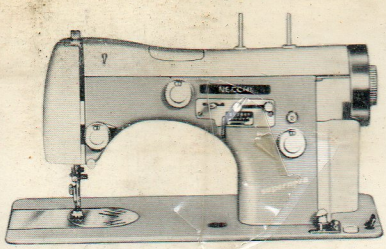
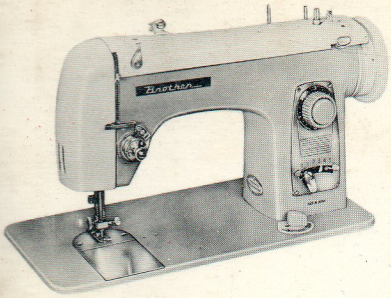
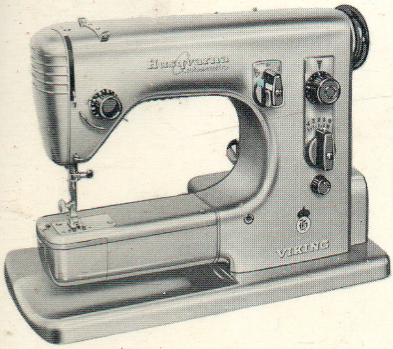
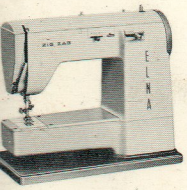
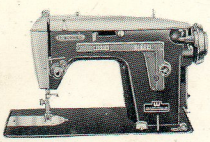
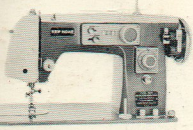


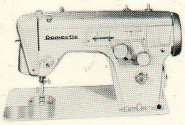


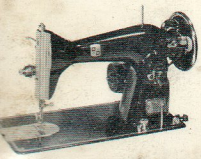


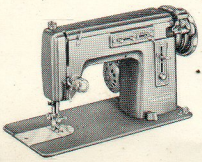


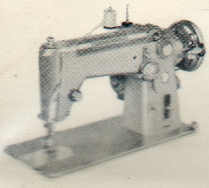




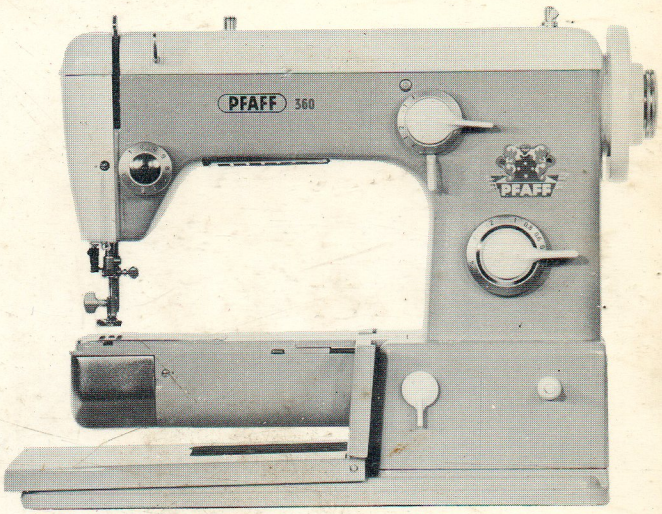








The Complete SEWING MACHINE Repair Book



Jack Miller & Bill Boltin

- Do-It-Yourself Repairs and Maintenance
- Buyers' Guide—The Right Machine for You
- Hundreds of Money-Saving Tips!

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Introduction

Sewing has origins as far back as primitive man who instinctively felt the need to cover his body with animal skins which were fastened together with the aid of fish bones. The fish bones were used to make holes through which he passed thread made of gut or fibre. During the Iron and Bronze age these fish bones became needles with a hole or "eye" developed in the upper part.

It was not until the middle of the 18th century that attempts were made to sew by mechanical means. However all of these early attempts tended to imitate hand-sewing.

In 1775 the first sewing machine patent was issued to a man named Weisenthal, In England. The machine used a two-pointed needle with an eye in the middle. Four years later another Englishman, Thomas Saint, patented a model with a kind of crochet-needle, which produced a chain stitch.

In 1807 an Austrian tailor, Joseph Madersperger, constructed a machine using a two-pointed needle with an eye in the middle which produced a perfect imitation of hand-sewing. In 1829, Barthelemy Thimonier, a Frenchman, departed radically from previous principles by building a machine that produced a chain stitch at the (then) amazing speed of 200 stitches a minute.

