

SINGER
CLASS 251-22

SERVICING INSTRUCTIONS FOR MACHINE 251-22

DESCRIPTION

251-22 is a high speed, single needle, lock stitch, compound feed machine, especially adapted for stitching "wash and wear" as well as foam-laminated, synthetic and regular light to medium-heavy materials.

The combination of needle feed and drop feed, independently adjustable, insures positive and accurate feeding of two or more plies of material, with all plies coming out evenly at end of seam.

CHARACTERISTICS - - -

Needle, Catalog 2270 (16x257).

Needle bar stroke, 1-13/64 inches

Clamp-type needle bar.

Federal Stitch Type #301.

Balanced, rotary sewing hook on horizontal axis makes two revolutions for each stitch. Hook is gear driven and automatically lubricated. Wiper prevents accumulation of lint and abrasive matter on hook.

Thread guard on hook and bobbin case holder on eccentric bearing accommodate heavier threads.

Since the most important factor in sewing "wash and wear" material is the maintenance of a constant, light thread tension and presser foot pressure, both the needle thread tension assembly and the pressure regulating thumb screw have been provided with a locking nut. Vibration and unintentional contact can no longer upset the tension and pressure settings.

Drop feed consists of pendant link feed with feed leveling hinge pin.

Pendant link feed mechanism enables feed dog to remain in continuous, even contact with material for longest possible portion of feeding cycle.

Length of stitch determined by a push button stitch regulator on top of machine arm. Stitch length indications imprinted on machine pulley are in view of operator.

Maximum stitch length, with regular fittings, 10 stitches per inch.

THE SINGER MANUFACTURING COMPANY

Presser bar, barrel-type with external pressure spring.

Clearance under presser foot, 5/16 inch.

Automatic lubrication and drip-proof oil return system. Centrifugal pump delivers oil under pressure from reservoir (capacity, 1-1/2 pints) to all principal bearings.

Spiral gears are flood lubricated.

Provision is made to automatically lubricate all other bearings in machine. Oil wicks lubricate bearing surfaces in head end of machine and return excess oil to reservoir.

Thread take-up lever oil guard covers entire path of take-up lever.

SINGER* OIL, "TYPE A" or "TYPE C" recommended.

Oil flow window, in direct view of operator, reveals circulation of oil inside machine arm.

Bed dimensions: Length, 18-3/4 inches. Width, 7 inches. Space at right of needle, 11 inches.

Machine head is supported by a machine base and oil reservoir which is designed to fit a standard cut out in table.

Machine pulley 147139. Outside diameter of belt groove 2.90 inches for 3/8 inch V-belt. Effective diameter for 5/16 inch round leather belt is 2-3/8 inches.

When machine is in operation, top of machine pulley must always turn over toward operator.

Knee lifter, regularly furnished, is an integral part of machine base and reservoir.

Arm designed with seat for mounting light fixture independently of presser bar lifting lever hinge screw.

SPEED

Maximum speed is 5000 revolutions per minute, depending upon nature of material, ability of operator and continuity of operation.

It is advisable to run these machines 500 revolutions per minute slower than maximum for the first 100 hours of operation, after which they can be driven at maximum speed.

INSTALLATION

When machines are shipped with machine base and oil reservoir bolted to machine, remove and discard bolt and plug bolt-hole in base with special cap screw (see Fig. 1) supplied with machine.

Base fits into table cut-out (shown in Fig. 1) and rests on four corners without fastening.

Rasp edges of cut-out, if necessary, as base must slide in without driving and must be located so that machine head does not touch table when it is placed on base.

Use shims on corners, when necessary, to prevent base from rocking. Base should be level in both directions so that oil level in reservoir will be accurately related to marks stamped in base.

See that plunger is in place inside base as shown in Fig. 1, before putting machine on base.

Machine head is not fastened but should rest on cork gasket in base. The machine hinges must not support the head except when machine is tilted back.

Knee lifter, except for knee plate and knee lifter lever (see Fig. 2) is shipped assembled to base. After base is in position, loosen clamp screws shown in Fig. 2 and slide shaft forward to position shown. Attach knee lifter lever. Set stop screw so that there is only a little play of the lifter before it starts to lift presser bar, then hold stop screw and tighten lock

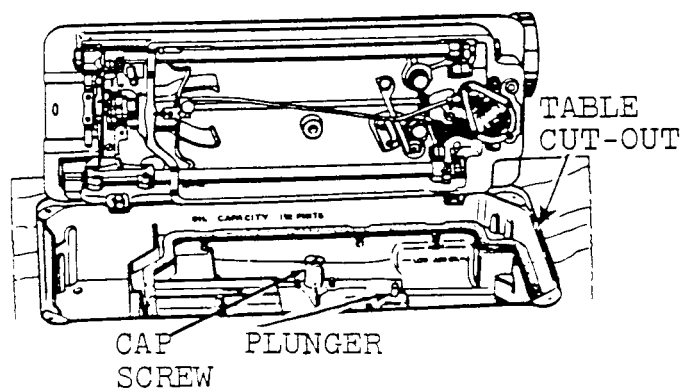


Fig. 1. Installation of Machine on Base

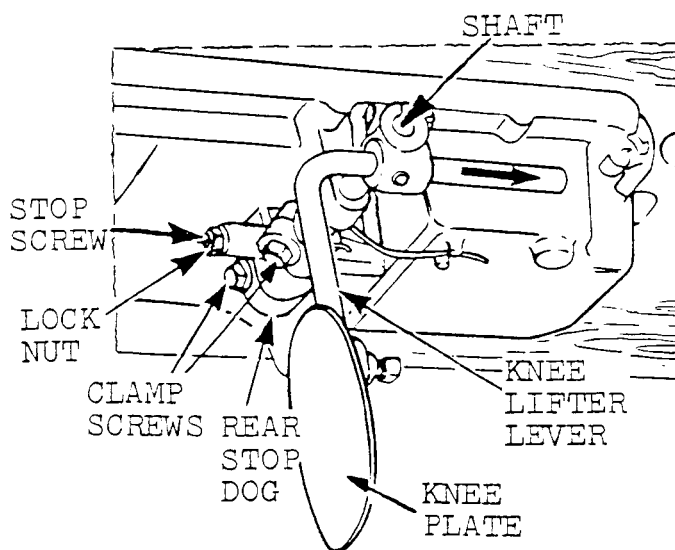


Fig. 2. Installation of Knee Lifter on Machine Base

nut. Set rear stop dog to allow presser bar to be just raised to its limit but not enough to permit further strain on knee lifter nor to lift machine from its base.

CAUTION: Before starting machine, it must be thoroughly oiled. Observe instructions in Operators Guide, Form 21147, this machine.

