needle with shuttle.

2. Move the needle bar up or down as required; and then tighten the screw. be in proper time for the machine to function properly. See figure 9-6. Timing the Needle with the Shuttle If a class 31 sewing machine does not form the lockstitch, if it skips stitches, or if it frays or breaks thread, the needle is not moving in the proper relationship with the shuttles motion. First make sure you have the right needle. Check the needle for the correct class, variety 16 x 87, and size. Insert the needle in the needle bar (long groove to the left) as far as it will go (fig. 9-6). Next compare the needle stroke to the shuttle stroke. To do this, remove the throat plate. Turn the balance wheel toward you until the point of the shuttle on its forward stroke reaches the center of the needle while the needle is on the upstroke. At this time, the needle bar should have risen 1/10 inch and the point of the shuttle should be 1/16 inch above the eye of the needle, as shown in A o f figure 9-6.
3.
4. NOTE: Prior to making adjustments to the sewing machine, always follow the troubleshooting chart in Table 9-1.
5. If the needle eye is not in this position, the following steps should be taken: 1. Loosen the needle bar connecting stud screw, as shown in B of figure 9-6. 3. Rotate the balance wheel through the full cycle to check the timing. 4. Replace the throat plate. Timing the
6.
7. **Feed Dog with the Needle**
8.
9. The feed driving eccentric is an adjustable connection between the arm shaft (the shaft in the head) and the feed rock shaft (first shaft beneath the bed of the

machine). If the feed mechanism is properly timed, the feed dog should be on its downstroke and level with the throat plate when the point of the needle reaches the material. If there is a twisted knot every 1 to 2 inches on the bottom of your material, check the timing of the needle before adjusting the feed mechanism. To adjust the feed eccentric, first lower the stitch regulator to the lowest position so the machine forms its longest stitch. Turn the balance wheel until the feed dog is on its downstroke and is flush with the throat plate. Move to the rear of the machine and take off the arm side cover. Turn the balance wheel away from you until the feed eccentric collar setscrew is visible (fig. 9-7). Hold the collar with your left thumb. Loosen the screw and rotate the balance wheel away from you until the needle, on its downstroke, reaches the material. Tighten the setscrew. Rotate the balance wheel to check the timing. Recheck the timing of the shuttle point with the needle. When you time the feeding mechanism, you may throw the needle out of time with the shuttle.



10.
11. 239.444 Figure 9-7.—Feed eccentric. 9-6

Table 9-1.—Troubleshooting Chart

TROUBLE	PROBABLE CAUSE	REMEDY
Needle breakage.		
Incorrect class and variety needle being		Use correct class and variety used. needle.
Needle loose in clamp.		Tighten needle clamp screw.
Needle too small for fabric.		Use larger needle.
operator pulling on the material.		Allow machine to feed material.
Needle thread breakage.		
Thread too heavy for needle.		Use larger needle or smaller thread.
Right twist thread being used.		Use left twist thread.
Damp or defective thread being used.		Use only dry smooth thread.
Machine incorrectly threaded.		Check machine for proper threading.
Needle incorrectly set.		Set needle with long groove to the left.
Needle thread tension too tight.		Loosen needle thread tension.

Thread take-up spring out of adjustment. ---Adjust thread take-up spring.
Burr on bobbin case, --- Shuttle point or Smooth with emery cloth.
tension disks. Thread rubbing against presser foot. ---Adjust presser foot.
Needle has burr on eye or point, blunted ---Replace needle. or bent.

Bobbin thread breakage.
Bobbin tension too tight. ---Adjust bobbin tension.
Bobbin incorrectly threaded. ---Thread bobbin to revolve clock- wise.
Bobbin wound too full to revolve freely. ---Remove some of the bobbin thread.
Rounds of bobbin thread lapped over one another. --- Insure bobbin thread is straight when winding bobbin.
Bobbin case is dirty.--- Clean and lubricate bobbin case.

Skipped stitches.
Machine out of time. ---Time needle to shuttle.
Thread controller spring out of ---Adjust thread controller spring. adjustment.

Drawing of seam.
Needle and bobbin tension too tight.--- Loosen needle and bobbin tension.

stitches piled up.
Stitch regulator out of adjustment. ---Adjust stitch regulator.
Pressure on presser foot too tight. ---Loosen presser foot adjustment screw.

Feed dog striking throat plate.
Feed dog set too high.--- Lower feed dog to correct height.

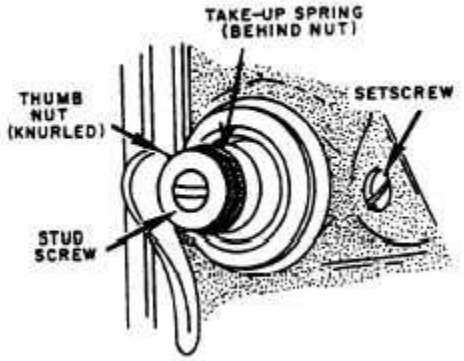
9-7

Adjusting the Feed Dog

The height at which the feed dog should be set depends on the weight and number of plies of the material being sewn. If the feed dog is set too low, the material does not feed through the machine; if it is set too high, it may cut or fray the material. The recommended height of the feed dog for sewing lightweight canopy material is slightly less than one tooth above the throat plate. If you are sewing heavier material, raise the feed dog to a height that ensures positive feeding of the material. After you have decided on the correct height for the project you are working on, adjust the feed dog accordingly, by loosening and then tightening the screw, as shown in figure 9-7. You must remember that each time the height of the feed dog is changed, the feeding mechanism may be out of time. For this reason, set the feed dog first, and then make the necessary adjustment on the feeding mechanism. Since most of your canopy repairs involve material of approximately the same weight, one-time adjustment of the feed dog is usually sufficient. Repeated changing of its height is not necessary.

Adjusting the Thread Take-up Spring

To adjust correctly the take-up spring in the tension assembly (fig. 9-8), you should first understand its normal operation. The thread take- up lever pulls the thread take-up spring down about even with the slack thread regulator while the needle is going up. While the take-up lever is coming down with the needle, the thread take- up spring pulls the slack out of the thread and keeps it from getting under the needle. If you do not have this adjusted properly, a loop can form



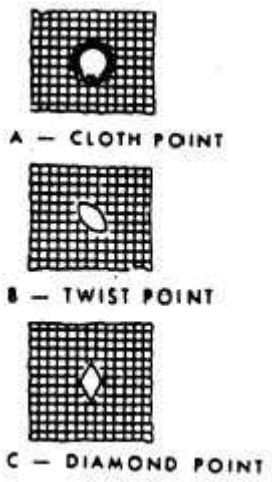
239.445 Figure 9-8.—Tension assembly.

over the needle hole in the throat plate, and the needle can split the thread as it enters the needle hole. You should set the spring about 1/4 inch above the slack thread regulator. The thread take- up spring should be set so that the spring will have completed its downward motion and be resting on the stop when the needle, on its downstroke, reaches the fabric. To adjust the spring, loosen the setscrew, as shown in figure 9-8. To put more tension on the spring, you turn the assembly clockwise; to put less tension on the spring, you turn the assembly counterclockwise. It may be necessary for you to replace the thread take-up spring because it can bend and become weak. Loosen the setscrew and insert a screwdriver into the slot of the tension screw stud (fig. 9-8). Turn the stud to the left until it is screwed out of the thread take-up spring regulator. Remove thumb nut (fig. 9-8), the tension spring, and tension discs. The take-up spring is now free for removal. After replacing the old spring with a new one, assemble the parts in reverse procedure.

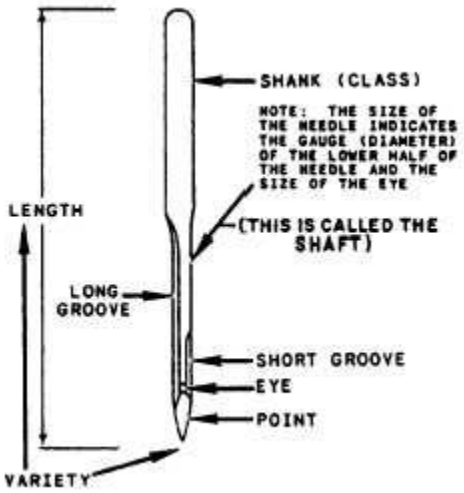
Replacing the Needle

While replacing a needle is a relatively simple job, you must know a few things about needles in order to decide which needle is required when a needle must be replaced. It is very important that the proper needle be used to ensure good machine operation. The selection of needles by class, variety, and size for different machines and materials is necessary to eliminate thread breakage, needle breakage, skipped stitches, and fraying of the thread. Needles for the various machine classes are selected and ordered by needle number and size. The needle numbers consist of a class number and variety number separated by a‘‘x”; for-example, the class and variety needle 16 x 87 is used in the 31-15 sewing machine. Cloth point needles are

round, sharp-pointed needles used for sewing cloth, since they do not cut the strands as they are forced between the woven threads of the fabric. Many different varieties of cutting point needles are available, but they are used only for sewing heavy leather. Figure 9-9 shows the shape of the openings made in material by the cloth point (view A), twist point (view B), and the diamond point (view C). Figure 9-9 illustrates why it is important that a round-pointed needle be used in cloth; views B and C show how cutting point needles can cut the warp and filler threads. 9-8



239.446 Figure 9-9.—Shapes of needle points.



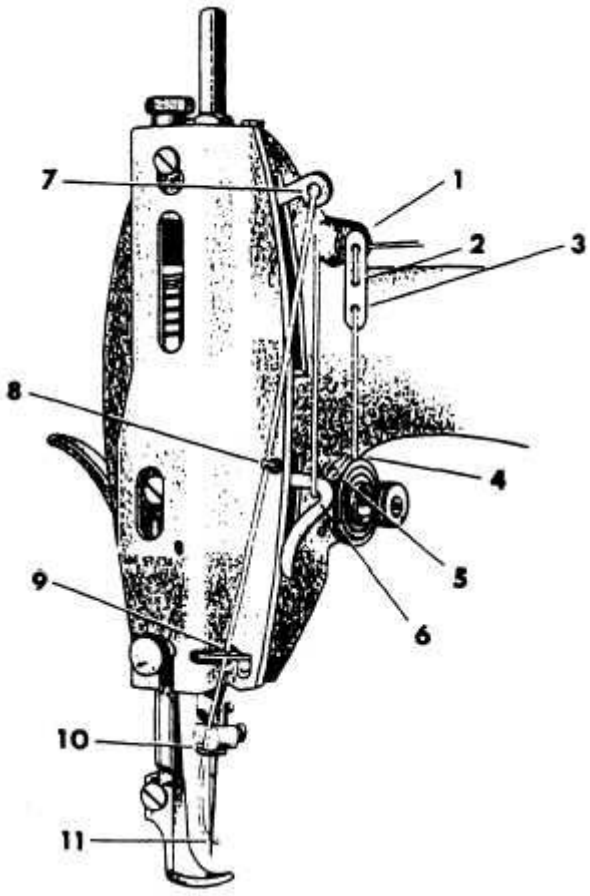
239.447 Figure 9-10.—Sewing machine needle.

Machine needles have along groove on one side, and either a short groove or a scarf on the opposite side, as shown in figure 9-10. The purpose of the grooves is to allow the thread to fall back into the needle when it enters the material to prevent the thread from breaking or fraying; therefore, it is important that the long groove be placed in the machine properly. On different class machines, the direction varies with the position of the bobbin assemblies. 0n class 31 machines, the long groove is placed to the left. The scarf is to prevent the oscillating shuttle from striking the

needle as it passes close to the needle to pick up the thread loop to form the lockstitch. Needles are sized by the diameter or gauge of the needle and the needle eye. The selection of the correct size needle is determined by the size and type of thread and material used. The thread must pass freely through the eye of the needle to prevent thread fraying or breaking. The sizes of the class 16 x 87 needles used for most sewing will range from size 18 through size 22. The needle size number increases with the diameter of the needle; therefore size 18 needles are used for lighter weight materials than size 22. Listed below are some of the needle sizes you will be working with and their uses:

Size 18. For sewing two to four plies of thin material, such as silk, nylon, or rayon, with size E thread.
Size 20. For sewing five or more plies.
Size 21. For sewing two to four plies of medium weight materials, such as aircraft cloth, 12-ounce duck, light leather, and artificial leather.
Size 22. For sewing two to four plies of medium weight material, such as heavy duck, lightweight and medium weight web- bings, and russet leather.
Size 24. For sewing elastic or rubberized — materials.

You should check the condition of the needle's point before you start to sew. A dull or rough round needle acts the same as a cutting needle. It cuts or pulls threads and may weaken the seam. The condition of a needle may be checked by sliding the fingernail over the point. If it scratches or catches the nail, the needle should be replaced with a new one. A dull needle may be sharpened by placing it in the chuck of a drill press, and the drill operated at high speed while holding a fine grain sharpening stone lightly against the side of the needle at the proper angle. The point is then polished with a piece of russet leather. Having selected the proper needle, turn the balance wheel toward you until the needle bar moves to its highest point. Loosen the needle clamp screw and put the shank of the needle up into the groove as far as it will go. Turn the long groove so that it faces to the left and is directly in line with the arm of the machine. Then tighten the clamp screw, and check to see that the needle does not turn or slip. For troubleshooting, refer to table 9-1.



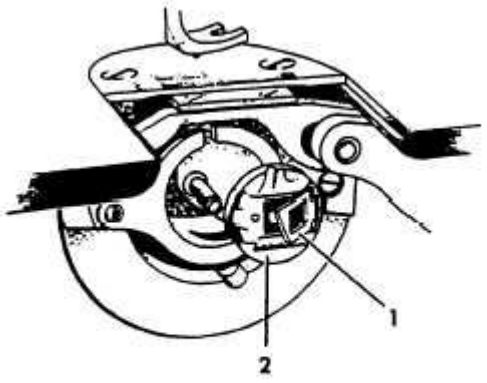
1. Top hole of thread retainer
2. Middle hole of thread retainer
3. Bottom hole of thread retainer
4. Tension disks
5. Thread takeup spring
6. Tension thread guard
7. Thread takeup lever
8. Thread guide
9. Thread guide
10. Thread guide
11. Needle eye

239.268 Figure 9-11.—Threading the 31-15 sewing machine.

Threading the Machine

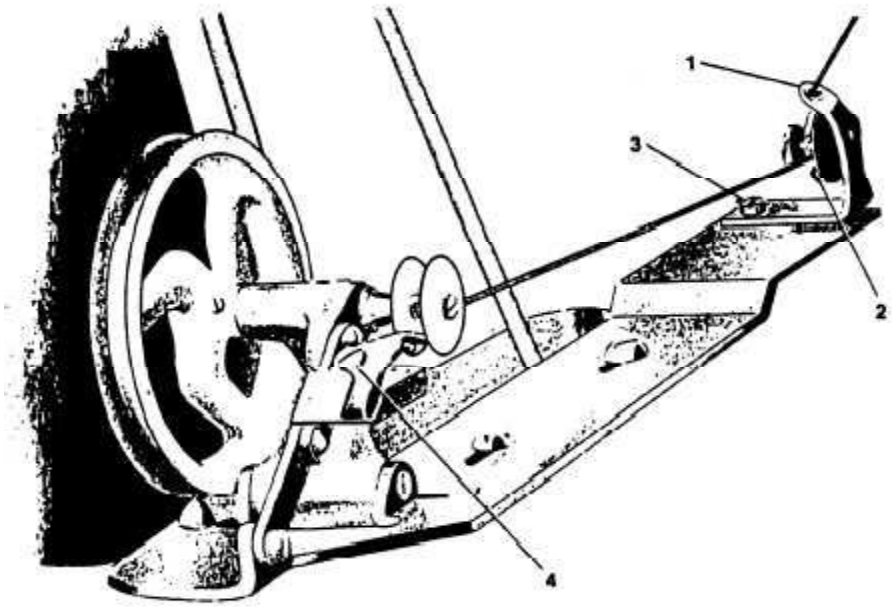
Threading a machine is a very simple job. The procedure may vary slightly with different models; but after working with the various machines in the loft, the task becomes automatic. The component parts used in threading the 31-15 sewing machine are shown in figure 9-11. Use this figure in studying the procedures that follow. Pass the thread from the thread stand to the thread post on top of the machine, right to left throught the bottom hole, and then right to left through the top hole. Pass the thread from right to left through the top hole in the thread retainer (1).