Following the success of Thimonier several improved models were produced, but in 1845, Elias Howe, an American, made another major departure with the invention of a machine that sewed with a lock stitch. The Howe machine used two threads but contained serious flaws because of its poor design.

Three years later, a young Boston mechanic named Isaac Merrit Singer was summoned to repair a sewing machine. Impressed by its operation he built his own model and in 1851 the Singer Sewing Machine Company was founded.

A year later, another brand name famous in American sewing machines, Wheeler & Wilson Co., entered the market with an entirely new idea—a rotating shuttle and a feed dog with a rectangular movement.

Toward the end of the last century, Wilcox & Gibbs offered a machine which sewed at the rate of 4,000 stitches a minute. The shuttle revolved three times for each stitch, thus operating at 12,000 rpm.

The post-war years were notable for the development of a number of fine zigzag foreign machines. The foresight evident in these machines quickly captured the imagination of the American public and since then they have become a definite and important factor in the sewing machine market.

BUYING A NEW MACHINE

THE purchase of a sewing machine for home use is a lifetime investment. Machines of reputable manufacture are built to last for many years, with only minor replacement of inexpensive parts. Cleaning, oiling, and adjustment of machines are within the ability of any homemaker and are the major maintenance requirements necessary for continued good service.

Today's machines offer a wide range of models, designed to fit the purchase's needs and purse. It is often a bit confusing to make a decision:present needs may change as the family grows or the children leave to establish their own homes. No one machine is likely to have all the features you consider desirable, so a compromise is in order in selecting the machine that you consider best suited to your present and future possible needs.

Plan Ahead

Part of your decision should be made at home before looking at different makes of machines.

First you must decide upon the kinds of sewing you intend to do. Many homemakers use their machines only for occasional plain sewing, for patching mending, or darning, or for the mending of a simple garments. A straight-sewing machine is satisfactory for this work. This type may also be preferred by the woman whose chief interest is fine dressmaking and tailoring and who has little use for machine-made decorative effects.

The more versatile swing-needle or zig-zag type machines are designed to handle a wider range in stitch styles and such specialty sewing as decorative stitching and embroidery; the making of place mats and napkins, decorative blouses and children's clothes; and seam finishing and button-holes. These machines, in part, do the jobs intended for the attachments that can be bought for the straight-sewing machines—and which are so seldom used. You must decide whether the specialty job will be done often enough to warrant the added cost.

Choice Of Machines

Another choice is between cabinet and portable machines. A cabinet with well-supported leaves and sturdy legs gives good sewing support and is ready for instant use. There are many cabinets to choose from for any one machine head. Choose the cabinet for comfort, sturdiness and convenience, since its main purpose is to house the machine. A machine in a permanent cabinet or table is more convenient and time saving for anyone who does much sewing. It may be better to invest the extra cost of a fancy cabinet in more useful furniture. However, choices in cabinets allow a selection that will fit in with any type of home furnishing.

The portable is the best choice where space is limited, as in small homes and apartments, or where a machine must often be moved from place to place. Some portables are fitted with an extension table which gives greater work

areas, and can be set into a sturdy work table thus procuring the same stability and work space as cabinet machines.

Some portables are merely an ordinary heavy sewing head, sometimes inadequately wired, set into a cheap, heavy and unwieldy carrying case. A truly portable machine is of lightweight construction and has a base and carrying case designed for the machine—sturdy and well finished.