ADJUSTMENT OF OIL WICKS

All wicks that lubricate needle thread take-up should touch oiling points on take-up assembly, as shown in Fig. 3.

ADJUSTMENT OF HOOK OIL FLOW REGULATOR

Sewing hook is automatically lubricated. Flow of oil is controlled by oil flow regulator 140551.

Oil flow regulator 140551 is set at factory for automatic lubrication of hook under average sewing conditions.

Turn regulator thumb screw (see 140551, Fig. 4) clockwise to increase flow of oil to hook as indicated by (+) sign near its arrow on head of thumb screw.

Turn regulator thumb screw counterclockwise to decrease flow, as indicated by (-) sign near its arrow on head of thumb screw.

HOOK LUBRICATION TEST AND ADJUSTMENT:

The adjusting screw should be initially set completely IN and then backed OUT 2-1/2 turns.

To determine whether oil is properly flowing to the hook - - -

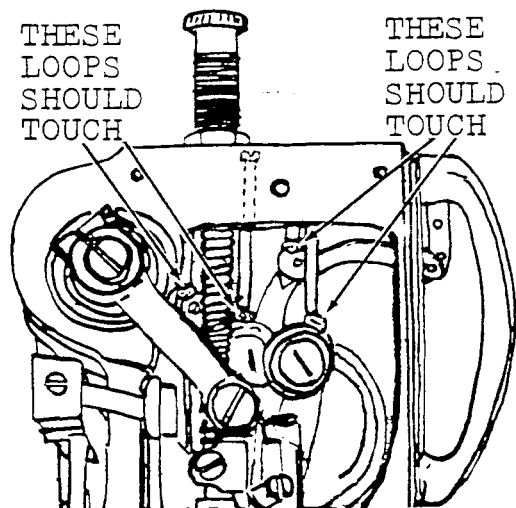


Fig. 3. Oil Wick Adjustment

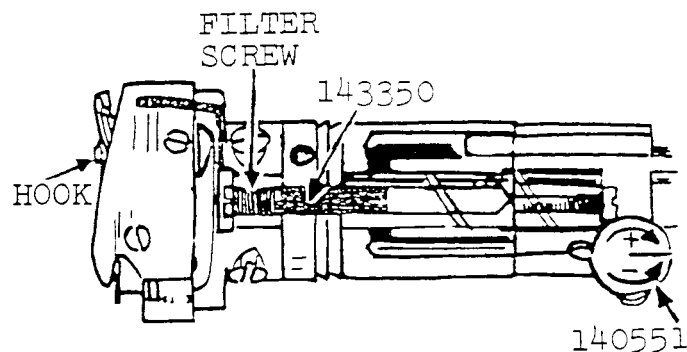


Fig. 4. Oil Flow Regulator in Hook Shaft Bushing

Remove bed slide.

Run machine for approximately one minute to establish a uniform rate of flow. Stop machine. Hold a piece of white paper underneath hook and run machine for 10 seconds without moving paper.

Remove paper and inspect: There should be a distinct line of oil directly beneath hook bearing, along with a fine spray on each side.

If there is not a trace of oil or if there is an excess of oil on test paper, adjust oil flow regulator, as instructed above.

Machine must run at least one minute between adjustments to insure uniform oil flow.

HOOK LUBRICATION TEST
AND ADJUSTMENT (CONT'D)

(See Fig. 5)

When correction cannot be made
by turning regulator thumb screw - - -

Remove needle, bobbin and bobbin case from machine.

Remove bracket screw and position finger shown in Fig. 5. Loosen two hook body screws, and remove sewing hook from driving shaft.

Loosen filter screw shown in Fig. 4 and check oil filter wick complete 143350. Oil wick should be replaced whenever it has become clogged by lint or dirt from oil.

An excess of oil indicates that filter wick may have become detached from filter screw or that filter screw is loose. Repair or replace as required.

Inspect all oil passages in shaft and bushing to see that they have not become clogged with lint or dirt. Just plain dirt can prevent oil from reaching its objective.

To test oil flow while hook is removed from machine, hold test paper under end of hook shaft (with machine running at full speed) for 15 seconds. Oil streak should then be about 1/16" wide.

When correct flow is obtained replace sewing hook and position finger, as shown.

Check hook timing and adjustments as instructed on pages 8 to 10.

Re-test oil flow as instructed on page 4. When hook lubrication is satisfactory, replace all parts removed earlier.

NEEDLES

Needles of Catalog #2270 (16X257) are recommended.

Selection of needles can make a great difference in the ease and quality of the work. It is important that the needle be just right for machine, thread and work being done.

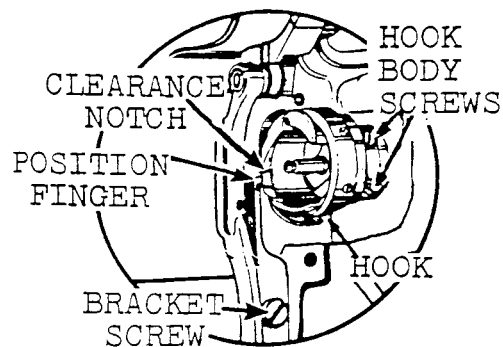


Fig. 5. Sewing Hook and Position Finger

The correct size will permit thread to pass freely through needle eye; avoiding strain and breakage of thread.

Use the smallest possible needle for thread in use.

If trouble occurs in stitching inspect needle - - -

A bent needle or a clogged needle eye and groove may cause machine to skip stitches.

Needle incorrectly seated in needle bar may cause thread breakage or skipped stitches.

A hook or burr on needle point will result in undesirable cuts in material along line of stitching.

Check needles often to make sure that these defects are not present.

Orders for needles must specify Quantity required, Size number and Catalog number.

For example - - - -

"100 Size 13, Catalog 2270
(16X257) Needles."

For best sewing results, always use **SINGER*** needles.

THREADING

Thread machine as instructed in Operator's Guide, Form 21147.

Use left twist thread in needle.

Either right twist or left twist thread may be used in bobbin.

TO AVOID THREAD BREAKAGE

1. Remove sharp edges from thread contact surfaces of all thread handling parts.
2. Check needle and thread.
3. Thread machine correctly.
4. Make certain machine is set for lightest tensions possible, without loss of thread control.
5. Keep machine clean and well oiled, at all times.

PRELIMINARY INSPECTION

Before any unnecessary time and effort is spent making major adjustments or installations, check following conditions of machine performance.

1. Sample of work currently produced on this machine.
2. Needle and thread in use.
3. Threading.
4. Speed of Machine.
5. Lubrication condition.

Before checking and adjusting a machine that has been idle for some time, check for hardened oil or grease between moving parts. Clean machine in Varsol or similar cleaning compound and remove all hardened lubricant. Then hand-oil all moving parts at points of contact.