Pass the thread from left to right through the middle hole in the thread retainer (2).
Pass the thread from right to left through the bottom hole in the thread retainer (3).
The thread is then passed down and under from right to left between the tension disks (4).
Draw the thread up into the thread take-up spring (5),
drawing the thread up and beyond the spring end so that it comes out in the center of the spring. The thread is then placed under the tension thread guard (6).
Pass the thread up and from right to left through the hole in the thread take-up lever (7).
The thread is now drawn down through three thread guides (8), (9), and (10).
Pass the thread from left to right through the eye of the needle (1 1).
Draw about 2 inches of thread through the eye of the needle to begin sewing.
Removing the Bobbin Case Before attempting to remove the bobbin case, turn the balance wheel toward you until the needle moves upward to its highest position.
Remove the slide in the bed of the machine so you can see what you are doing.
Reach under the table with your left hand, and, using your thumb and forefinger, open the bobbin case latch (fig. 9-12) and lift out the bobbin case. While the latch is held open, the bobbin is retained in the bobbin case. Release the latch, turn the open end of the bobbin case down, and the bobbin will drop out. Winding the Bobbin The bobbin winder is fastened to the table with its driving pulley in front of the sewing machine



1. Bobbin case latch
2. Bobbin case

239.269 Figure 9-12.—Removing bobbin case. 9-10



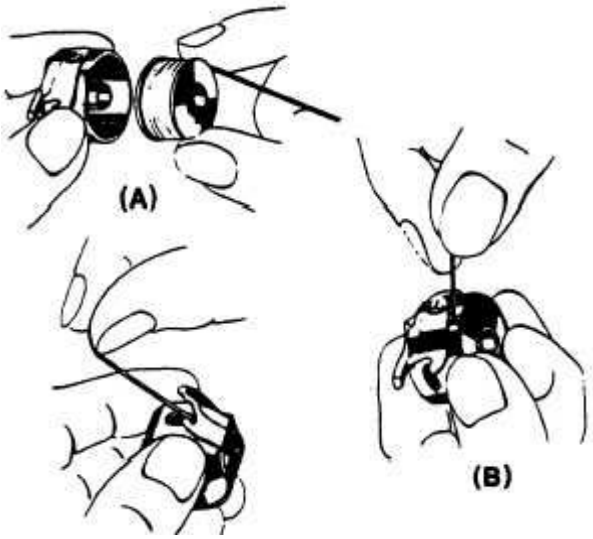
1. Thread guide
3. Setscrew
4. Bobbin winder stop latch screw

239.270 Figure 9-13.—Winding the bobbin. belt.

The bobbin winder is so positioned to allow the pulley to drop away from the belt when sufficient thread has been wound on the bobbin. Figure 9-13 illustrates the bobbin-winding operation. The procedure is as follows: Place the bobbin on the bobbin winder and push it on the shaft as far as it will go. Pass the thread from the spool down through the thread guide. Loop the thread around back and through the tension disks. The thread is then wound around the bobbin a few times and the pulley pushed up against the machine belt. The bobbin can be wound while the machine is being used for sewing. If there is no material under the presser foot, make certain that the presser foot is raised and not riding on the feed dog while winding the bobbin. When sufficient thread has been wound on the bobbin, the pulley on the bobbin winder drops back from the machine belt automatically. If the thread does not wind evenly on the bobbin, loosen the setscrew in the tension bracket and move the bracket to the right or left as required; then tighten the bobbin winder stop latch screw. The amount of thread wound on the bobbin is regulated by the bobbin winder stop latch. To wind more thread on the bobbin, turn the screw to the right; to wind less thread on the bobbin, turn this screw to the left.

Threading the Bobbin Case

Hold the fully wound bobbin between the thumb and forefinger of the right hand with the thread end running over the top toward the right, as shown in figure 9-14, view A. With the left

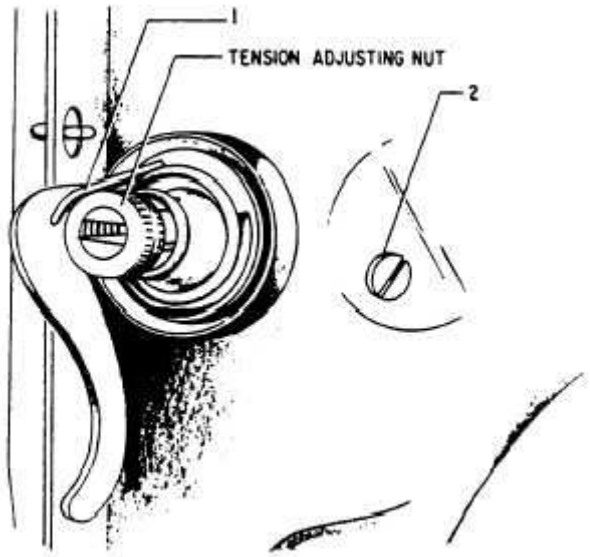


239.271 Figure 9-14.—Threading the bobbin case. 9-11

hand, hold the bobbin case as shown, with the thread slot near the top. Place the bobbin into the bobbin case and pull the thread into the slot in the edge of the bobbin case (view B). Draw the thread down under the tension spring and into the delivery eye at the end of the tension spring (view C). When the free end of the thread is pulled, the bobbin will rotate clockwise if the bobbin case has been threaded properly.

Replacing the Bobbin Case

Hold the latch open on the threaded bobbin case with the thumb and forefinger of the left hand, with the latch in a horizontal position. Place the bobbin case on the center stud of the shuttle body. Release the latch and press the bobbin case back until the latch catches the groove near the end of the stud. Preparing for Sewing With the left hand, hold the end of the needle thread, leaving it slack from the hand to the needle. Turn the balance wheel toward you until the needle moves down and catches the bobbin thread. Continue to turn the balance wheel forward until the needle comes up and brings the bobbin thread up with the needle thread. With the thread take-up lever at its highest position, lay both threads back under the presser foot . Commencing Place the presser foot, to Sew edge of the material beneath the lower the presser foot, turn the balance wheel by hand until the needle is in the material, and press lightly on the treadle. To prevent fouling the needle thread in the bobbin case, hold the ends of both threads until the first few stitches are made. While sewing, hold the work flat, but do not pull or push on the material. Let the feed dog carry the work evenly under the presser foot and needle. If the operator pulls on the material, the needle bends, strikes the throat plate, and is either dulled, or more likely, broken. When the needle is about to cross a seam or other unusually thick or uneven place in the work, disengage the clutch, and hand-turn the machine over the rough place; otherwise, the needle may be broken or thrown out of time.

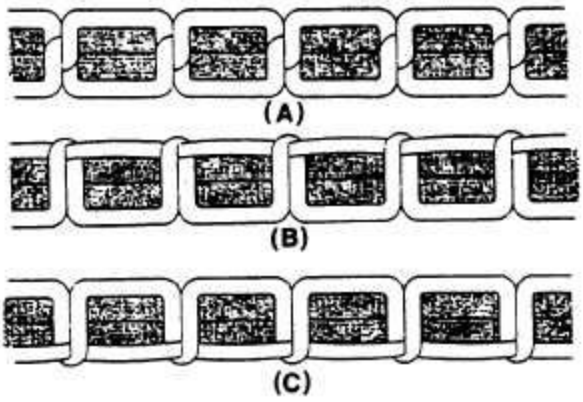


1. Thread take-up spring 2. Setscrew

239.272 Figure 9-15.—Adjusting the machine thread tension.

Regulating the Tension

The tension on the needle thread should be regulated only when the presser foot is down. If the tension of the machine thread is not correct, it should be adjusted by turning the tension adjusting nut, as shown in figure 9-15. To INCREASE THE TENSION, turn the nut clockwise; to DECREASE THE TENSION, turn the nut counterclockwise. The tension on the bobbin thread is regulated by the small screw in the bobbin case tension spring. To increase the tension, turn the screw clockwise; to decrease the tension, turn the screw counterclockwise. This screw is very small and is easily lost if extreme care is not exercised in backing it out when the tension is decreased. If the screw is tightened excessively or is slightly too long, it will penetrate into the inside of the bobbin case and prevent removal of the bobbin. When the tension on the bobbin thread has been properly adjusted for a particular size of thread, it is seldom necessary to change it. A correct stitch can usually be obtained by varying the tension on the needle thread, which is an easier adjustment. 9-12



239.273 Figure 9-16.—Properly and improperly adjusted tensions.

For ordinary stitching, the needle and bobbin threads should be locked in the center of the thickness of the material, as shown in figure 9-16, view A. When adjusting the tensions, you will not have a cross section of the stitch. If the tension on the needle thread is too tight, or if the bobbin tension is too loose, the thread will lie straight along the upper surface of the material and appear as small loops, as shown in figure 9-16, view B. If the tension on the bobbin thread is too tight, or if tension on the needle thread is too loose, the bobbin thread will lie straight along the underside of the material, as shown in figure 9-16, view C.

Regulating the Length of a Stitch

The length of a stitch can be checked at the time the tension of the stitch is checked, as a trial run of stitches is necessary during both procedures. The length of a stitch is regulated by the thumbscrew in the slot on the front of the uprise of the machine. To LENGTHEN the stitch, loosen the thumbscrew and move the lever DOWN. To SHORTEN the stitch, loosen the thumbscrew and move the lever UP. When the desired length of stitch has been obtained by test running the machine on scrap material, tighten the thumbscrew.

Regulating the Pressure on the Material

Pressure on the pressure-regulating material is regulated by the thumbscrew on top of the machine face. To increase the pressure, turn the thumbscrew clockwise. The pressure should be just heavy enough to enable the feed dog to move the work along evenly.

Removing Work

Hand-turn the balance wheel toward you until the thread take-up lever is at its highest position. Raise the presser foot, either by the hand lever or by the knee lift, and draw the work and threads straight behind the presser foot. Cut the threads close to the material, leaving free about 2 inches of bobbin and machine thread.

Adjusting the Thread Take-up Spring

The thread take-up spring (fig. 9-15) should be set so that when the eye of the needle reaches the material on the downward stroke of the needle bar, the spring will be through acting on the thread, and will rest against the stop of the thread take-up spring regulator. If the thread take-up spring is not correctly set, loosen the setscrew (2) in the arm of the machine and turn the tension adjusting stud to the right for more movement of the spring, or to the left for less movement. When the spring is correctly set, retighten the setscrew. The tension on the thread take-up spring should be just sufficient to take up the slack of the needle thread until the eye of the needle reaches the material on its descent. To increase the tension on the thread take-up spring, loosen the tension adjusting stud and move the take-up spring from the recess in the regulator to the right between the regulator and the tension disks. When the required tension is obtained, securely tighten the tension adjusting stud and move the spring back into its position in the regulator recess. To decrease the tension, move the spring to the left between the regulator and the tension disks.

SINGER SEWING MACHINE 7-33

The class 7-33 sewing machine is a lockstitch heavy duty machine, and is intended for use in sewing heavy canvas, webbings, and other material not adaptable to the lighter duty sewing machines. The only difference between the 7-31 and the 7-33 is that the 7-33 has the clutch on the motor, while the 7-31 has the clutch on the balance wheel. The operation and maintenance techniques are identical. The procedure for operating the 7-33 sewing machine is the same as for the 31-15 sewing machine. 9-13

As on any Singer sewing machine, the balance constant use. Use a castor base oil as wheel of the 7-33 should always turn toward the recommended by the manufacturer. operator.

Needles and Thread Lubrication

The procedure for ordering needles is the same The 7-33 machine is oiled at all the oiling for the 7-33 machine as for the 31-15 sewing points shown in figures 9-17 and 9-18. The machine. Refer to table 9-2 for the relative sizes machine should be oiled twice daily when it is in of needles and thread.

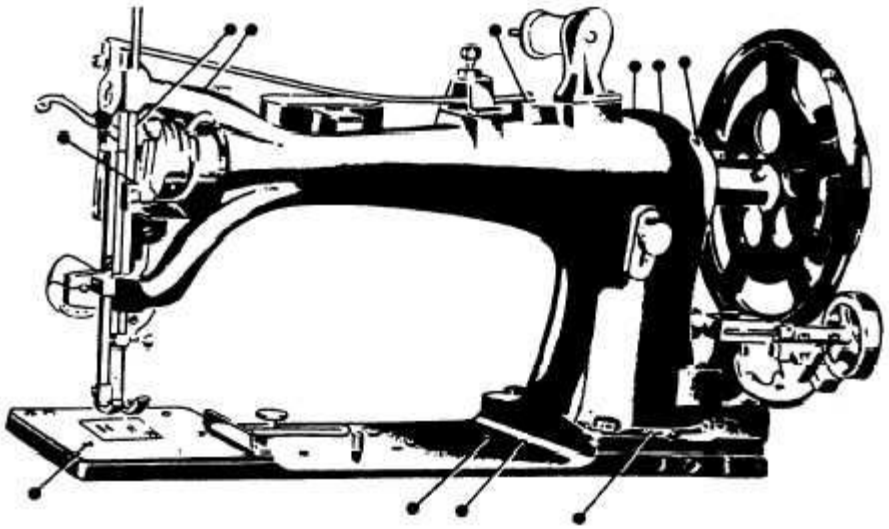


Figure 9-17.—Oiling points at the front of the 7-33 sewing machine.