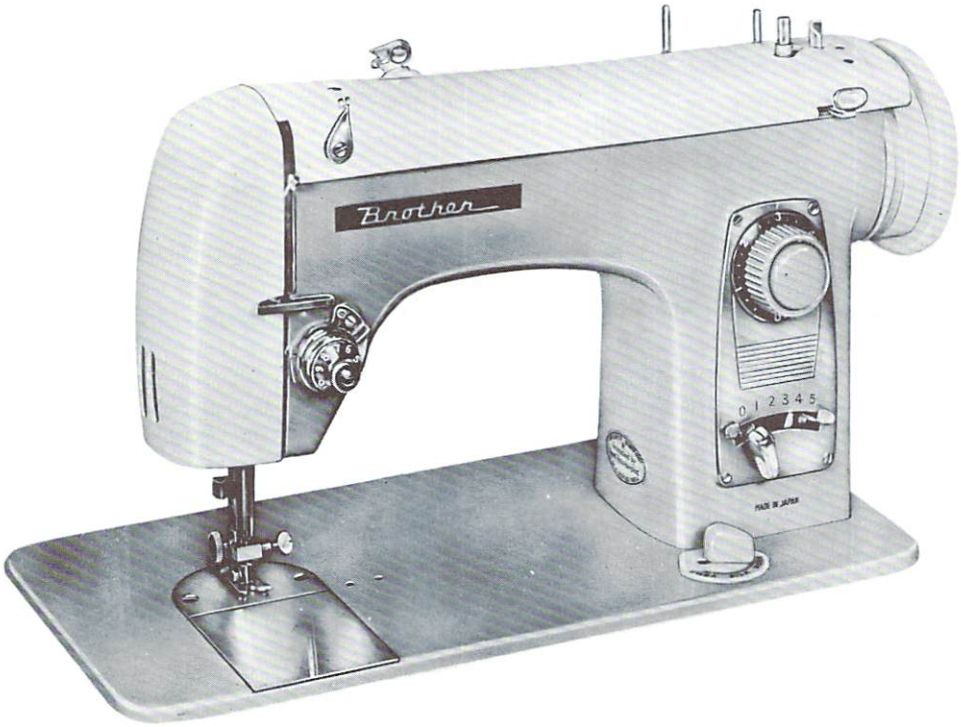
The choice between lightweight and regular-head portables depends partly on how much bulky sewing or mending of heavy fabrics will be done. Does the space between the bed and the arm of the machine allow space to handle bulky articles? If you need to move a portable machine often, can you lift it comfortably from the floor to the table?

You may have to choose between a long shuttle machine or a round bobbin type. The long shuttle mechanism is simple and direct, usually easier and quicker to clean and oil, but noisier and not designed for as high speed operation as the round bobbin class. Unless especially balanced, these machines are not well adapted to electric motors. The round-bobbin machines are either oscillating or rotary. They are usually smoother in operation and better balanced for higher speed.

Personally Inspect

A personal inspection of a variety of machines will help you decide on the one best suited to your purpose. Visit your friends, and neighbors and the dealers; check the features of one machine against another. You want to choose a machine that is easy to handle and operate, readily adjustable to your varying sewing needs, and easy to care for and keep in perfect running order.

Brother Sewing Machines



Brother Sewing Machine

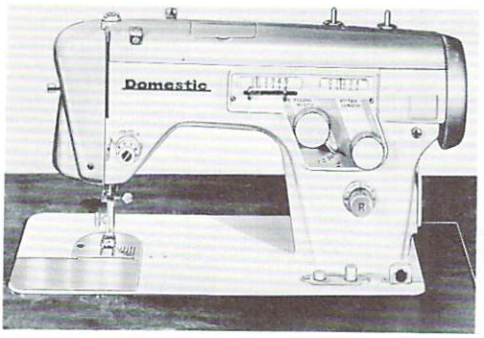
The Brother factory is the largest sewing machine corporation in the east; one of the most modern precision engineering firms in the world. Here are assembled the most accurate machines, tools, guages, and other instruments for building a complete line of appliances.

Highly trained and experienced engineers supervise every operation in the complex business of building modern sewing machines. Most of the machines used by Brother to produce their diversified line of sewing machines, knitting machines, electric blenders, washing machines, fans, etc., along with their giant conveyor system, were designed exclusively for the Brother factories.

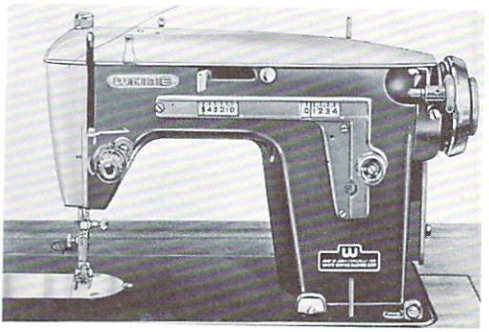
Brother zealously guards its reputation, relying on the principle that devotion to research, perseverance and precision development will enable it to provide the world with superior products of lasting quality.

Brother's line of sewing machines includes 18 models, from straight to ultra-automatic, all planned for simplicity of operation and beauty of design.