After a machine has had considerable use, check for worn out parts, loose-fitting shaft, eccentrics, yokes and links, bent needle bar, presser bar and needle,

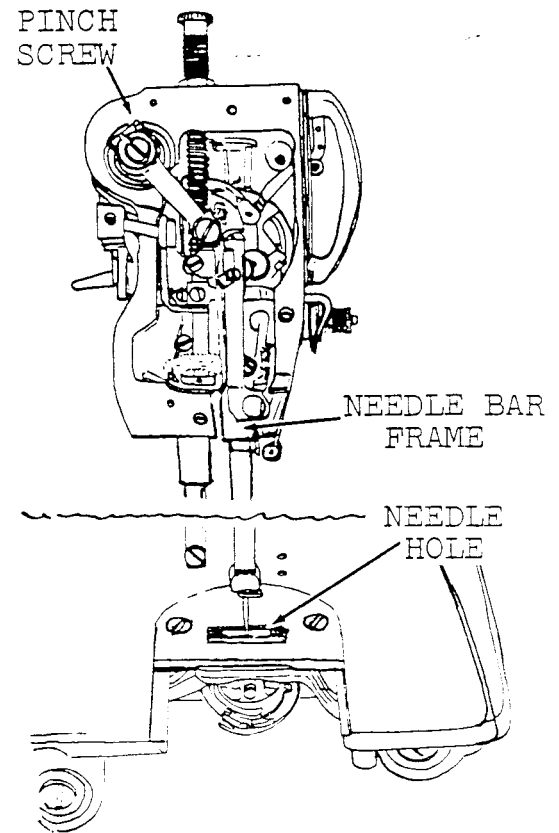


Fig. 6. Positioning the Needle

damaged hook, throat plate, presser foot and feed dog. Replace all parts showing wear with **SINGER** parts for top performance.

POSITIONING NEEDLE IN RELATION TO THROAT PLATE AND FEED DOG

Set feed eccentrics for longest stitch.

Insert Catalog 2270 (16X257) needle correctly in needle bar.

Remove face plate and slide plate.

CHECK:

Needle should not contact surfaces of throat plate or feed dog at any time.

SETTING:

Needle bar frame, needle bar and needle may be positioned forward or backward in relation to needle hole in feed dog, after loosening clamp screw shown in Fig. 6. Securely tighten this clamp screw after desired setting is obtained.

TO SET THE NEEDLE BAR AT THE CORRECT HEIGHT
(See Fig. 7)

PREPARATION:

Remove face plate, slide plate and throat plate.

See that needle is correctly set in needle bar.

HEIGHT SETTING (without timing mark):

When needle bar is at its lowest point (during rotation of machine pulley) needle stop on needle bar should be 1-1/32 inches above throat plate seat, as shown in Fig. 7.

To adjust, loosen needle bar clamping screw and raise or lower needle bar, as required. Securely tighten clamping screw.

SETTING THE TIMING INDICATOR PIN:

Set needle bar at correct height, as instructed above.

When needle bar is at its lowest point (during rotation of machine pulley) the point of timing indicator pin should be level with UPPER TIMING MARK on needle bar, as shown in Fig. 7.

To adjust indicator pin, loosen set screw, shown in Fig. 7, in needle bar frame and raise or lower pin, as required. Securely tighten set screw.

HEIGHT SETTING (using timing mark):

When timing indicator pin is correctly set, as instructed above, and needle bar height has been subsequently disturbed, needle bar may be quickly restored to its correct height, as follows - -

Turn machine pulley slowly until needle bar is at its lowest point. Loosen needle bar clamping screw and raise or lower needle bar, as required, to bring UPPER TIMING MARK level with pointer on timing indicator pin, as shown in Fig. 7. Securely tighten clamping screw.

Replace throat plate and slide plate.

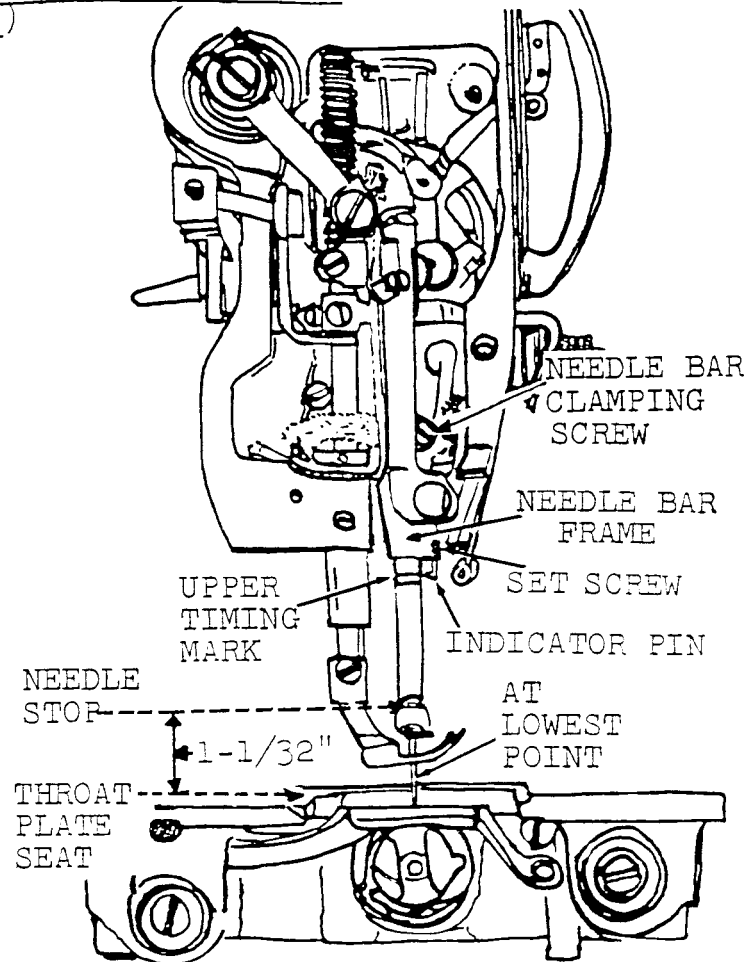


Fig. 7. Setting Needle Bar Height

When replacing face plate, make certain that screw holes in face plate gasket are aligned with respective screw holes in face plate, avoiding injury to gasket and consequent oil leakage.

Check timing of hook, as instructed on page 8.

TIMING:

Timing the machine consists of first adjusting the radial position of sewing hook with relation to movement of needle bar and needle thread take-up lever so that loop of thread formed by needle will be correctly taken by point of hook at proper time for desired stitch formation. The check spring and feed are then timed to synchronize their motions with needle and hook movements.