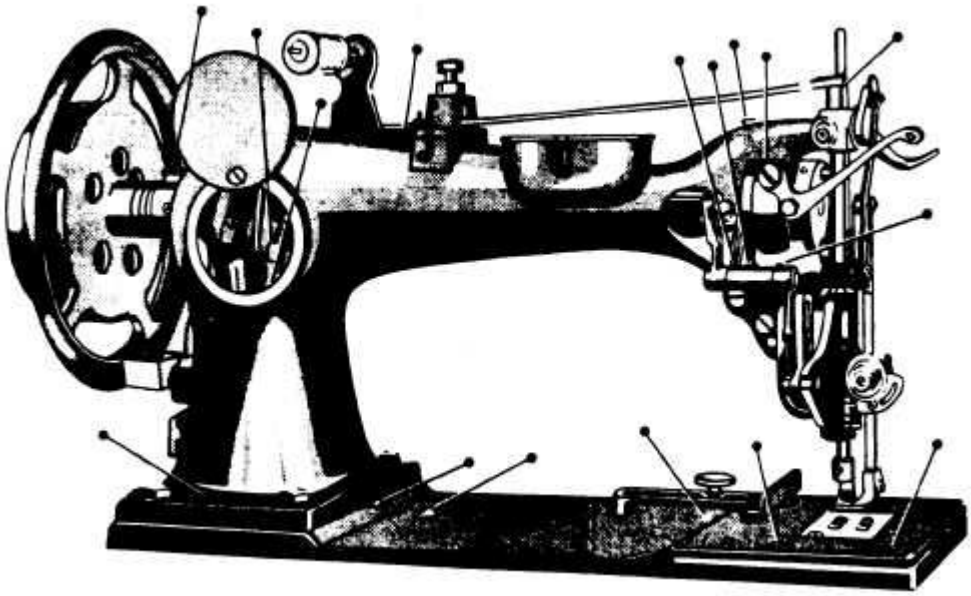


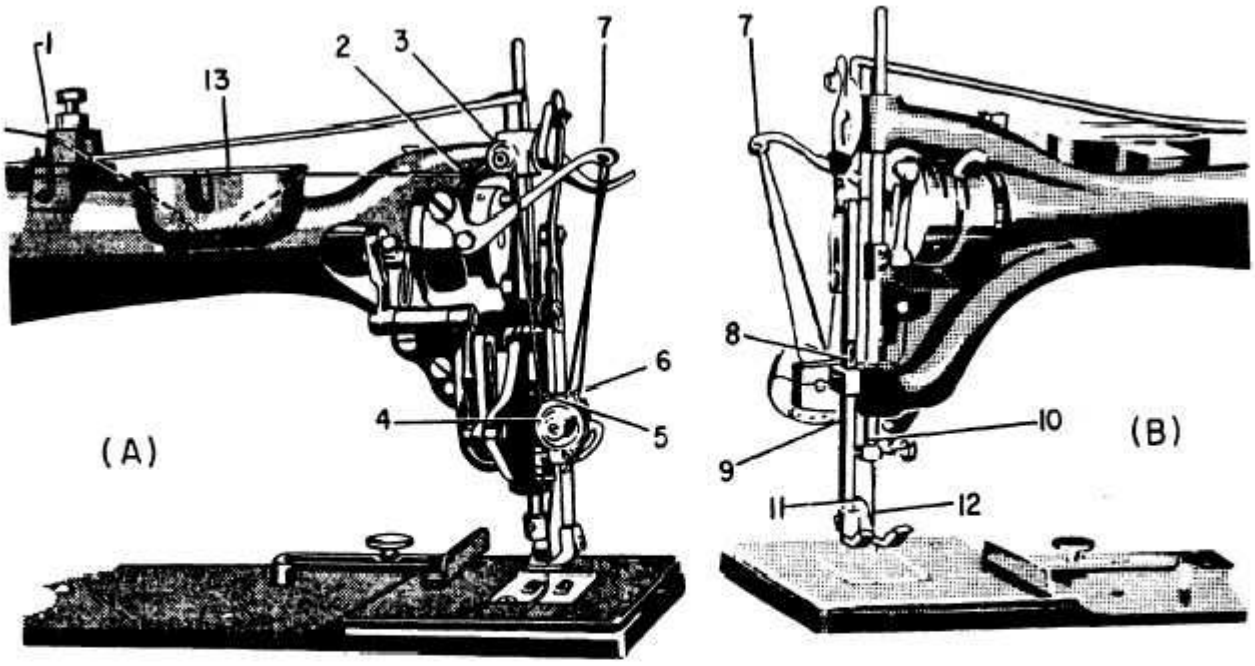
Figure 9-18.—Oiling points at the back of the 7-33 sewing machine. 9-14

Table 9-2.—Relative sizes of needles and thread

Machine	Needle class and variety	Needle sizes	Classes of work	Needle size	Cord size
7-31 or 7-33	7 x 1	19, 21, 22, 23, 24 25, 26, and 27.	Medium to heavy canvas.	24	3-cord

7-31 or 7-33	7 x 5	28, 29, 30, and 31.	Heavy canvas and webbing.	28	6-cord

Setting the Needle The same procedure may be followed with this machine as for the 31-15 sewing machines. Threading the Machine Turn the balance wheel toward you until the thread take-up lever (7) moves up to its highest position (fig. 9-19). Pass the thread from the thread stand to the thread post, right to left through the bottom hole, then right to left through the top hole. Pass the thread through the two thread guides (1) and (2). Continue the passage of thread between the retainer disks (3), down and under the tension disks (4). Pass the thread into the loop of the thread take-up spring (5), under the wire loop (6), up, and from back to front through the hole in the thread take-up lever (7). Now pass the thread down through the thread guide (8), into the slot in the vibrating presser bar (9), and on down through the thread



1. Thread guide
2. Thread guide
3. Retainer disks
4. Tension disks
5. Thread takeup spring
6. Wire loop.
7. Thread takeup lever
8. Thread guide
9. Slot in the vibrating presser bar
10. Thread guide on the needle clamp
11. Eye of the needle
12. Hole in the lifting presser foot
13. Lubricating cup

239.276 Figure 9-19.—Threading the 7-33 sewing machine. 9-15

guide (10), which is located on the needle clamp. The needle is now threaded from left to right through the eye of the needle (11). After the needle is threaded as shown in figure 9-19, pass the thread down through the hole in the lifting presser foot (12). Draw about 4 inches of thread through the hole in the lifting presser foot with which to begin sewing. Notice that the lubricating cup has been bypassed. No lubricant is used on the threads and cords used in the manufacture or repair of parachutes. Removing the Bobbin Turn the balance wheel forward to bring the needle bar and thread take-up lever to its lowest position. With the aid of the shuttle opening tool or a small screwdriver, insert the blade end in the slot in the spring latch beneath the shuttle cylinder (fig. 9-20). Press the latch away from the cylinder and it will swing out. The bobbin will then slide out of the shuttle cylinder. Winding the Bobbin Place the bobbin on the bobbin winder spindle and push it up closely against the shoulder. The small pin in the shoulder must enter the slot in the bobbin. Pass the thread from the thread stand through the hole in the left side of the bobbin from the inside. Push the bobbin winder pulley up against the balance wheel, and place the bobbin winder

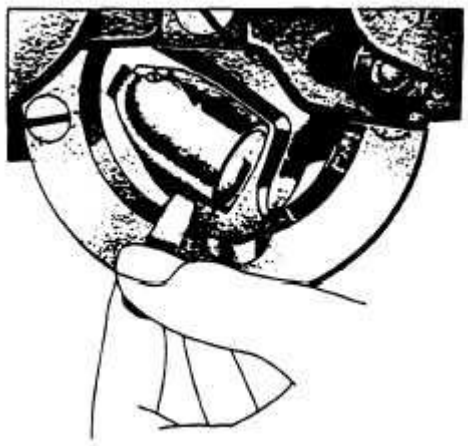
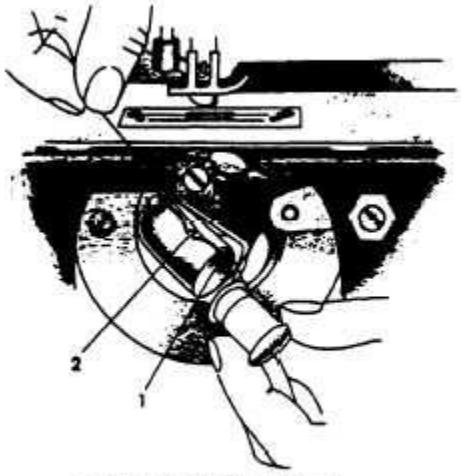


Figure 9-20.—Removing the bobbin cylinder. 239.277 from the shuttle



1. Thread slot in the cylinder
2. Delivery eye and tension spring

239.278 Figure 9-21.—Replacing the bobbin. latch in position.

Raise the presser foot and start the machine. The end of the thread should be held until a few turns are wound on the bobbin to prevent slipping. When sufficient thread has been wound on the bobbin, the bobbin winder will stop automatically.

Replacing the Bobbin and Threading the Shuttle

Take the bobbin between the thumb and forefinger of the left hand, as shown in figure 9-21. The free end of the thread should be drawn off from the underside toward the right. Place the bobbin in the shuttle cylinder as far as it will go. Draw the thread into the slot in the cylinder and under the tension spring into the delivery eye. Push the shuttle cylinder in until it is locked by the spring latch. There should be about 3 inches of thread hanging free from the shuttle with which to begin sewing.

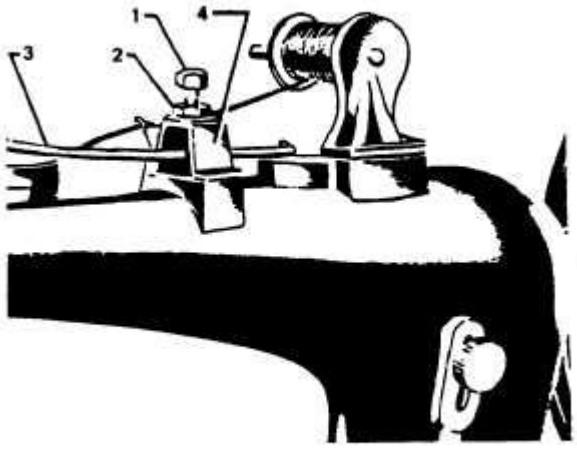
Regulating the Tension

The tension on the needle thread is regulated by the thumb nut at the front of the thread retainer disks. The tension on the thread retainer disks should be just enough to cause the tension wheel to turn when the thread is taken from the spool. The tension on the bobbin thread is regulated by the small screw that holds the tension spring to the shuttle cylinder. To increase the tension, 9-16

turn the screw clockwise. To decrease the tension, turn the screw counterclockwise. The tension on the machine and bobbin threads should be checked by test-running a row of stitches on scrap material. The lockstitch should lock in the center of the material, as described for the 31-15. When sewing webbings with the 7-33 sewing machine, the specifications for webbing sewing should be checked to determine at what ply of the webbing the stitch should lock.

Regulating the Length of Stitch

The procedure for regulating the stitch on the 7-33 ‘sewing machine 31-15. Regulating the Pressure on the Material is the same as for the The pressure on the material is regulated by means of the hexagon head screw (1). (See figure 9-22.) Loosen the hexagon head locknut (2) and turn the adjusting screw clockwise to increase the pressure, or counterclockwise to decrease the pressure on the spring (3). When the desired pressure has been obtained, hold the adjusting screw with a wrench to keep it from turning while



1. Hexagon head adjusting screw
2. Hexagon head locknut
3. Spring
4. Bracket

239.279 Figure 9-22.—Regulating the pressure on the material.

9-17 the locknut is being tightened against the bracket (4). The pressure should be just heavy enough to enable the feed dog to move the work along evenly, and to prevent the work from rising with the needle.

Preparing the Sewing

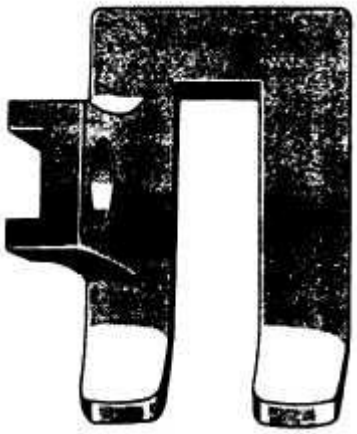
The same sewing preparatory procedures are used for the 7-33 as for the 31-15 sewing machine, except there is no knee lifting device. The hand presser bar lifter is the only device provided for lifting the presser foot on the class 7-33 sewing machine.

Removing the Work

Stop the machine and raise the thread take- up lever to its highest position. Draw about 3 inches of thread through the thread retaining disks. Raise the presser foot and draw the work back, cutting the threads close to the material. Leave the ends of the threads under the presser foot .

Modification of Presser Foot for Webbing Sewing

The modification of a presser foot is illustrated in figure 9-23. The presser foot should be cut



239.280 Figure 9-23.—Modification of presser foot for webbing sewing

along the dotted line, removing the right portion of the foot. After cutting, the edges should be filed down to a smooth round finish. Parachute harness and webbing sewing is classified as a major repair. However, there are various other sewing projects requiring webbing sewing.

ROTARY SEWING MACHINES

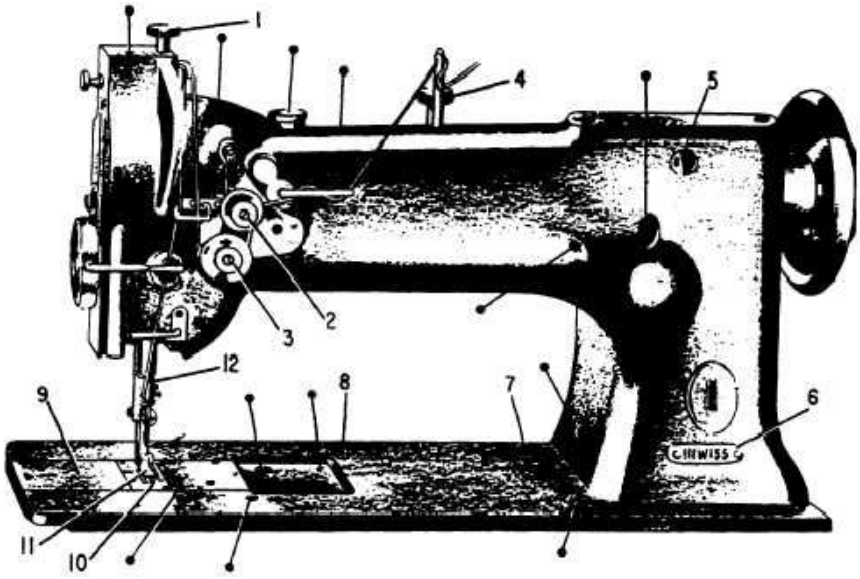
Some of the most commonly used rotary sewing machines are the class 111 W series. They are the type used to teach basic sewing in PR "A" school, and can be found in almost any PR shop.

CLASS 111 SEWING MACHINES

The class 111 sewing machines are one line (single needle) lockstitch machines designed to sew medium weight and heavyweight material. They are capable of sewing at a speed of approximately 3,000 stitches per minute (spin). The lockstitch is formed in the bobbin assembly by the rotary hook on the 111 machines. The class 111 machine is commonly used for sewing aircraft protective covers, upholstery, and soundproofing.

DIFFERENT MODELS OF THE 111 W SEWING MACHINE

The following text discusses the various models of the 111 W sewing machine. 111 W 150 Sewing Machine The 111 W 150 sewing machine is a high-speed, single-needle, lockstitch, compound feed machine employing a gear-driven rotary hook with a vertical axis. It is designed for sewing medium weight fabrics such as



1. Vibrating presser bar thumbscrew
2. Tension thumb nut
3. Thread controller stud thumb nut
4. Presser bar spring regulating screw
5. Stitch indicator disk view hole
6. Model number
7. Hook driving shaft lock stud
8. Feed regulating stud (plunger)
9. Bed slide
10. Throat plate
11. Presser foot
12. Needle bar

239.281 Figure 9-24A.—Class 111 sewing machine, front view showing oiling points. 9-18

flight clothing, nylon, twills, and lightweight canvas. 111 W 151 Sewing Machine The 111 W 151 sewing machine is also a single- needle, lockstitch, rotary hook machine, intended for high-speed straight stitching of medium heavy materials. The 111 W 151 sewing machine differs from other models of the class 111 machines in that it has a single presser foot instead of the alternating presser foot. 111 W 152 Sewing Machine The 111 W 152 sewing machine is a single- needle, lockstitch, compound feed machine with a vertical axis sewing hook. This machine has alternating pressers with a 3/8-inch lift. It has a safety clutch that prevents the hook from being damaged or getting out of time due to accidental strain. 111 W 153 Sewing Machine The 111 W 153 sewing machine is similar to the 111 W 152, but it is used for sewing heavy work such as automobile and truck upholstery, tents, awnings, and leather flight jackets. 111 W 154 Sewing Machine The 111 W 154 sewing machine is also similar to the 111 W 152, but its alternating pressers have a lift of 1/2 inch, and the machine is designed for stitching upholstery work, leather coats, and binding heavy materials such as felt padding. 111 W 155 Sewing Machine The 111 W 155 sewing machine is similar to the 111 W 154 except that its minimum stitches per inch is 3 1/2, and it has an adjustable lifting eccentric for instantly setting the alternating pressers to the minimum amount of lift required for the work to be sewn.