Domestic And White



Domestic Sewing Machine
Model 6477



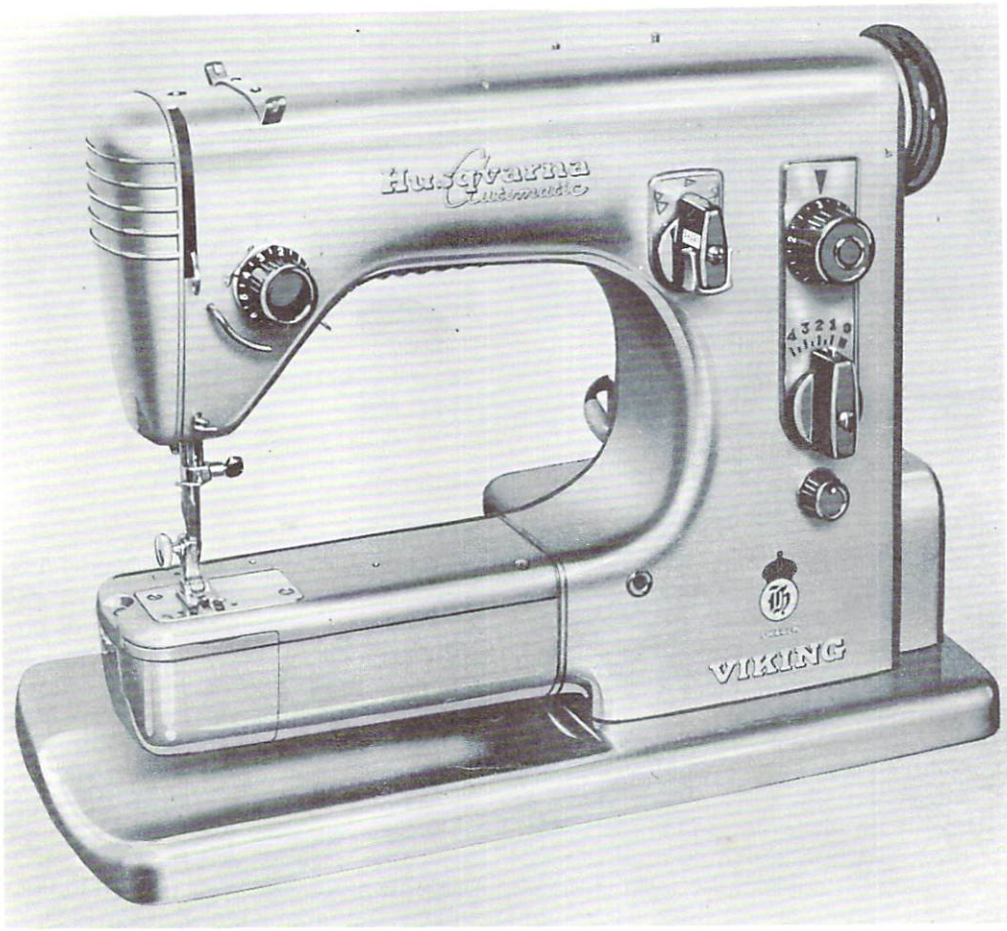
White Sewing Machine
Model 671

Domestic Sewing Machine Co. Inc., is a wholly-owned subsidiary of White Sewing Machine Corporation. Both trade names are firmly established in millions of homes through out the country, and continue to enjoy brisk patronage.

Three Domestic Models are finding current favor. They are: Model 4427, a deluxe straight stitch; Model 5437, a deluxe manual zigzag; and Model 6647, a three position full automatic zigzag with built-in buttonholer and design-elongator controls. All three are round bobbin machines featuring concealed bobbin winders with automatic push button clutch release, push button feed controls and recessing spool pins.

At the present time the following White models were on sale: Model 664, a deluxe straight stitch machine with built-in sew light, recessing spool pin, micro-calibrated stitch control with integrated push button reverse; Model 671, a deluxe manual zigzag featuring simplified Unimatic control, twin slide-scale dials and push button reverse; Model 6 7 4, a c a m-operated semi-automatic machine producing 20 basic decorator designs. Model 673 is a 3-position automatic with built-in bobbin winder, automatic clutch release, built-in button-holer and design - elongator controls. Its front facing bobbin allows the use of twin needles for a greater variety of decorator designs.