Timing instructions outlined on pages 8 through 12 should be followed in exact order given for efficient results.

TO TIME THE SEWING HOOK

PREPARATION:

Make certain that timing indicator pin is correctly set in needle bar frame, as instructed on page 7.

Remove presser foot, slide plate, throat plate and feed dog

Select a needle in good condition and correctly set it in needle bar.

Turn machine pulley over toward you until needle bar reaches its lowest point and rises to position where LOWER TIMING MARK on needle bar is level with point of indicator pin on needle bar frame (see Fig. 8).

At this setting, point of sewing hook should be at center of needle, as shown in Fig. 9.

TIMING:

Loosen two hook body screws in hub of hook shown in Fig. 9. Turn hook on its shaft, as required to bring point of hook to center of needle.

Make certain that hub of hook is against oil retaining collar; then securely tighten two hook body screws.

TO SET CLEARANCE BETWEEN NEEDLE AND POINT OF HOOK

PREPARATION:

Remove slide plate, throat plate and bobbin case. Seat needle correctly in needle bar. Time the sewing hook as instructed above.

CHECK:

Point of hook should pass needle clearance above eye as closely as possible, as shown in Fig. 10, without striking or deflecting

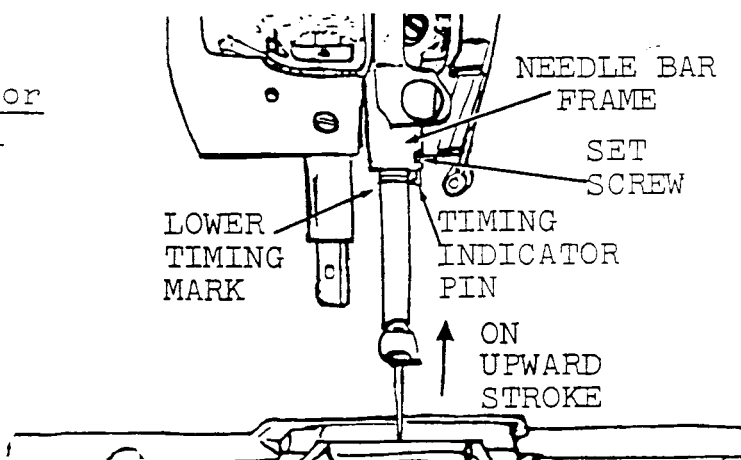


Fig. 8. Checking the Timing of the Hook

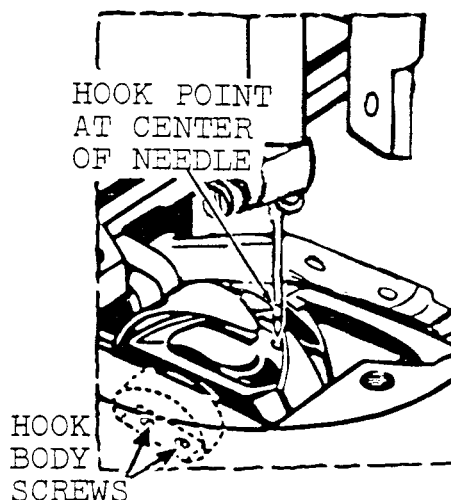


Fig. 9. Timing the Hook

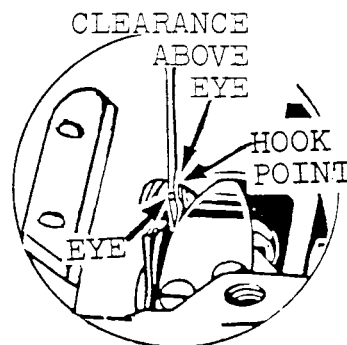


Fig. 10. Hook Point Passing the Needle

needle. This is achieved by setting a clearance equal to about the thickness of a piece of note-paper (about .005 inch), as shown in Fig. 11, page 9.

TO SET CLEARANCE BETWEEN NEEDLE
AND POINT OF HOOK (CONT'D)

Entire "FLAT" of hook point (not only the point of hook) should clear needle.

SETTING:

Loosen gear set screws #1 and #2 shown in Fig. 12.

Loosen bushing set screw shown in Figs. 13 and 14.

CAUTION:

MAKE CERTAIN THAT THE TWO BEVEL GEARS ARE KEPT IN MESH UNTIL GEAR SET SCREWS #1 AND #2, FIG. 12, ARE SECURELY RETIGHTENED.

Using a light mallet and a $\frac{1}{4}$ inch brass drift pin, as shown in Figs. 13 and 14, move hook assembly either toward or away from needle, as required. Tap very lightly to avoid damaging hook assembly

Securely tighten bushing set screw shown in Figs. 13 and 14.

Remove all end play from hook shaft by moving the hook assembly firmly against front hook shaft bushing and, at the same time, moving hook shaft bevel gear (see Fig. 12) toward the hook on the shaft. Then securely tighten screw #1, Fig. 12; then screw #2.

Check thread clearance between position finger and bobbin case holder.