FUNCTIONAL FEATURES

The oiling parts for class 111 sewing machine are shown in figure 9-24A. Figure 9-24B identifies 239.448

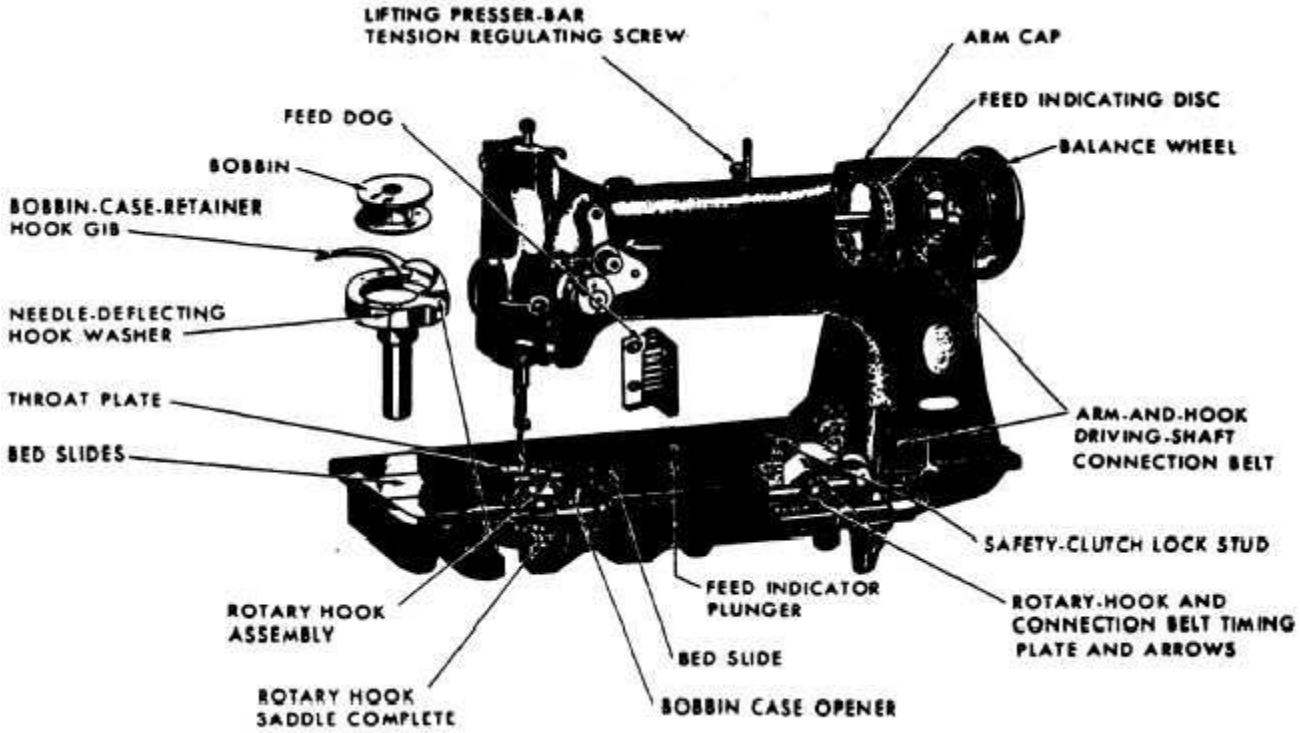


Figure 9-24B.—Class 111 sewing machine, front view showing components and parts. 9-19

the component parts. The primary feature of each component is explained in the following text:

Lifting Presser Bar Tension Regulating Screw.
Regulates the pressure on the alternating presser foot.

Feed Indicating Disc.
Indicates the number of stitches per inch which are being made by the machine.

Balance Wheel.
Provides a connection between the driving unit and the sewing machine head.

Arm-and-Hook Driving Shaft Connection Belt.
Connects the upper arm shaft with the hook driving shaft.

Feed Dog.
Feeds the material from the under side.

Rotary Hook Assembly.
Contains the mechanism that forms the lockstitch by using the needle and bobbin threads.

Bobbin.
Contains the lower thread used in forming the lockstitch.

Bobbin Case Retainer Hook Gib.
Holds the bobbin case in the bobbin race.

Needle-deflecting Hook Washer.
Deflects the needle so the rotary hook will not strike the needle.

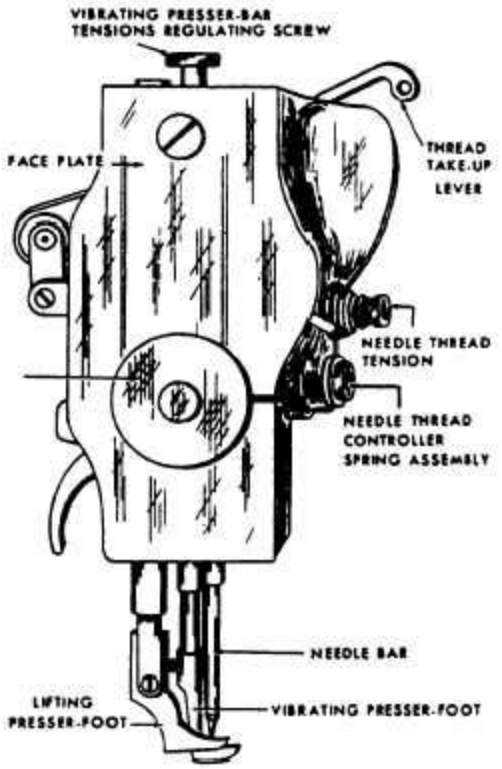
Throat Plate.
Surrounds the feed dog and keeps the material from slipping after the feed dog has been adjusted to the proper height. rotary plate.

Bed Slides.
Covers the feed eccentric and hook assembly on each side of the throat

Feed Indicator Plunger.
Used in connection with the feed indicator to regulate the number of stitches per inch desired.

Safety-clutch Lock Stud.
Re-engages the needle with the hook driving assembly after clearing a thread jam.

Bobbin Case Opener.
Prevents thread from jamming underneath the throat plate on the bobbin case base.



9-20 239.449 Figure 9-25A.—Class 111 sewing machine, side view.

Rotary Hook Saddle Complete.
The rotary hook is operated by the spiral driving pinion gear, which, in turn, is operated by the hook driving gear located on the hook driving shaft.

Rotary Hook and Connection Belt Timing Plate and Arrows.
Used to time the arm shaft with the hook driving shaft.

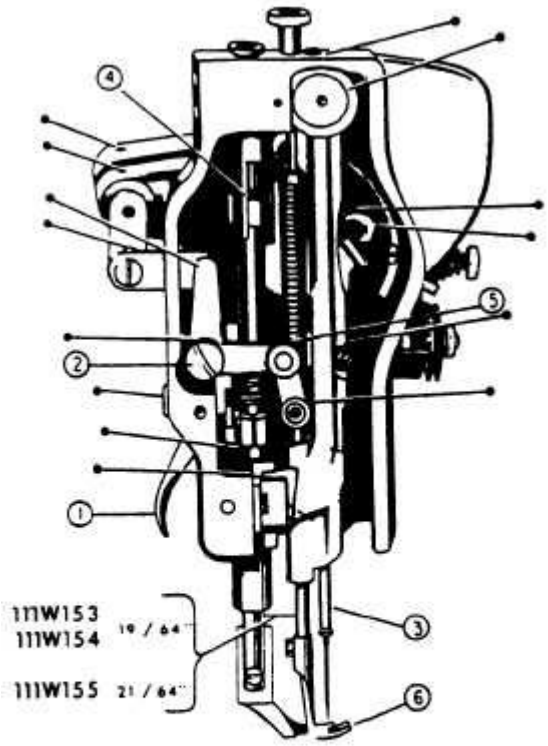
The following parts are shown in the side view of the Class 111 sewing machine (figures 9-25A and 9-25 B).

Thread Take-up Lever.
Pulls the needle thread against the tension disc after the lockstitch is formed at the rotary hook and pulls suffi- cient thread from the spool to make the next stitch.

Vibrating Presser Bar Tension Regulating Screw.
Regulates the pressure on the presser foot.
Only sufficient pressure to securely is needed. hold the material

Face Plate.
Covers mechanism of the two pressel and protects the feet and needle bar

Vibrating Presser Foot. Holds the material in place while the alternating presser foot rises to



1. Hand lift for presser foot
2. Vibrating presser bar thumbscrew
3. Needle bar
4. Vibrating presser bar
5. Presser bar
6. Presser foot

239.282 Figure 9-25B.—Class 111 sewing machine, side view showing oiling points.

Needle Thread Lubricator. Lubrication of the thread when sewing leather. Lubrication of the thread prevents it from fraying, and prevents the needle from becoming hot when sewing at high speed.

Needle Thread Tension.

Regulates the tension on the needle thread so that the lockstitch may be adjusted properly. Needle Thread Controller Spring Assembly. Removes sufficient slack from the needle thread when the needle is descending to prevent the needle from splitting the thread. Needle Bar. Holds the needle and carries the thread to the rotary hook where the lockstitch is formed. make another stitch. Lifting Presser Foot. Holds the material in place while the vibrating presser foot and feed dog go forward to get material for the next stitch. The class 111 machine is a compound feed machine. This means that the feed dog, vibrating presser foot, and needle move together to

feed the material. Some class 111 machines are equipped with a compound feed only, such as the 111 W 151; and others are equipped with a combination of the compound feed and alternating presser foot that holds the material while the needle and vibrating presser foot are moving into position for the next stitch, such as the 111 W 155. Perhaps the description of the feed mechanism gave you a hint that the class 111 sewing machine is a more complicated machine than the class 31. It is indeed. Timing the 111 W Class Sewing Machines The first step in timing the 111 W machine is to set the feed driving eccentric on zero stitches per inch (0 spi). Set the needle bar. With the needle bar in its lowest position (needle bar crank in the horizontal position, the rounded portion on the top and driving stud at the bottom), the connecting link will be vertical. Set the needle bar with the upper timing mark just visible at the base of the needle bar rock frame, and tighten the needle bar pinch screw. The needle bar is then properly set. To set a needle bar that has no mark, set the feed eccentric for eight stitches to the inch. Then set the needle bar so that when it rises 3/32 inch from its lowest position and the point of the sewing hook is at the center of the needle, the needle eye will be about 1/16 inch below the hook point. The next step is to time the arm shaft with the hook drive shaft. With the connection belt removed, rotate the balance wheel toward the operator until the thread take-up lever is at its highest point, then aline the arrow on the hook drive shaft collar with the timing plate arrow, and replace the connection belt. Rotate the balance wheel and check. The next step is to center the feeding action. For this step the feed driving eccentric must be set on zero spi. With the needle entering the feed dog, center the needle in the hole 9-21

in the feed dog with a distance of 17/32 inch between the needle bar and the presser bar. In centering the feeding action, the following sequence should be followed: Hold the needle centered in the feed dog with a 17/32-inchspace between the needle bar and presser bar. Tighten the feed driving crank and feed driving rockshaft crank pinch screws, making sure that the crank is flush with the end of the feed driving rockshaft and parallel with the bed. Next, tighten the needle bar rock frame rockshaft crank pinch screw in the back of the uprise.

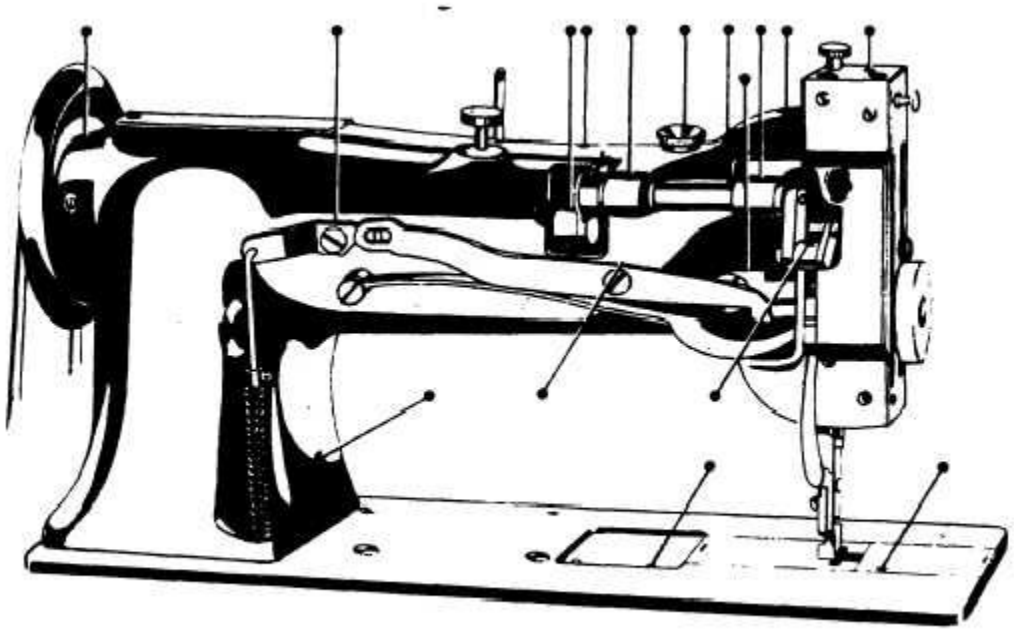
The shank of the presser foot is 17/32 inch wide and may be used for measuring the space.

The next step is to set the sewing hook to or from the needle. This is done by moving the hook saddle left or right as necessary; the hook should pass the needle as closely as possible without touching. When this is done, retighten the hook saddle screws. Next, set the sewing hook with the needle. With the needle bar on the upstroke, the lower timing mark on the needle bar should be just visible at the base of the needle bar rock frame. Set the point of the sewing hook in the center of the needle 1/16 inch above the eye. To advance the sewing hook, move the hook drive gear to the right; and to retard, move the hook drive gear to the left.

NOTE: The first screw in the hook pinion gear and the second screw in the hook drive gear are splined screws. The hook drive gear must be centered in relation to the sewing hook shaft at the bottom of the hook saddle.

Lubrication of The Class 111 Sewing Machines

Figures 9-24A, 9-25B, and 9-26 show the various lubrication points on class 111 sewing machines. Oiling points are indicated by the unnumbered arrows. Familiarization with the nomenclature of the machines may also be accomplished by studying these illustrations. To lubricate the class 111 machine, swing back the top cover and oil the bearings, then replace the cover. Loosen the thumbscrew in the upper end of the faceplate, turn the faceplate upward, and oil the wick and bearings, as shown in figure 9-25B. After oiling, turn down the faceplate and tighten the thumbscrew. Turn the machine back on its hinges and apply oil at the places designated by the arrows in figure 9-27. All contacting parts on the bottomside of the machine should also be oiled. To lubricate the hook, remove the bed slide and place oil in the oil well (fig. 9-26).