Husqvarna



(Also Called Viking In Some Countries and Nordic In Canada)

For over 800 years, the high grade iron ore and high quality Swedish steel produced in the Smaland province of Sweden have been well known. This is the home of the Husqvarn A Vapenfarbrik Aktiebolag (The Royal House Small Arms Factroy, Inc.), founded to produce musket bores for King Charles XI, and which now produces sewing machines, firearms, anti-aircraft guns, motorcycles, and hundreds of household appliances.

At the end of the Franco-Prussian war, five years after the factory had passed into private ownership, the precision, accuracy and skill of the Husqvarna workmen were concentrated on the manufacture of sewing machines and other peaceful household articles, which now account for over 96 of the factory's output.

Husqvarna Viking sewing machines are sold and serviced in 107 countries. Although a complete line of household and industrial machines is offered, only the new, versatile Model 21 is discussed here.

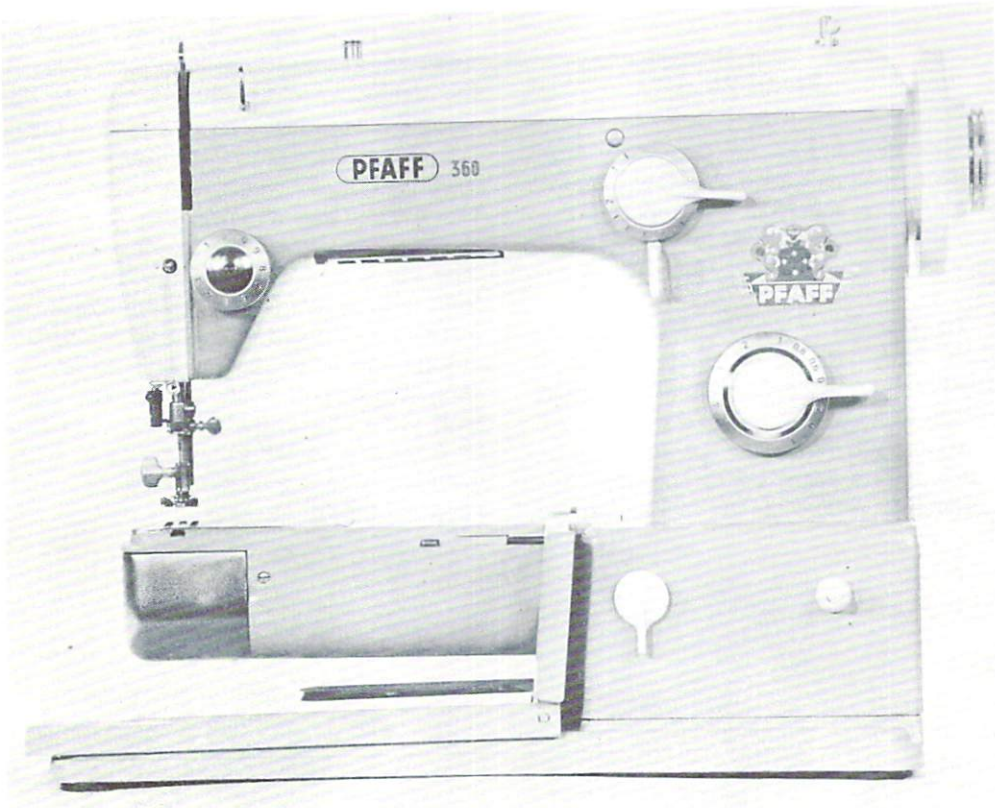
Model 21

The motor has an extremely high starting torque, which makes it possible to start the machine or operate it at very low speed without turning the balance wheel by hand.

To prevent stalling at low speeds when sewing thick or dense material, Husqvarna Viking developed a patented built-in reduction gear for the Model 21. This gear is on the same principle as an automobile transmission, mechanically increasing power as it reduces speed, thus enabling the machine to be operated smoothly at extremely slow speed without stalling when sewing these heavy materials, such as bulky seams, canvas or leather.

A common difficulty in the development of automatic sewing machines is the tendency of threads to jam in the hook (or shuttle) race, in addition to the "pinch" effect which produces a thread friction variable with the speed of the machine. To overcome this is a Husqvarna Viking sewing hook assembly. The hook encloses in a case which rotates with it: this floating type full rotary hook is jam-proof and thread cannot get caught in it. Because there is no shuttle race, the thread friction does not vary with the speed of the machine, resulting in a neater, more uniform stitch. This design makes it possible to use a greater range of thread sizes.