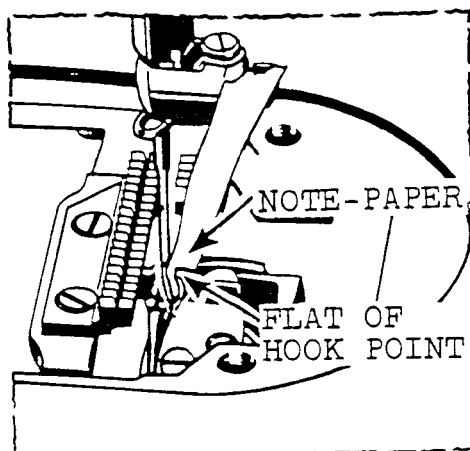


Fig. 11. Flat of Hook Point Clearing the Needle

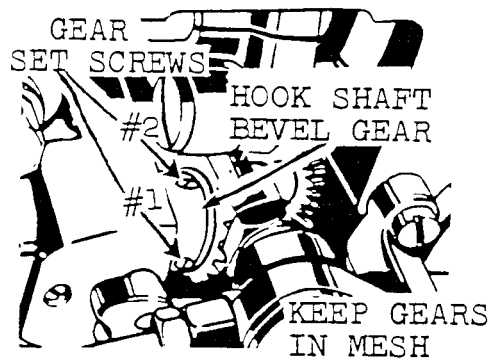


Fig. 12. Preparation for Setting: Loosening Bevel Gear

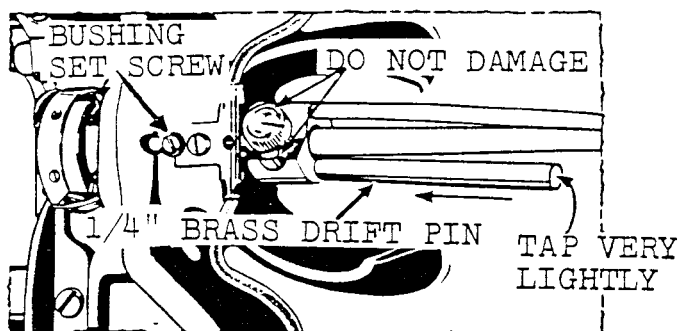


Fig. 13. Moving Sewing Hook Assembly Toward the Needle

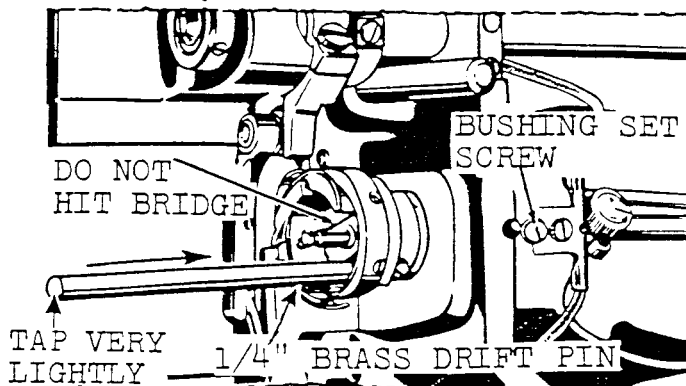


Fig. 14. Moving Sewing Hook Assembly Away from Needle

TO SET CLEARANCE FOR BOBBIN CASE
HOLDER POSITION FINGER
(See Fig. 15)

Clearance between position finger and bobbin case holder should be just sufficient to allow thickness of thread to pass through easily. Normally an .018 inch to .022 inch clearance is required.

Bend position finger carefully to achieve setting.

Top surface of position finger must be level with top of bobbin case holder.

FUNCTION OF BOBBIN CASE HOLDER
NEEDLE GUARD

The needle guard on the bobbin case holder (see Fig. 17), should prevent needle from contacting hook or bobbin at any time.

If needle tends to move side-wise toward hook point during the crucial loop-taking period, needle guard should deflect needle toward left (away from the hook as shown in Fig. 16) sufficiently to prevent damage.

When all settings are correct it is usually not necessary for needle guard to deflect needle at loop-taking time.

When large needles (Size 20 or larger) are used, needle guard may deflect needle too far toward left at the bottom of needle stroke and cause breakage of needle on bobbin case holder at base of position finger slot (see Fig. 17).

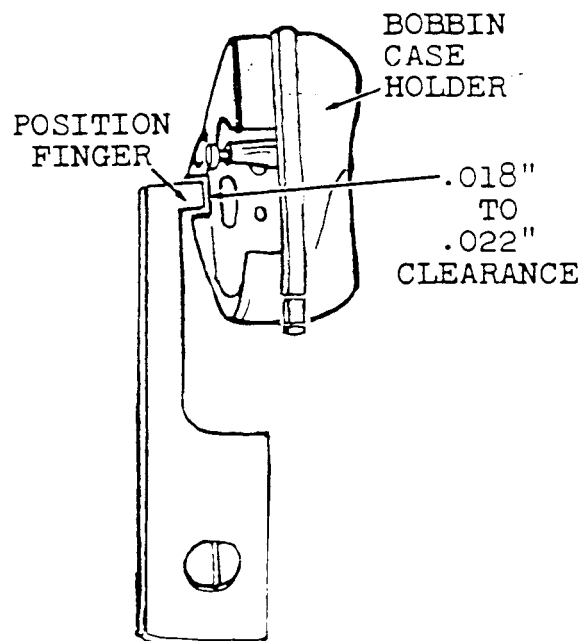


Fig. 15. Bobbin Case Holder Position Finger

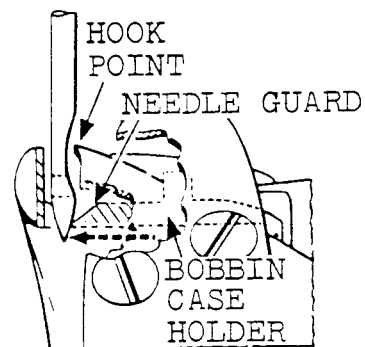


Fig. 16. Correct Relationship of Needle-Guard to Hook Point at Loop-taking Time

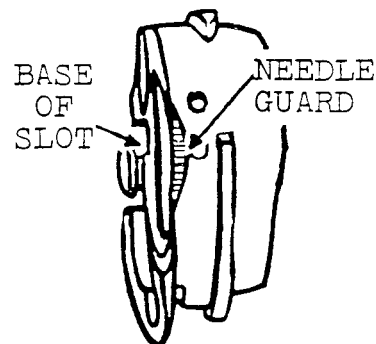


Fig. 17. Needle Guard on Bobbin Case Holder

FUNCTION OF BOBBIN CASE HOLDER
NEEDLE GUARD (CONT'D)

This condition can be avoided by "stringing" needle guard as instructed next, until needle is deflected only slightly at the lowest point in its stroke. Before doing this, check and adjust machine in sequence described on pages 8 through 10.

TO STRING THE NEEDLE GUARD

When it becomes necessary to string the needle guard to provide more clearance for needle, remove bobbin case holder from hook.

Remove a slight amount of metal from needle guard on bobbin case holder, by using a $\frac{1}{8}$ inch strip of very fine emery cloth (about #320), holding one end of the emery cloth in a clamp and rubbing edge of needle guard along strip, as shown in Fig. 18.

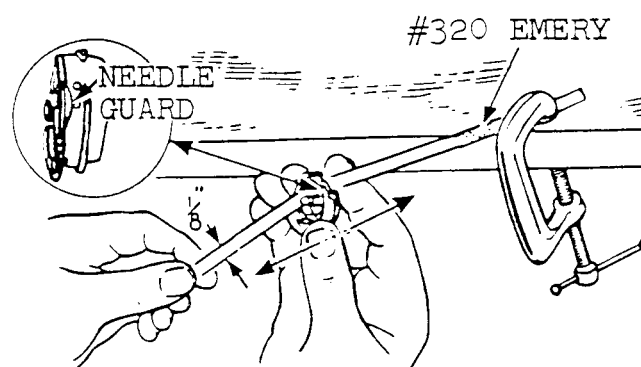


Fig. 18. Stringing the Needle Guard

Extreme care must be taken not to remove too much metal as this will allow hook point to rub needle, as shown in Fig. 19, or it may permit needle to strike hook; damaging needle, hook or bobbin case holder. Broken or damaged parts should be replaced by parts in good condition.