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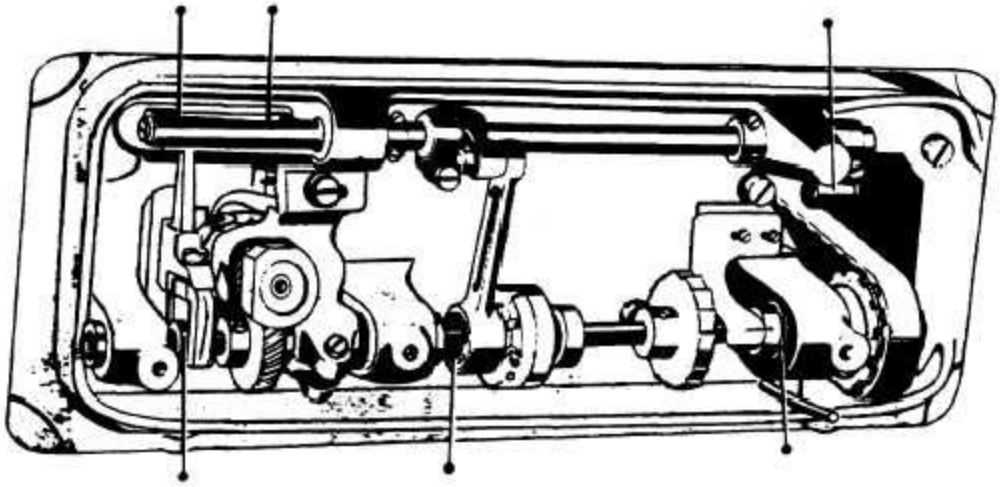
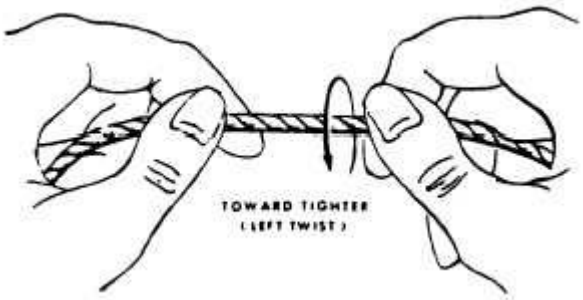
This Figure 9-26.—Rear of machine, showing oiling points. 9-22



239.284 Figure 9-27.—Base of machine, showing oiling points.

lubricates the upper hook bearing and the mechanical opener mechanism. The small, green felt pad on the side of the bobbin case should be kept wet with oil to lubricate the hook race. When this pad is wet, it appears nearly black; when it appears light green, it indicates that it is dry. When a machine is new, oil should be applied to this felt pad EACH TIME A BOBBIN IS REPLACED. Needles and Thread The thread used on rotary sewing machines is left twist. To determine the twist of thread, refer to figure 9-28. Table 9-3 lists the class and variety of needles and the needle size range for each of the class 111 machines.



239.267 Figure 9-28.—How to determine the twist of thread.

The size of needle to be used is determined by the size of the thread and material used. The thread must pass freely through the eye of the needle. If rough or uneven thread is used, or if it passes with difficulty through the eye of the

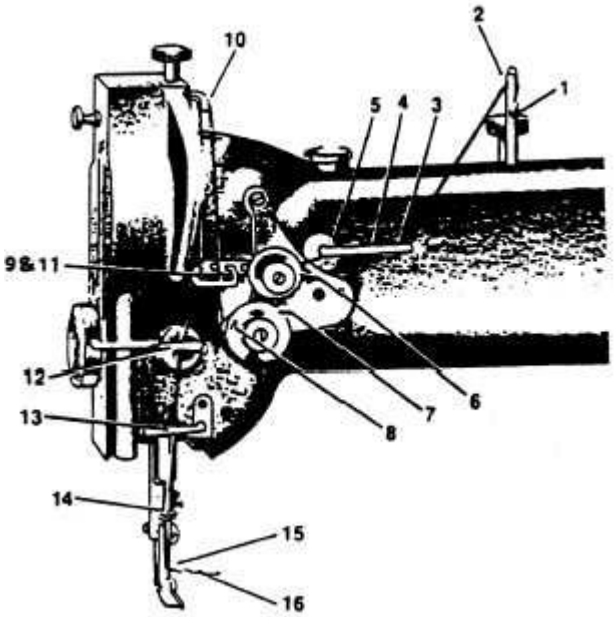
Sewing Machine	Stitches per minute	Stitches per inch	Needle class and variety	Needle size range
111 W 150	3,500	5 to 32	135 x 7	7 to 24
111 W 151	3,500	5 to 32	135 x 17	14 to 26
111 W 152	2,900	5 to 32	135 x 17	12 to 24
111 W 153	2,900	5 to 32	135 x 17	12 to 24
111 W 154	2,900	5 to 32	126 x 11	22 to 27
111 W 155	3,500	3 1/2 to 32	135 x 17	12 to 24

Table 9-3.—Data for Class 111 Sewing Machine 9-23

needle, the machine will not function prop- erly. Needles used on rotary sewing machines are ordered the same way as those for oscillating sewing machines. The needles for rotary sewing machines have seven parts. This is one more part other than the needles for the oscillating machines. The additional part is the SCARF, which is a small indention just above the short thread groove. The purpose of the scarf is to permit the point of the sewing hook to come close enough to pick up the needle thread without striking the needle.

Operation

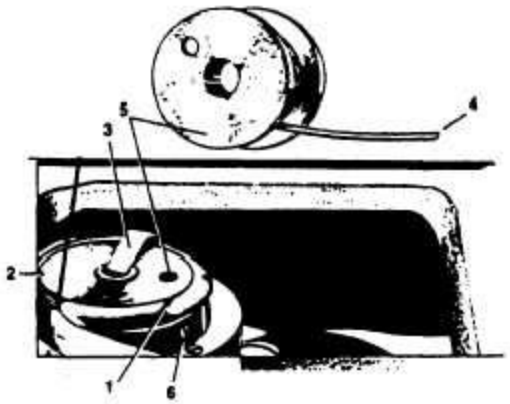
Operation of rotary sewing machines is the same as for the oscillating sewing machines. Setting the Needle Turn the balance wheel toward you until the needle bar moves up to its highest position. Loosen the setscrew in the needle bar and slip the needle up into the bar as far as it will go. The needle must be inserted with its long thread groove toward the left, the eye of the needle being directly in line with the machine bed. Retighten the setscrew. Threading the Machine Pass the thread from the thread stand from back to front (fig. 9-29) through the lower hole (1) in the thread post on top of the machine, then from right to left through the upper hole (2) in the post. Pass the thread down through hole (3), up through hole (4), and down through the hole (5) in the thread guide on the front of the machine. Continue the thread over from right to left between the tension disks (6), and down, from right to left, around the thread controller (7). Then the thread should go up into the fork (8) in the thread controller disk against the pressure of the wire controller. The thread is then passed up through the thread guide (9), and from right to left through the hole in the thread take-up lever (lo). Pass the thread down through the thread guide (11), and between the felt pad and the felt pad retainer finger (12). (If the machine you are threading does not have the felt pad and retainer



1. Lower hole in thread post
2. Upper hole in thread post
3. Hole in thread guide
4. Hole in thread guide
5. Hole in thread guide
6. Tension disks
7. Thread controller
8. Fork in the thread controller
9. Thread guide
10. Thread takeup lever
11. Thread guide
12. Felt pad and retainer finger
13. Thread guide
14. Thread guide
15. Eye of needle
16. Free end of thread

239.285 Figure 9-29.—Threading the class 111 sewing machine.

finger installed, bypass this component.) Finish the threading by passing the thread down through the thread guide (13), through the thread guide (14) at the bottom of the needle bar, and from left to right through the eye of the needle (15). Always thread a needle toward the bobbin. Removing the Bobbin To remove the bobbin, draw out the right- hand slide plate in the bed of the machine. Insert the fingernail of the forefinger under the latch; raise the latch and lift the bobbin out. (See figure 9-30). 9-24



1. Slot in the bobbin case
2. Projection on the bobbin case
3. Bobbin case latch
4. End of bobbin thread
5. Bobbin
6. Tension adjusting setscrew

239.236 Figure 9-30.-Bobbin case threaded.

Winding the Bobbin

To wind the bobbin and adjust the bobbin winder, follow the procedure given for the 31-15 sewing machine.

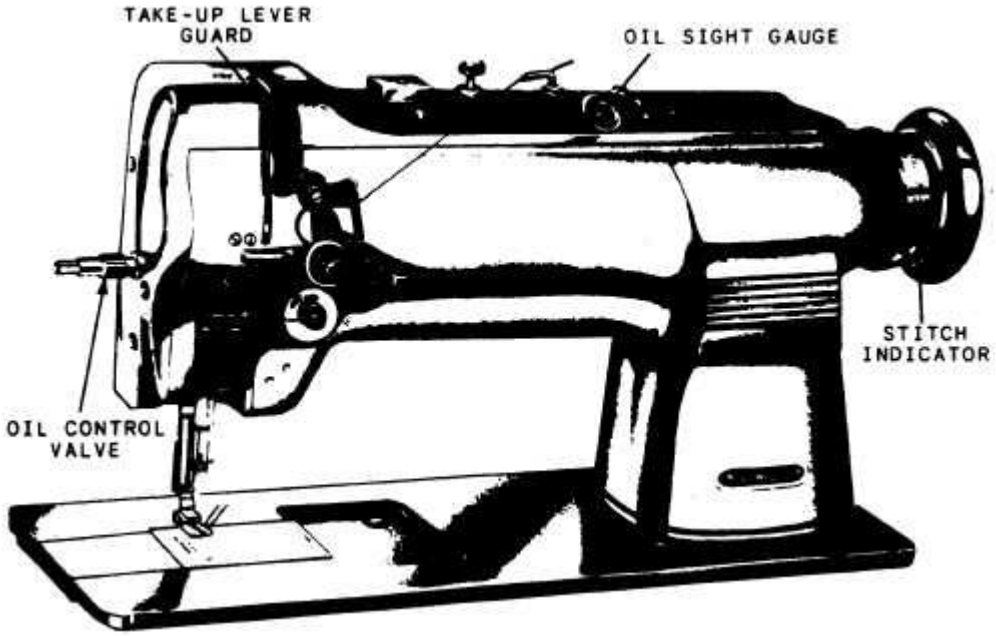
Replacing the Bobbin and Threading the Bobbin Case

Hold the bobbin between the thumb and forefinger of your right hand with the thread drawn out on the bottom from left to right. Place the bobbin on the center stud of the bobbin case; then push down the latch. Draw the thread into the slot (1), and under the back of the projection (2). Leave a loose end of thread about 2 inches long above the slide. When closing the slide plate, leave just enough space for the thread to pass through when it is first picked up by the needle. Regulating the Tension The tension on the needle thread is regulated by the tension thumb nut located at the front of the tension disks on the front of the machine. To increase the tension, turn this thumb nut clockwise. To decrease the tension, turn the thumb nut counterclockwise. The tension on the bottom (bobbin) thread is regulated by means of the small screw nearest the center of the tension spring in the outside of the bobbin case (l), as shown in figure 9-30. To increase the tension, turn this screw clockwise. To decrease the tension, turn the screw counterclockwise. Regulating the Length of Stitch The number of stitches per inch is stamped on the stitch indicating disk, which can be seen through the hole on the uprise. To change the length of stitch, press down the feed regulating stud (plunger), located in the bed of the machine. At the same time, turn the balance wheel slowly until the plunger enters a notch in the adjustable feed eccentric disk. Continue to hold the plunger and turn the balance wheel forward or backward until the number of stitches per inch desired can be seen through the hole in the front of the uprise. Disengage the plunger by releasing it. Regulating the Pressure on the Material The pressure on the material is regulated by the presser bar regulating screw at

the back of the sewing machine. The screw acts on a flat spring. To increase the pressure, turn this screw downward. To decrease the pressure, turn this screw upward. The pressure should be only heavy enough to enable the feed to move evenly along whatever thickness of material you are using. Preparing for Sewing With the left hand, hold the end of the needle (machine) thread, leaving it slack from the hand to the needle. Turn the balance wheel over toward you until the needle moves down and up again to its highest position. If the sewing machine is properly timed, this will bring the bobbin thread up with the machine thread through the hole in the feed dog. Lay the threads back under the presser foot and close the slide. Place the material under the presser foot. Lower the presser foot either by hand or by the knee lift, and begin to sew. Start the sewing by turning the balance wheel over toward you as you depress the treadle.

Removing the Work

After the machine has stopped, move the thread take-up lever to its highest position. Raise 9-25



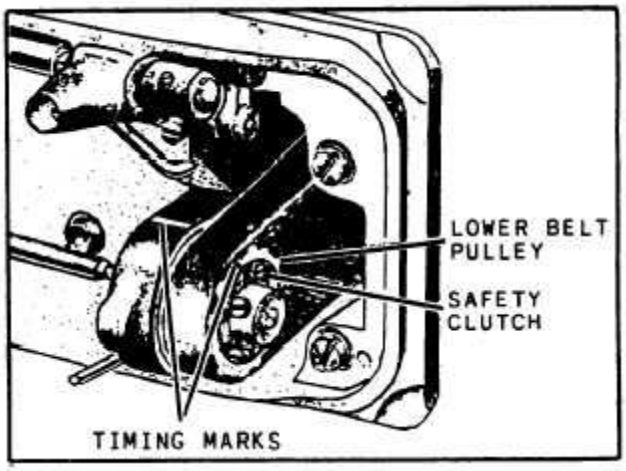
240.80 Figure 9-31.—The 211 W 151 sewing machine.

the presser foot, draw the work back, and cut the threads close to the material. Lay the ends of the threads back under the presser foot.

SINGER SEWING MACHINE 211 W 151

This machine performs the same functions as the 111 W 151. It is a newer model, more streamlined and modern in appearance, and has some design features not found in the 111 W 151 machine. (See figure 9-3 1.) These features include a new lubrication

system, a thread take-up lever guard, a thread lubricator, and a new stitch indicator. The 211 W 151 sewing machine is a high-speed (4,000 rpm maximum), single-needle, lockstitch- type machine, designated for sewing medium to heavyweight fabrics. It is belt-driven and has a rotary hook on a vertical axis, which makes two revolutions for each stitch. It has a safety clutch (fig. 9-32) that is adjustable to suit the sewing conditions; this protects the sewing hook from damage. If the hook is obstructed by foreign matter, the clutch will disengage and re-engage only after the area has been cleared. The feeding mechanism is a compound drop and needle feed with the longest stitch at five stitches per inch.



240.81 Figure 9-32.—Safety clutch and lower belt pulley.

Other features of the machine include a hinged presser foot, a presser bar lift of 1/4 inch, a needle bar stroke of 1 5/16 inches, a bed that is 20 3/8 inches long by 7 inches wide, and a space of 10 1/2 inches to the right of the needle. Needles The needles used in this machine vary according to the clearance under the presser foot. 9-26

Use 135 x 7 needles with machines set with 1/4-inch clearance under the presser foot, and 135 x 17 needles with those set with 3/8-inch clearance (lift). Adjustments Adjustments to the 211 W 151 are basically the same as for 111 W 151. These adjustments are discussed in the following text.

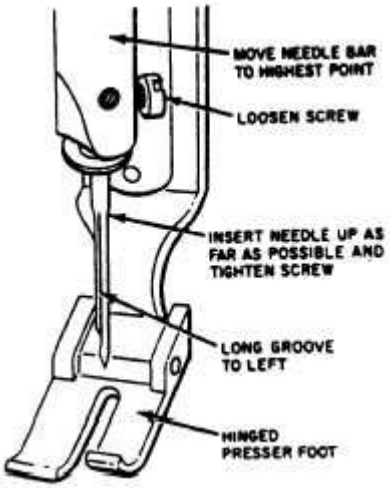
SETTING THE NEEDLE BAR.—

Place the needle bar up into the needle bar holder as far as possible. Hold in this position and turn the balance wheel toward the operator until the needle bar is at its lowest position. When in this position, set the bar so the upper timing mark is just visible below the needle bar frame, and tighten the needle bar connecting stud pinch screw. In case the needle bar does not have timing marks, set the machine to zero stitches per inch and place the needle bar up in the holder as far as possible. Turn the balance wheel

by hand until the bar is at its lowest position. After reaching the lowest position of the needle bar, continue turning the balance wheel toward the operator until it reaches 3/32 inch above its lowest point, then set the eye of the needle 1/16 inch below the point of the sewing hook.

SETTING THE NEEDLE.—

To set the nee- dle, insert the needle shank as far as possible into the needle bar with the long groove of the needle to the left and tighten the screw. (See figure 9-33.)