Clean bobbin case holder thoroughly, before replacing it in hook.

Replace bobbin case, throat plate and slide plate.

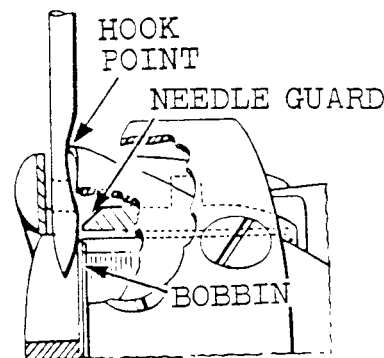


Fig. 19. Needle Contacting Hook Point and Bobbin (Too Much Metal Removed from Guard)

TO SET CHECK SPRING

HEIGHT SETTING (See Fig. 20):

Thread the machine.

Turn machine pulley over toward operator slowly. When take-up lever begins to rise, check-spring makes a slight dip and returns to its higher position. Later, as take-up lever approaches top of stroke, setting the stitch, check-spring should be drawn all the way down. As lever descends, check-spring return to rest.

Loosen set screw shown in Fig. 20. Turn stud (at the same time turning entire tension assembly) either over toward left to lower check-spring and decrease its movement, or over toward right to raise check-spring and increase its movement. Securely tighten set screw.

CAUTION:

Check-spring height setting must be checked each time a different type presser foot is applied to machine.

TENSION SETTING (See Fig. 21):

Thread the machine. Securely tighten set screw shown in Fig. 21. Make certain thumb nuts are on stud as shown.

Tension on check-spring, should be sufficient to ensure action at top speed; but still light enough to permit itself to be drawn all the way down (as take-up lever approaches height of stroke) before any thread is drawn through the tension discs.

Using a large screwdriver in slot of stud, turn stud either over toward left to decrease tension or over to right to increase it, as shown.

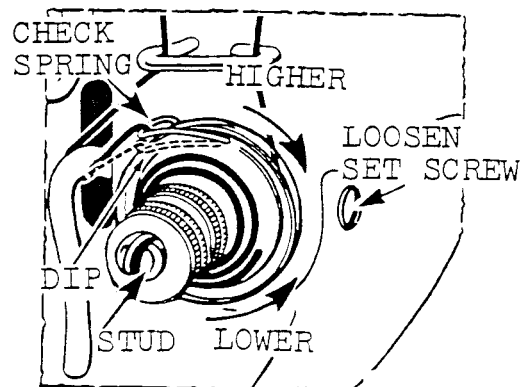


Fig. 20. Setting Height of Check-Spring

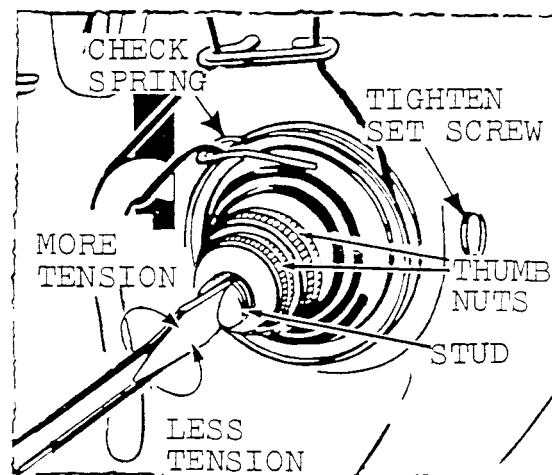


Fig. 21. Adjusting Tension on Check-Spring

TENSION VARIATIONS:

The required tension on check-spring may vary, depending upon the thread and material used. Heavier thread and bulkier material require more tension to ensure correct thread control.

FEED ECCENTRIC STOP SCREW

The feed dog is prevented from making longer stitches than a predetermined maximum by the stop screw shown in Fig. 22 in the feed eccentric.

The following stop screws are available for this machine - - -

#141151, 10 stitches per inch. Regular for machine.

#140257, 5-1/2 stitches per inch, available upon order.

TO PREVENT UNAUTHORIZED PERSONS FROM CHANGING STITCH LENGTH

The stitch regulator plunger (see Fig. 23) can be removed to prevent unauthorized persons from changing stitch length.

To remove plunger, first remove four cover screws and top cover. Then remove stop ring near tip of the plunger, allowing plunger to be withdrawn. Hole in the top cover should be filled by inserting plug screw 140607, available on order. Replace top cover.

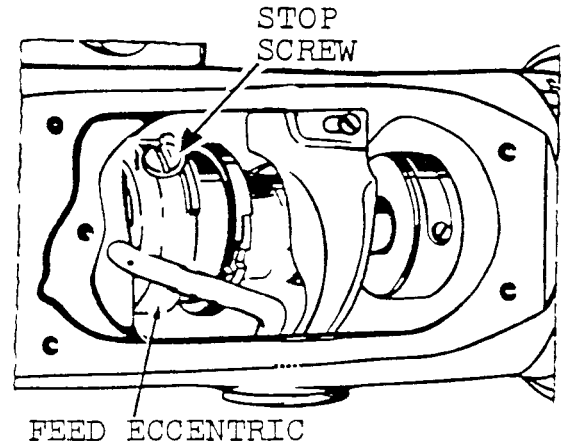


Fig. 22. Feed Eccentric Stop Screw

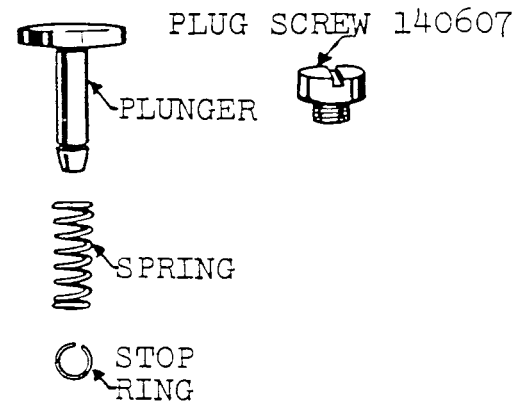


Fig. 23. Stitch Regulator Plunger

TO SET THE FEED DOG
AT THE CORRECT HEIGHT

Before checking the height of the feed dog, set the machine at maximum stitch length.

The feed bar hinge pin shown in Fig. 24, should be adjusted so that all the teeth of the feed dog will rise equally high above the throat plate, as shown in Fig. 25.

Feed dog should rise approximately $\frac{3}{64}$ inch above the top surface of the throat plate for all types of material except "wash and wear". For "wash and wear" material, set feed dog height to $\frac{1}{32}$ inch above the throat plate.

Feed bar hinge pin is an eccentric. Its high side is indicated by the flat on the slotted end, shown in Fig. 24.

When it is desired to adjust the feed bar (see Fig. 26) so that the feed dog will rise $\frac{3}{64}$ inch above throat plate, loosen the two hex-head screws shown in Fig. 26, and using a screwdriver as shown, turn the eccentric hinge pin until the flat is at the top, as shown in Fig. 24.

To adjust the feed dog for a $\frac{1}{32}$ inch rise, turn the eccentric hinge pin so that the flat is at the bottom.

To raise or lower the rear end of the feed dog turn the eccentric hinge pin out of position either clockwise or counterclockwise as required.

If the desired height cannot be obtained as stated above, loosen the clamp screw on crank shown at top of Fig. 26 and raise or lower feed dog, as required. Securely tighten clamp screw on crank and level feed dog by means of feed bar hinge pin, as described above. Securely tighten the two hex-head screws on feed bar.

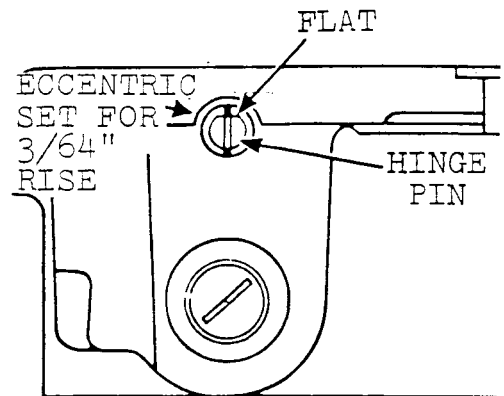


Fig. 24. Feed Bar Hinge Pin (Eccentric)

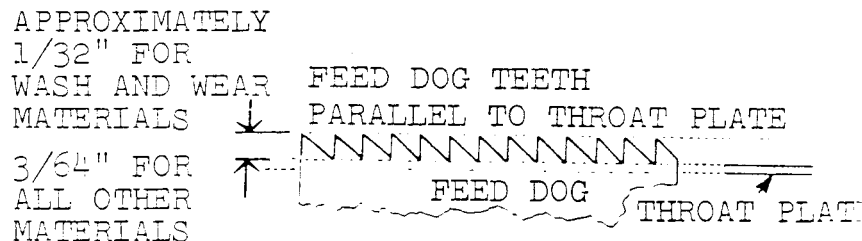


Fig. 25. Feed Dog at Correct Height

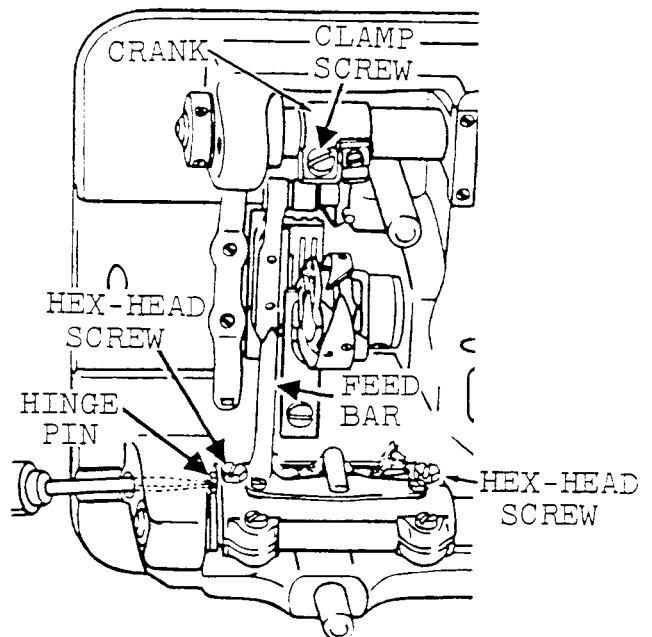


Fig. 26. Adjustment

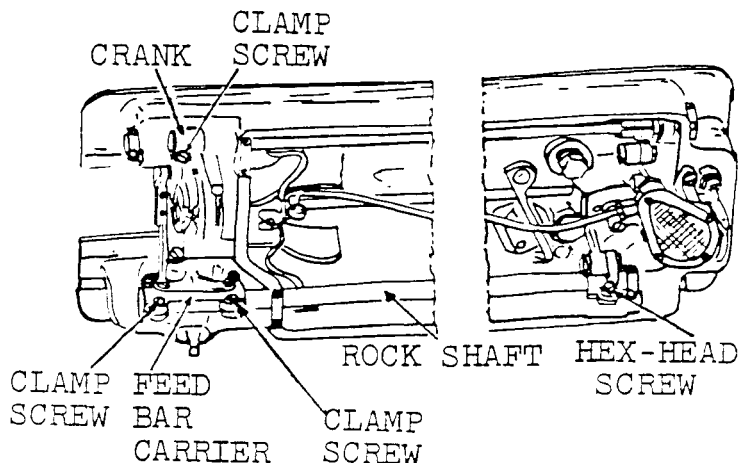
Variations of feed dog height may sometimes be necessary to balance the height with the presser foot pressure.

CAUTION: After adjusting always make certain that feed dog does not strike the throat plate. See instructions "TO CENTRALIZE FEED DOG" next.

TO CENTRALIZE FEED DOG
IN THROAT PLATE SLOTS
(See Fig. 27)

CHECK:

Feed dog should not contact edges of throat plate slots.



SIDEWISE SETTING:

Feed dog can be moved toward left or right, as required after loosening two clamp screws on feed bar carrier and one clamp screw on crank

Feed dog should travel midway between sides of throat plate slots.

Make certain feed dog height adjustment is correct as instructed on page 14.

Securely tighten all three clamp screws, loosened earlier.

Fig. 27. Centralizing the Feed Dog in Throat Plate Slots

LENGTHWISE SETTING:

Set machine for longest stitch.

Feed dog should be set so that its movement is equidistant from front and rear edges of throat plate slots.

Loosen hex-head screw shown in Fig. 27 and move feed bar carrier and rock shaft as required.

Securely tighten hex-head screw.

Check position of needle in relation to needle slot in feed dog and re-set if necessary, as instructed on page 6.

Check linkage for freedom of movement. Feed must move smoothly to obtain maximum efficiency.

TO SET THE PRESSER BAR
AT THE CORRECT HEIGHT

PREPARATION:

Remove slide plate.

Face plate need not be removed for this adjustment. It is removed in Figs. 28 and 29 to show relationship of parts.

CHECK:

1. When presser foot rests firmly upon throat plate (with feed dog below throat plate) there should still be some clearance between guide bracket and lifting bracket, as shown at #1 in Fig. 28.

2. At the same time, when presser foot rests firmly upon throat plate, clearance between lifting lever link stud and lower surface of recess (provided for it, in machine casting) should be $\frac{1}{64}$ inch to $\frac{1}{32}$ inch, as shown at #2 in Fig. 28.