240.82 Figure 9-33.—Setting the needle.

240.83 Figure 9-34.—Needle bar rock frame rockshaft damp screw.

RELATIVE POSITION OF' NEEDLE BAR AND PRESSER BAR.—

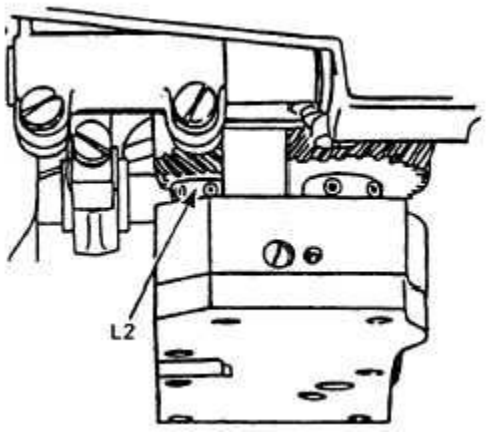
To set the relative position of the needle bar to the presser bar, loosen the needle bar rock frame rockshaft clamp screw, which is located behind the cover plate on the

front upright position of the arm (fig. 9-34). Set the needle bar so the distance between the needle bar and presser bar is 17/32 inch. Retighten the clamp screw.

NOTE: A handy tool for this adjustment can be manufactured locally from a thin piece of metal stock filed to exactly 17/32-inch width. This gauge should be placed between the two bars while the clamp screw is being tightened. This enables the operator to keep pressure on the loose needle bar.

ADJUSTMENT HEIGHT OF SEWING HOOK.—

Before attempting to adjust the height of the sewing hook, it is necessary to make a feeler gauge for testing the height. This gauge can be made of 0.032-inch shim stock, or a regular feeler gauge can be cut or trimmed down so it will fit in the small groove in the throat plate, which retains the bobbin case stop finger. If, after testing, the hook height is unsatisfactory, turn the balance wheel so the two setscrews in the bottom of the hook are accessible; loosen them with an Allen wrench. Remove the cloth washer from the bobbin case and turn the hook until the height adjusting screw is directly 9-27



239.450 Figure 9-35.—Timing tbe sewing hook.

under the hole in the bobbin case. (See figure 9-35.) Turn the screw into raise the hook, and out (while pressing down on the hook) to lower it. The gauge should barely pass between the throat plate and bobbin case stop finger. Retighten the Allen setscrews and turn the adjusting screw in so that a slight tension is left on the screw.

SETTING SEWING HOOK TO OR FROM NEEDLE.—

To set the relative position of the hook saddle to the needle, loosen the hook saddle adjusting screws (fig. 9-36) and slide the hook saddle to the right or left, as

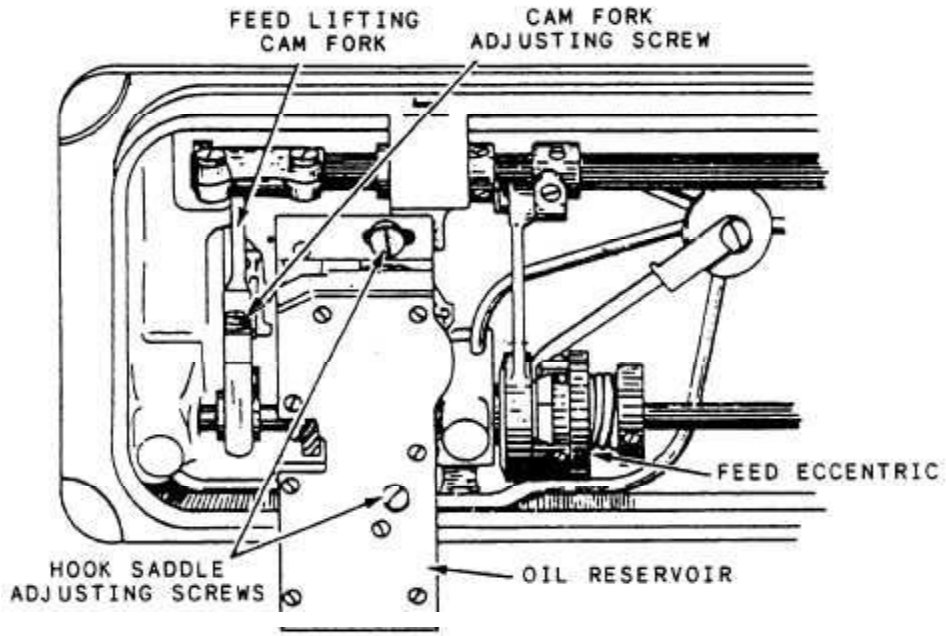
necessary, to set the point of the hook as close to the needle as possible (without actually touching). After setting the hook saddle, check the clearance between the hook drive gear and the face of the hook saddle. This clearance should be 0.008 inch; if it is not, reset it by loosening the screw and setscrew in the hook drive gear, and move the gear to the right or left to get the proper clearance.

TIMING BOBBIN CASE OPENER.—

To set the bobbin case opener, turn the balance wheel toward the operator until the lower timing mark on the needle bar is barely visible below the needle bar frame on its upward stroke. Tip the machine back and loosen the two Allen screws in the bobbin case opener drive gear; then line up the timing marks by turning the opener shaft with a screwdriver. The timing marks are located as follows: one on the flange of the opener, and the other on the hook saddle (fig. 9-35). Adjust the opener so it lightly touches the bobbin case and turns it enough to make a sufficient opening for a free passage of thread between the bobbin case stop finger and the throat plate. Tighten the screws in the bobbin case opener drive gear.

RAISING OR LOWERING THE FEED DOG

.— To raise or lower the feed dog, remove

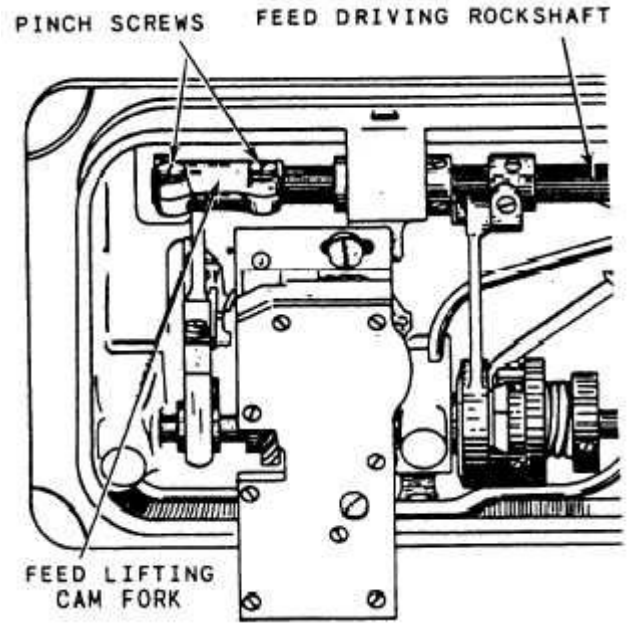


240.85 Figure 9-36.—Hook saddle assembly showing bobbin case raceway oil reservoir.

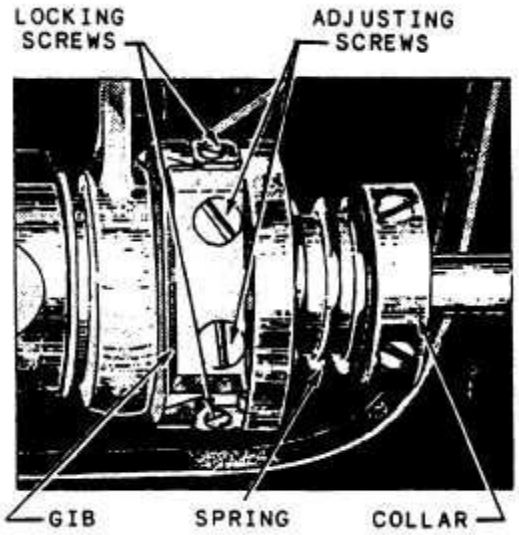
the throat plate and clean all lint and dirt from between the grooves and teeth of the feed dog. Tip the machine back and turn the balance wheel toward the operator until the feed dog is in its highest position. Loosen the screw in the feed lifting cam fork and raise or lower the dog as desired; then retighten the screw. A properly set feed dog will show a full tooth above the throat plate when at its highest position. After adjusting the feed dog, check to see that the needle is properly set in the hole in the feed dog. If adjustment is needed, loosen the pinch screws in the feed driving rock frame, and set the needle so that when it is all the way down, it will be slightly forward of center in the hole. Retighten the pinch screws. The feed adjust- ment points are illustrated in figure 9-37.

ADJUSTING FEED ECCENTRIC.—

The feed eccentric (fig. 9-38) may occasionally need adjustment to remove play caused by wear of the gib, or by looseness between the feed eccentric and the eccentric body. To adjust the gib, loosen the two locking screws, then turn inward on the adjusting screws until all play is eliminated and the eccentric fits in the slot properly.



240.86 Figure 9-37.—Feed adjustment for the 211 W 151 sewing machine.



240.87 Figure 9-38.—The feed eccentric.

CAUTION LOCKING SCREWS MUST BE LOOSENED BEFORE ATTEMPTING TO LOOSEN ADJUSTING SCREWS. RETIGHTEN THE LOCKING SCREWS AFTER ADJUSTMENT IS MADE.

The feed eccentric collar may be moved to the right or left to change spring tension, but it is ordinarily set flush with the hub of the eccentric body.

CHANGING THE LENGTH OF THE STITCH.—

TO change the length of stitch, stop the machine. Turn the balance wheel, by hand, toward the operator until the button drops (clicks), then turn the machine pulley until the number representing the desired stitches per inch is lined up properly and then release the button.

CAUTION DISENGAGE THE BUTTON BEFORE ATTEMPTING TO SEW. DO NOT ENGAGE THE BUTTON WHILE THE MACHINE IS IN OPERATION.

Removing Components To remove the hook, takeoff the presser foot, throat plate, and feed dog; then loosen the two 9-29

Allen screws in the hub of the hook and lift the hook off the hook shaft. To remove the bobbin case from the hook assembly, loosen the hook gib screws, lift off the gib, and then lift out the bobbin case.

Removing the Arm Shaft Connection Belt

When the arm shaft connection belt is disconnected for any reason, the machine will be completely out of time. Therefore, the needle should be removed before removing the belt to prevent damage. To remove the belt, slide it off the lower belt pulley, loosen the screws in the machine pulley, and remove the pulley and ball bearing, which come out through the end of the arm. Replace the belt by reversing this procedure. Remove the end play from the shaft by lightly setting the setscrews and tapping the balance wheel into position with the palm of the hand and then securely setting the setscrews. Place the belt over the upper belt pulley and line up the timing marks on the lower belt pulley and on the bed of the machine. While holding the lower belt pulley in position, turn the balance wheel toward the operator's position until the thread take-up lever is at its highest position, then slide the belt onto the lower belt pulley. The arm shaft connection belt and the lower belt pulley are illustrated with the safety clutch in figure 9-32.

CAUTION DO NOT TAMPER WITH THE SAFETY CLUTCH. ITS TORQUE IS PRESET AT THE FACTORY.

Lubrication

The hook saddle is equipped with an oil reservoir (fig. 9-36), which contains oil to be pumped to the bobbin case raceway. The flow of this oil is controlled by a control valve screw located just aft of the bobbin case opener in the hook saddle. For more oil, turn the valve screw clockwise; counterclockwise for less oil.

CAUTION DO NOT ADJUST FLOW OF OIL WITHOUT FIRST LOOSENING THE LOCKING SCREW LOCATED ON THE SIDE OF THE HOOK SADDLE JUST ABOVE THE CAM SHAFT GEAR. AFTER ADJUSTING THE CONTROL VALVE SCREW FOR PROPER FLOW, RETIGHTEN THE LOCKING SCREW.

SINGER SEWING MACHINE 143 W 2 AND 3

This type of machine is not as common as those previously described, but it has unlimited uses in the repair and maintenance of parachutes and survival equipment. The 143 W 2 is a high-speed sewing machine that has an aluminum alloy vibrating needle bar frame and a rotary hook. It is intended for overseaming and zigzag stitching on fine and general fabrics and lightweight leather. It has ball bearings on the rear end of the arm shaft and hook driving shaft. The needle bar has a maximum throw of 3/16 inch, vibrating both sides of a centerline. The 143 W 3 sewing machine is similar to the 143 W 2 except that the needle has a maximum throw of 5/16 inch. The maximum speed recommended for machine 143 W 2 is 3,500 stitches per minute, and for machine 143 W 3, 3,000 stitches per minute, the speeds depending on the material being sewn.

Needle and Thread

The needles for sewing machines are the 143 W 2 and 143 W 3 of class and variety 135 x 7; the sizes from 7 to 24. Left twist thread should be used on these

machines. To make a smooth even stitch with the sewing machine, use good, firmly twisted and smoothly finished thread. The thread should pass freely through the eye of the needle. Setting the Needle Push the needle up in the needle bar as far as it will go, with the LONG THREAD GROOVE TO THE FRONT, and secure it firmly with the setscrew. It may be necessary to turn the needle slightly to the right or left for some threads if stitches are missed. 9-30

Bobbin and Bobbin Case

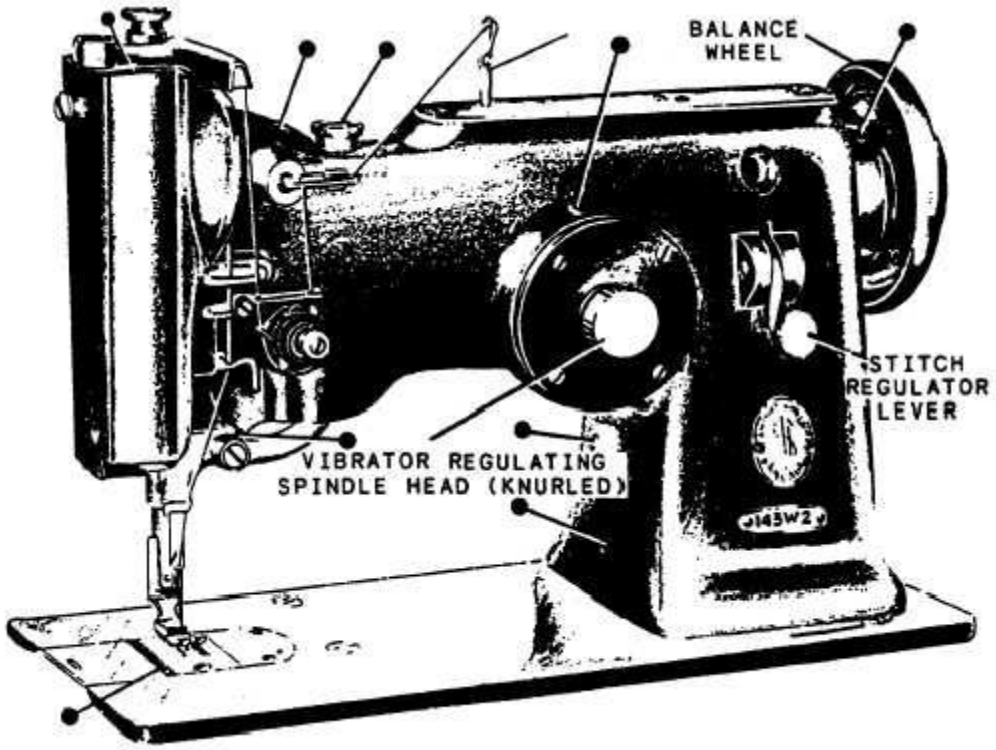
The procedure for removing the bobbin case, winding the bobbin, threading the bobbin case, and replacing the bobbin case is the same as for the 31-15 sewing machine. The only exception to this is that when the bobbin case is threaded, the thread should be drawn from the BOTTOM from left to right, instead of from the top as given for the 31-15. Threading the Needle These machines are threaded in the same way as the 111 series machines, described earlier in the chapter. When threaded up to the needle, thread the needle from the front through the eye to the back. The long thread groove should be in front when the needle is properly set in the needle bar.

Regulating the Length of Stitch

To adjust the length of stitch, depress the stitch regulator lever (fig. 9-39) on the uprise and, at the same time, turn the balance wheel forward until the lever engages in the notch in the stitch regulator flange. Hold the lever in the notch and turn the balance wheel backward or forward (as necessary) until the desired number of stitches per inch is shown opposite the arrow on the stitch regulator.

Regulating the Width of the Zigzag

The extreme width of the zigzag (needle throw) on the 143 W 2 is 3/16 inch; it is 5/16 inch on the 143 W 3. The width of bight is regulated by turning the knurled knob on the needle vibrator regulating spindle head (fig. 9-39) at the front of the machine. To increase the width of the stitch, turn the regulating spindle head to the left, and to the right to decrease. Setting the Needle Bar The two adjustment marks on the needle bar are 3/32 inch apart. To set, insert the needle bar up into the needle bar frame so the upper mark is just visible at the lower end of the needle bar frame with the bar at its lowest position. The eye of the needle should be 1/16 inch below the point



239.293 Figure 9-39.—Oiling points at the front of the 143 W 2. 9-31

of the hook, and the long thread groove toward the operator.

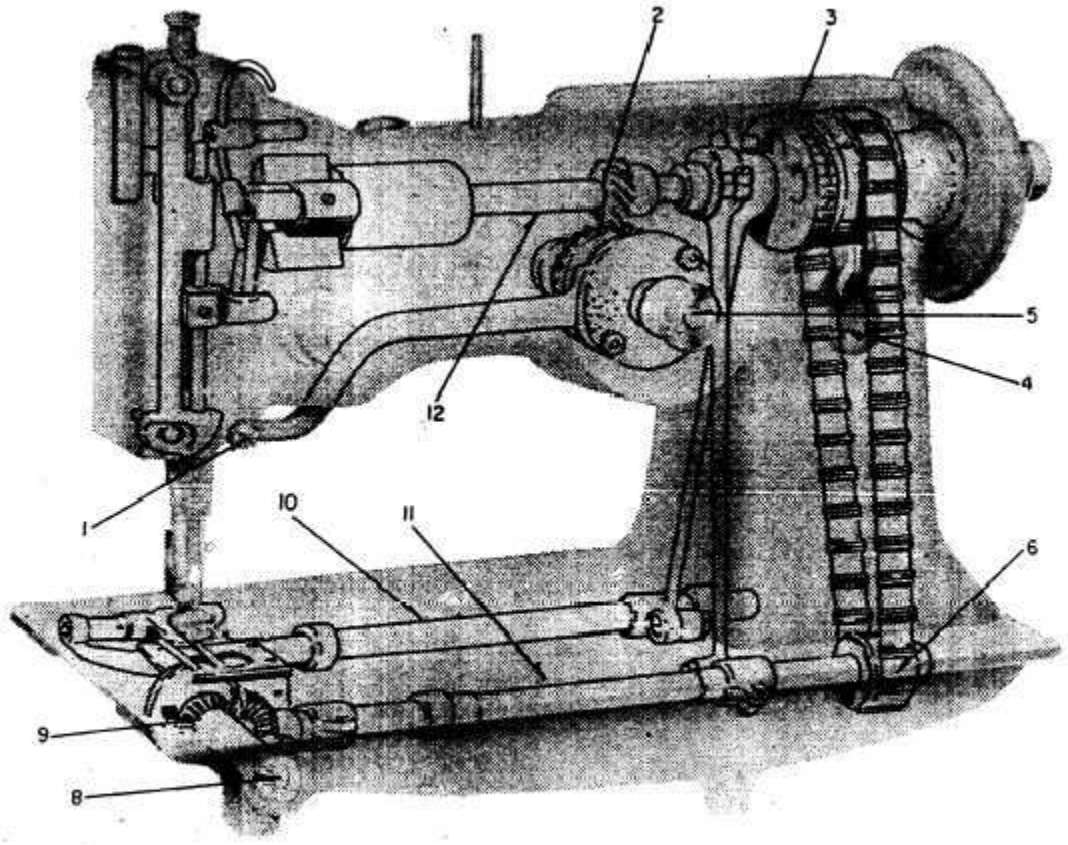
Setting and Timing the Needle Bar Frame

Turn the regulating spindle head all the way to the right. This will cause the machine to sew a straight stitch. The needle should be centered in the hole in the throat plate. If not, loosen the setscrew that holds the eccentric stud (1) and turn the stud until it is centered (fig. 9-40.) Turn the needle regulating spindle head (5) to the extreme left for the widest throw. Turn the balance wheel forward until the needle is at its lowest position. The needle bar should start to move in a sideward movement as the needle starts to rise. If it does not, you must advance or retard the vibrator pinion gear (2), shown in figure 9-40. Timing Sewing Hook Turn the balance wheel toward the operator's side until the needle bar is all the way down and has risen until the lower timing mark is just visible below the needle bar frame. Loosen the setscrews (10) in the lower belt pulley (fig. 9-41) and set the hook point to the center of the needle eye. Retighten the setscrews.

Setting the Hook Distance To or From Needle

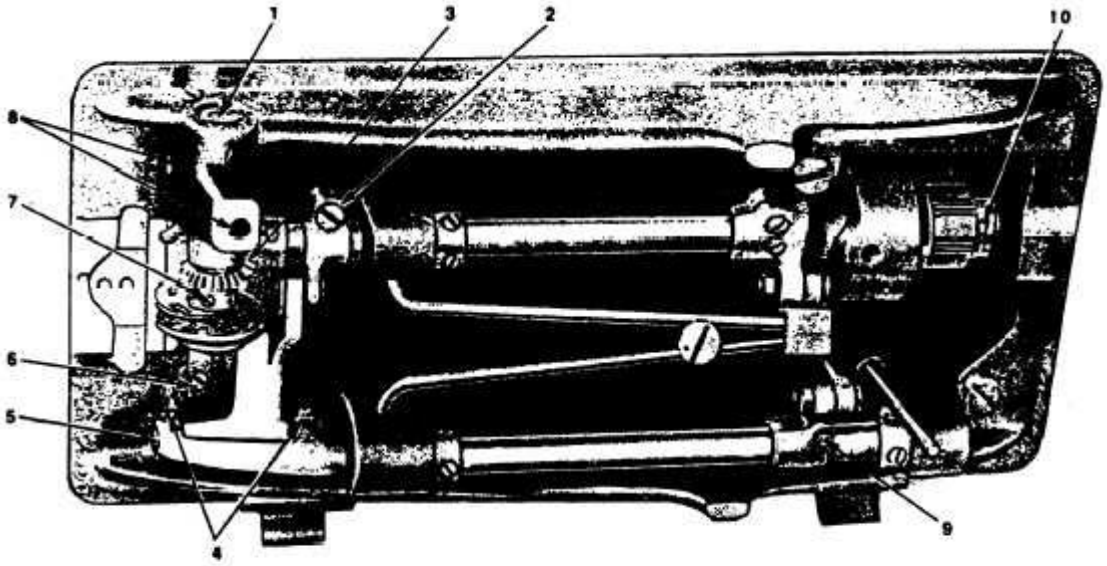
Loosen the two hook shaft retaining screws (8) (fig. 9-41) and the two screws in the hook pinion gear (7), and slide the hook to the correct position. Retighten the hook

shaft retaining screws. Set the gear in the proper place on the shaft—gear aligned with hook drive gear-and



1. Eccentric stud
2. Vibrator pinion gear
3. Stitch regulator
4. Stitch regulator lever
5. Regulating spindle head
6. Lower belt pulley
7. Hook drive gear
8. Hook spindle screw
9. Hook pinion gear
10. Feed driving rockshaft
11. Hook drive shaft
12. Arm shaft

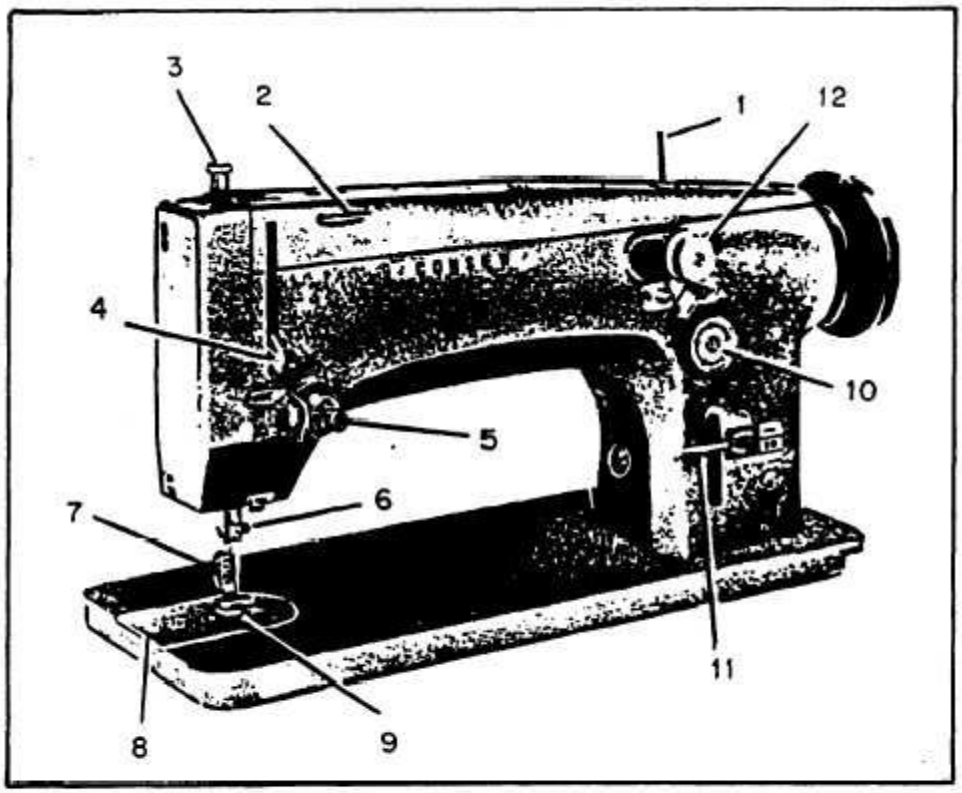
240.92 Figure 9-40.-X-ray view of zigzag sewing machine. 9-32



1. Hook spindle screw
2. Feed dog adjusting screw
3. Hook drive gear
4. Feed dog eccentric stud setscrews
5. Feed dog eccentric stud
6. Bobbin case stop
7. Hook pinion gear setscrews
8. Hook shaft retaining screws
9. Feed driving arm connection pinch screw
10. Lower belt pulley setscrews

240.93 Figure 9-41.—Adjustments in the bed of the machine.

retighten the two setscrews to hold the hook in position. Raising or Lowering the Feed Dog The feed dog should show a full tooth above the throat plate when at its highest position. To adjust the dog, remove the throat plate and make sure all lint, dirt, or other obstruction is removed, then replace the throat plate. Turn the balance wheel forward until the feed dog is at its highest position; then loosen the feed dog adjusting screw (2) (fig. 9-41), and raise or lower the feed dog as required. Retighten the adjusting screw to hold the feed dog in position. To prevent the feed dog from striking either end of the slots in the throat plate, loosen the pinch screw (9) (fig. 9-41) and move the feed dogs forward or backward (as necessary) until the longest stitch can be taken without striking the throat plate. Sewing Techniques In this chapter we pointed out the need to let the machine feed the material being sewn, and other techniques to obtain a good seam. At first you will find it very difficult to turn comers when using a sewing machine. If you will follow these instructions you will find it very easy to make a turn and not lose your stitch. Stop the machine while the needle is rising, but before it is out of the mate- rial, raise the presser foot and turn the work. This method uses the needle as a pivot. When the material lies in the new position, lower the foot and continue sew- ing. Removing the Work Raise the presser lifter and turn the machine by the balance wheel until the take-up lever is at its highest position. Draw the work out away from you. If the threads do not draw out easily, the take-up lever is not in the right position. If the machine is stopped as directed, the needle will not be unthreaded when you start to sew, even if only a short end is left through the eye of the needle. 9-33



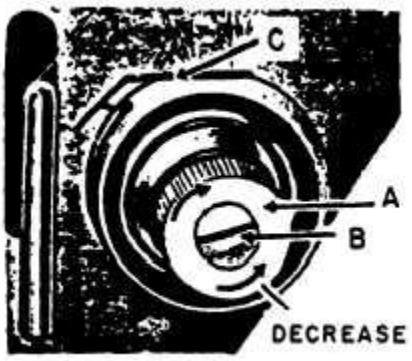
1. Spool pin
2. Thread guide
3. Pressure regulator
4. Take-up lever
5. Tension regulator
6. Needle bar
7. Presser foot
8. Slide plate
9. Needle Plate
10. Stitch length regulator
11. Feed direction lever (for tacking)
12. Zigzag width regulator

Figure 9-42.-Consew 99R.

CONSEW 99R and 99R-3 SEWING MACHINE

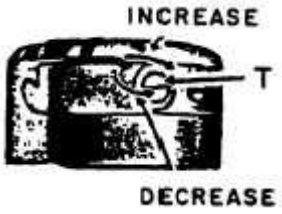
The Navy has recently acquired new model zigzag sewing machines (fig. 9-42), model 99R-3 is not shown, capable of the rope sewing needed to install the four-line release system. Two models are available-the 99R and the 99R-3. Both models are rotary hook- type machines. They are fairly conventional machines, and the operation of both is very similar to that of the machines we have already discussed. Models 99R and 99R-3 machines are iden- tical in outward appearance; the difference is in the type of stitch they make. In model 99R, every successive stitch forms a sym- metrical zigzag pattern stitch, type 304. In model 99R-3, a by successive pairs Threading the 99R zigzag pattern of stitches, type 239.451 is formed 308. and 99R-3 Machines Follow the instructions below when threading the needle and bobbin on the 99R and 99R-3 sewing machines: 1. Turn the balance wheel toward you until you are able to position the needle so you can place the thread through its eye. Remember, always thread the needle toward the bobbin. In this case. you run the thread from front to back. 2. Hold the loose end of the needle thread in your left hand, turn the hand wheel toward 9-34

you with your right hand until the needle moves down and up again to its highest position. 3. Pull the needle thread gently and the bobbin thread will come up with it through the hole in the needle plate. 4. Place both ends of the thread beneath and in back of the presser foot. 5. With the needle at its highest point, place the material to be sewn beneath the presser foot and fully lower the presser foot lifter lever. 6. Start sewing. Regulating the Tension Tension is the key word to good sewing. For perfect stitching, the tension of the upper and lower threads should be balanced and just sufficiently tight to lock both threads in the center of the material (look again at figure 9-16). The machine is correctly adjusted to make a perfect stitch before leaving the factory. When adjustments do become necessary, the problem is more likely to be caused by the upper thread tension, so always begin there. To adjust the upper thread tension, proceed as follows: 1. Lower the presser foot. Remember upper thread tension adjustments must be made with the presser foot down. 2. Check the upper thread tension. If it is loose, turn the tension nut (A in fig. 9-43)

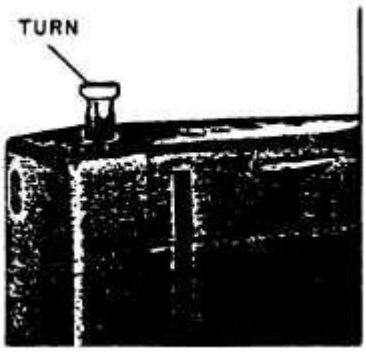


239.452 Figure 9-43.—Upper thread tension.

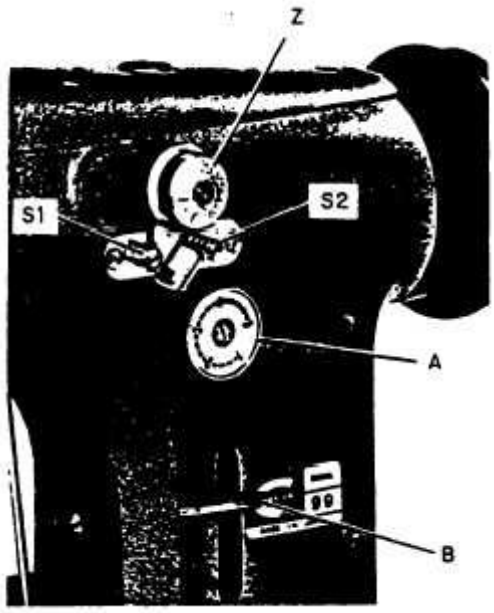
clockwise to increase the tension; if the upper thread tension is tight, turn the tension nut counterclockwise to loosen it. Adjusting the Bobbin Thread Tension When you find it necessary to adjust the bobbin thread tension, turn the tension screw (T of fig. 9-44) on the bobbin case clockwise to increase the tension, and turn the screw counterclockwise to decrease the tension. Regulating the Pressure of the Presser Foot The pressure of the presser foot should be adjusted according to the type of material being sewn. The heavier the material, the heavier the pressure. The lighter the material, the lighter the pressure. The pressure should be only heavy enough to prevent the material from rising with the needle and to enable the feeder mechanism to move the work along evenly. The pressure becomes tighter as the regulating thumbscrew is turned clockwise, and looser as the thumbscrew is turned counterclockwise (fig. 9-45).