3. When presser foot is at its highest point and needle bar is at its lowest, top of presser foot should clear lower end of needle bar, as shown at #3 in Fig. 29.

SETTING:

Remove large plug from face plate with screwdriver and loosen clamping screw shown in Fig. 28.

Raise or lower guide bracket, as required.

Make certain that needle is centered between toes of presser foot and then securely tighten clamping screw.

CAUTION:

When guide bracket has been moved on presser bar, inspect the check-spring for correct setting, as instructed on page 12.

When presser bar and components are set correctly, slack thread regulator will be positioned as low as possible. Since maximum

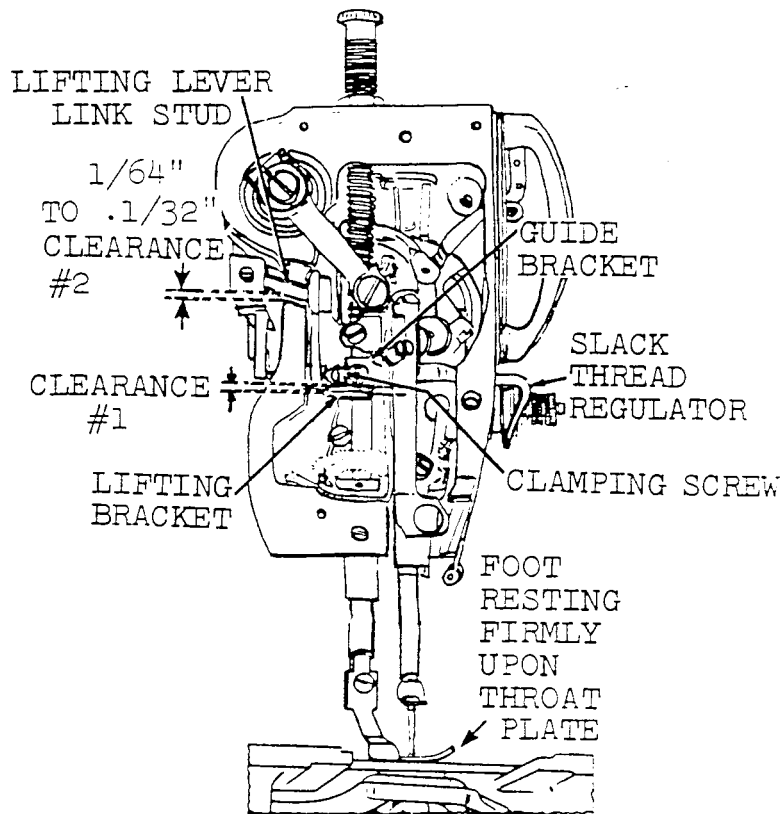


Fig. 28. Checking Height of Presser Bar

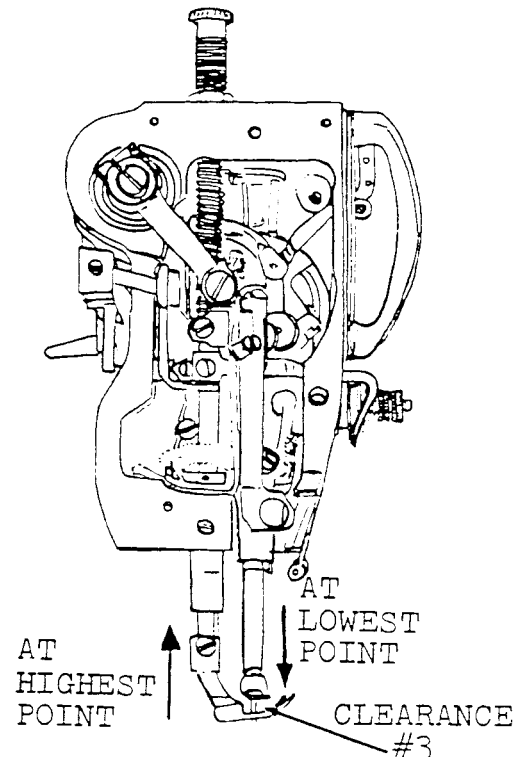


Fig. 29. Clearance between Presser Foot and Needle Bar

deflection of check-spring is dependent upon slack thread regulator position, this low setting will permit machine to sew efficiently at desired "LOW check-spring setting".

PRESSURE ADJUSTMENT OF
PRESSER BAR

The following method of pressure regulation may be preferred by mechanics rather than the instructions in Operator's Guide - - -

Loosen lock nut, shown in Fig. 30.

Turn thumb screw upward until presser foot applies no pressure at all.

Run the machine and, at the same time, very gradually increase the pressure by turning the thumb screw downward. Presser foot will vibrate very rapidly at first, gradually decreasing its vibration as pressure is increased.

When presser foot stops vibrating, STOP increasing pressure. Only increase pressure again to improve feeding. Use as little pressure as possible, consistent with proper feeding.

When bottom ply of material comes out longer than top ply, increase pressure slightly to bring out the two plies uniformly.

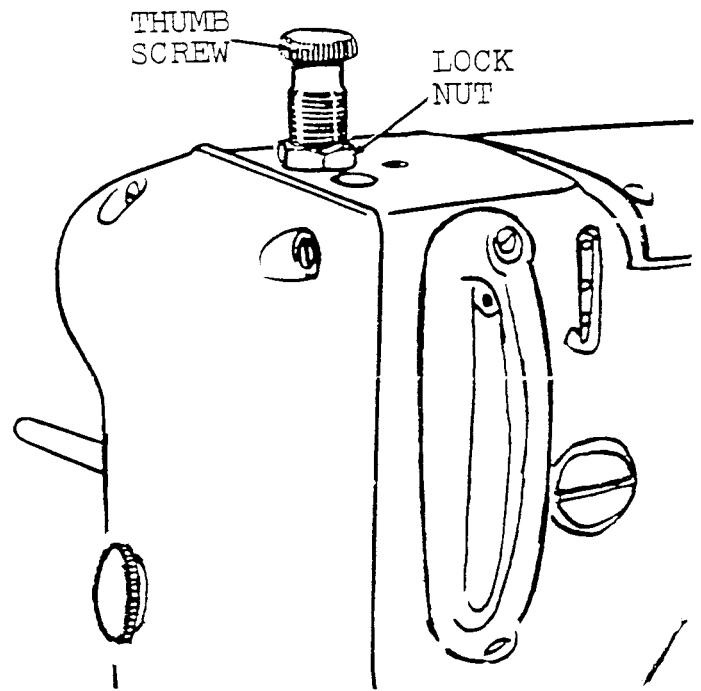


Fig. 30. Pressure Adjustment