239.453 Figure 9-44.—Bobbin thread tension.



239.454 Figure 9-45.—Adjusting the presser foot pressure. 9-35



239.455 Figure 9—46.-Stitch regulator.

Stitch Regulator and Reverse Sewing and Tacking

For reverse sewing and tacking, proceed as follows: 1. When the number 1 on dial A of figure 9-46 is set uppermost on a vertical line, the feeder does not move the material.

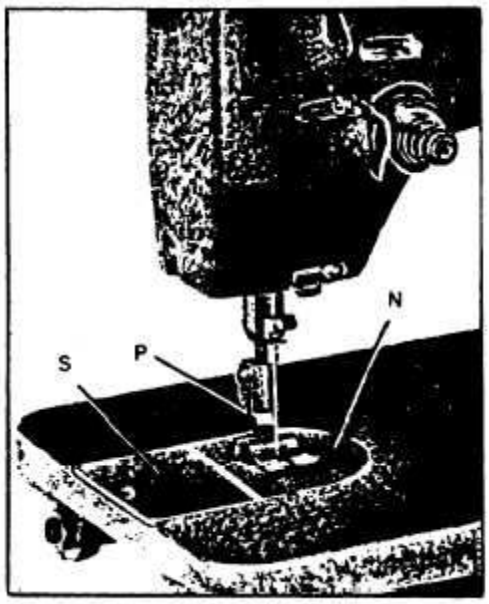
2. When the dial (A) is turned counter- clockwise and lever (B) is raised as far as it will go, the machine makes forward stitches, in- creasing in size as the dial knob is turned toward the larger numbers. 3. For reverse sewing, lower the lever (B) as far as it will go. 4. By moving the lever up and down during sewing, you can easily make forward or reverse stitches continuously and at will. You can make use of this feature for locking the thread at the start or end of seams.

Zigzag Sewing

Be sure that stops S1 and S2 are set at the extreme ends of their slot. If not, use a screwdriver to loosen them about one turn, and then tighten them in their extreme positions. Turning the zigzag regulating knob Z clockwise as far as it will go causes the machine to sew with a straight stitch. Turning this knob counterclockwise produces a zigzag stitch. The zigzag becomes wider the more this knob is turned in a counterclockwise direc- tion. The widest zigzag stitch is sewn when knob Z cannot be turned any further. This occurs when the pointer at the underside of knob Z points at the largest number on the dial and is stopped by stop S2. When you want to control the width of the zigzag between certain minimum and maximum limits between the numbers on the dial, use a screwdriver to set stops S1 and S2 to the selected widths. Be sure to set stop S1 as far to the left as possible when a straight stitch is desired. NOTE: The zigzag regulating knob can be moved into any desired position while the machine is operating. Do not turn the zigzag regulating knob when the machine is at rest and the needle is in the material. If you do you may bend or break the needle. Turn the handwheel toward you to raise the needle out of the material before operating the regulating knob. Preparing the

Machine for Rope Stitching (Model 99R-3 only)

For rope stitching, the standard combination of presser foot, feed dog, and (throat) needle plate is replaced with a special set of components designed specifically for this purpose. To do this, move slide plate (S of fig. 9-47) as far to the left



239.456 Figure 9-47.—Rope stitching. 9-36

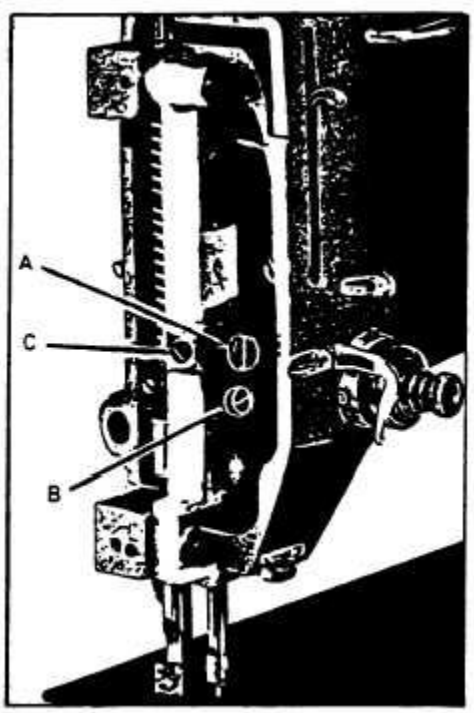
as it will go. Using a screwdriver, remove the two screws holding the needle plate (N) to the bed of the machine. Remove presser foot (P) from the presser bar and lift the needle plate off the bed. Now the feed dog becomes exposed. Loosen the two screws that attach the feed dog to its carrier, and remove the feed dog. Proceeding in reverse order, first install the special rope-sewing feed dog on the feed dog carrier, making certain that the two screws are tightened well. Next, put in place the special (throat) needle plate, and then the special presser foot, tightening all their screws securely, and close the slide plate. Adjust the stitch length and the width of zigzag to suit the rope to be sewn.

Setting the Needle Bar at the Correct Height

Before adjusting the height of the needle bar, make sure that the needle is pushed up into the needle bar as far as it will go. Now, remove the faceplate from the machine. Set the zigzag control knob for straight sewing and turn the handwheel toward you until the needle reaches the lowest point of its downward stroke. See that the needle enters the needle slot in the throat (needle) plate at the very center. When the needle is centered, proceed in the following manner: Remove the slide plate, needle (throat) plate and feed dog. Continue turning the hand- wheel toward you until the needle bar has risen approximately 3/32 inch above its lowest position. The point of the sewing hook should now be at the center of the needle at a distance approximately 3/32 inch above the eye. If adjustment should be required, loosen the setscrew (B of fig. 9-48) in the needle bar connecting stud to raise or lower the needle bar as may be necessary. Be sure to tighten the setscrew after making this adjustment.

Centering the Needle in the Throat (Needle) Plate

If the needle needs centering within the needle slot in the needle (throat) plate, set

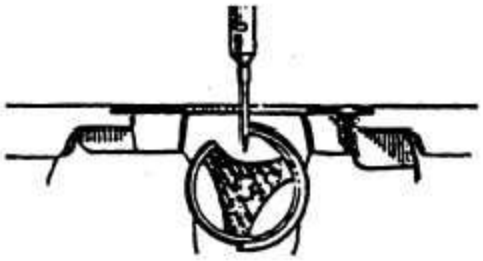


239.457 Figure 9-48.-Setting needle bar.

the machine for straight sewing and turn the handwheel toward you until the needle bar reaches the lowest point of its downward stroke. Loosen setscrew (C of fig. 9-48) and turn eccentric stud (A of fig. 9-48) until the needle is centered correctly. Retighten setscrew (C). Set the zigzag knob to the widest stitch position and turn the handwheel toward you. Observe the passage of the needle through the needle (throat) plate. It should pass at about an equal distance from either end of the needle slot when making the left and right zigzag stitch. If necessary, readjust the eccentric stud (A of fig. 9-48) as described before.

Timing the Sewing Hook

Remove the presser foot, slide plate, throat (needle) plate and bobbin case. Also remove the feed dog. With anew needle in the machine, turn the handwheel toward you until the needle bar reaches its lowest point. Continue turning and allow the needle bar to rise about 3/32 inch while on its upward stroke. With needle bar in this

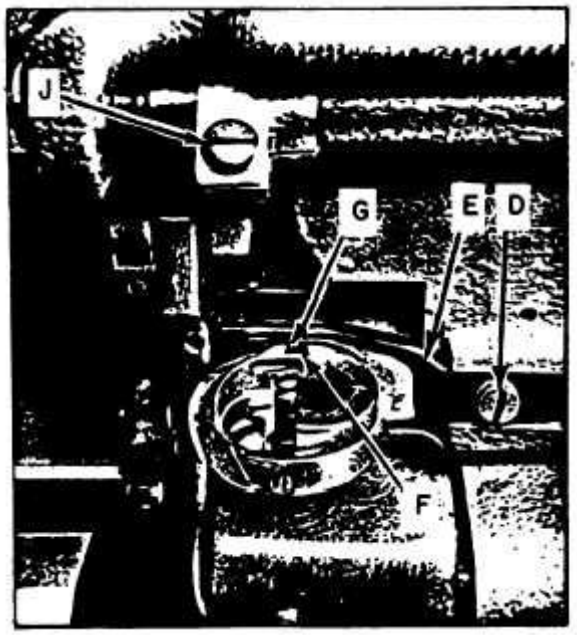


239.458 Figure 9-49.—Timing sewing hook.

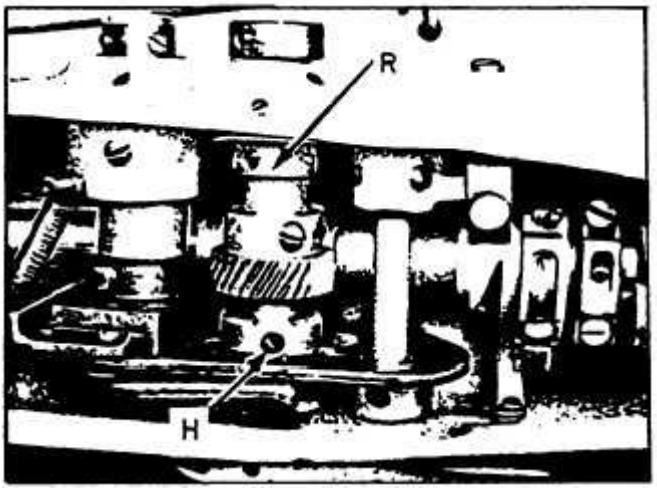
position, the point of the sewing hook should be at the center of the needle (fig. 9-49). If the sewing hook is not timed correctly, loosen the three setscrews in its hub. Turn the hook on its shaft to align the point with the center of the needle, as shown in figure 9-50. Tighten the three setscrews.

To Remove and Replace the Sewing Hook

Remove the needle, slide plate, and bobbin case. Take out screw (D of fig. 9-50) and remove hook retainer (E of fig. 9-50). Loosen the three setscrews in the hub. Turn the handwheel until the thread guard (widest part) of the hook is at



239.459 Figure 9-50.—Sewing hook.



239.460 Figure 9-51.—Removing sewing hook.

the bottom, then remove the sewing hook from its shaft (fig. 9-5 1). When installing a new sewing hook, have the thread guard at the bottom. Now turn the bobbin case holder until the notch (F) is at the top. Replace the hook retainer (E) watching that the projection (G) near its end (fig. 9-50) enters notch (F) in the bobbin case holder. Fasten the hook retainer to the underside of the bed by means of its screw. Replace the needle and time the sewing hook as described in the preceding paragraph. Reinstall the bobbin case, throat plate, and slide plate. Timing the Feeding Mechanism The feeding mechanism is timed at the factory for average stitching performance. Normal timing is such that the feed dog teeth, rising from their lowest position, should be just flush with the surface of the throat (needle) plate after the needle point has traveled about 5/16 inch above the plate while on its upstroke. To adjust the feeding mechanism, remove the top cover from the machine. Turn the handwheel toward you until the two setscrews, which lock the feed eccentric into the main shaft, come into view (fig. 9-5 1). Loosen both setscrews; lightly tap the feed eccentric toward you to advance the feed timing. To retard the feed timing, tap the eccentric to rotate it toward the rear of the machine. 9-38

NOTE: Rotate the eccentric no more than about 1/16 inch, then tighten its setscrews and check for results.

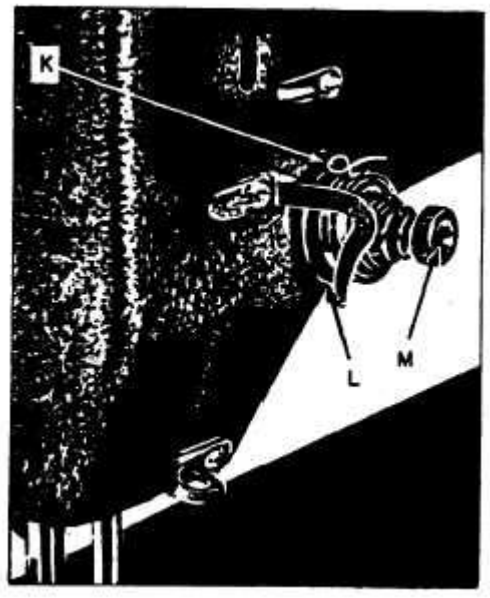
Timing the Movement of the Needle Bar Frame

Set the zigzag knob for straight stitch. Turn the handwheel and observe the travel of the needle into and out of the needle slot in the throat (needle) plate. If the needle is not centered in the slot, make the adjustments that have been described. Now adjust the needle to produce the widest zigzag stitch. Turn the handwheel toward you and observe vibration (sidewise movement) of the needle bar. The needle bar, on its upward movement, should begin to vibrate when the point of the needle is no less than about 3/32 inch above the throat plate, and should stop vibrating when the

needle has reached approximately the same position on its downward movement. To adjust the vibration of the needle bar on model 99R, loosen the setscrews (H of figure 9-51) in the vibrator cam and slightly turn this cam on its shaft. Tighten the setscrews and check for results. On model 99R-3, the vibration of the needle bar is produced by a plate cam located at R on figure 9-51. Loosen its setscrews and slightly turn the cam on its shaft, following the same procedure as outlined in the preceding paragraph. Be sure to retighten the setscrews.

To Raise or Lower the Feed Dog

When at its highest position, the feed dog should usually rise above the throat (needle) plate the full depth of the teeth. To adjust the position of the feed dog, loosen screw (J of fig. 9-50) and raise or lower the feed dog; then tighten the screw. When raising or lowering the feed dog, be careful that its underside does not drop so low that it strikes the hook.



239.461 Figure 9-52.—Adjusting thread take-up spring.

Adjustment of the Thread Take-up Spring

The thread take-up spring (K of fig. 9-52) should be set so that when the eye of the needle reaches the material on the downward stroke, the spring has completed its action and rests against the top of the thread take-up spring regulator. If the thread take-up spring is not correct, loosen setscrew (L of fig. 9-52) and turn the tension stud (M) to the left for reduced movement of the spring, or to the right for more movement. After the take-up spring is set correctly, tighten setscrew (L). Regulation of the tension of the thread take- up spring (K) is done by turning the tension stud (M) to the right to increase tension or to the left to decrease it. Tension of the spring should just be enough to take up the slack of the needle thread until the eye of the needle reaches the material on its downward movement. 9-39