Pfaff



The Pfaff Automatic 360 Slide

The G.M. Pfaff AG, of Kaiserlautern, Germany, a nearly century old factory, manufactures the most advanced sewing machines. Founded by George Michael Pfaff, the first sewing machine was produced in 1862. The painstaking attention to detail, the fine workmanship and skill that went into that first model are still the standards for Pfaff products today and responsible for the quality reputation that Pfaff enjoys all over the world.

Popular Pfaff Models

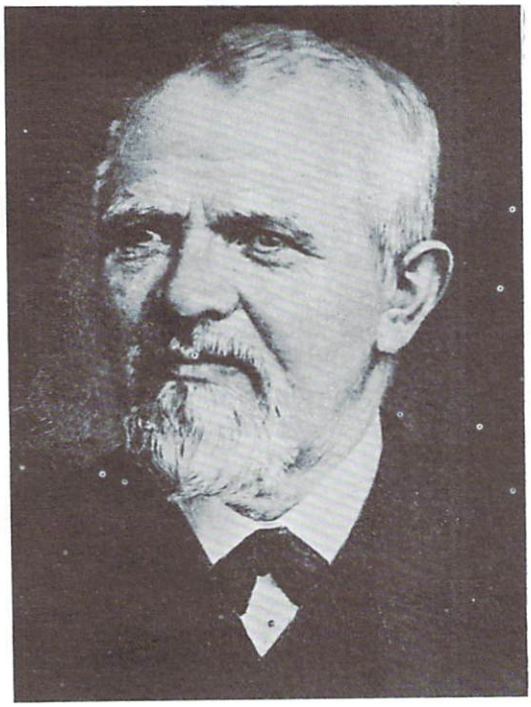
The Pfaff Automatic 360 Free-Arm portable sewing machine with the famous Dial-a-Stitch. This Pfaff is so engineered that it can become a portable or can be easily converted into a cabinet model. It features a unique free-arm construction designed for easy darning and the sewing of sleeves. The free-arm is easily converted into a flat bed machine with a wide area for sewing by a fold-away sewing

base that lifts into position. An additional extension also is provided. A patented rotary hook prevents threads from jamming at even the highest speeds. Another feature is an exclusive built-in needle threader that threads itself automatically, saving time, work and eyestrain. It overcasts seams, sews on buttons, makes buttonholes, appliques, embroiders, monograms, and the automatic Dial-a-Stitch makes it possible to dial any stitch for hundreds of decorative designs.

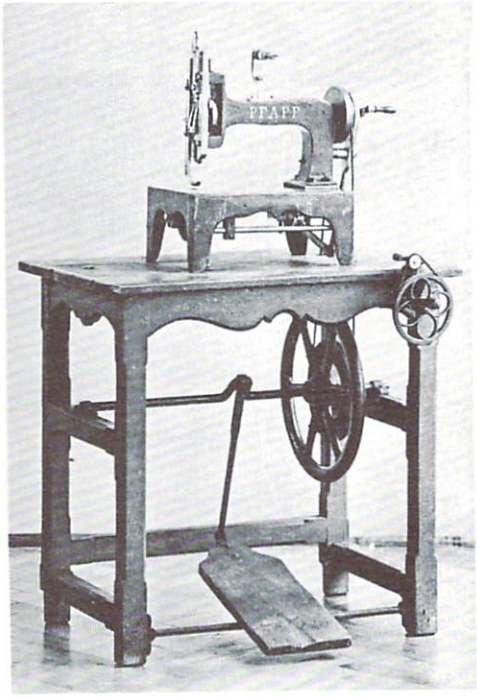
The Pfaff Automatic 260 has no cams to put in or take out: it is only necessary to set the dial to the desired stitch and it performs automatically, making all of the beautiful, intricate stitch designs that add so much to today's fashion. This automatic action, plus the many exclusive features of Pfaff's Straight Stitch and Zig-Zag machines are incorporated into this machine.

The Pfaff 259 Zig-Zag sewing machine has a stitch regulator which permits setting the machine for that first satin stitch, so important for monogramming and buttonhole sewing. Short reverse stitching for darning and tacking is made possible by simply touching a lever.

The Pfaff 259 has the jam-proof rotary hook to prevent thread breakage, and the built-in automatic needle threader.

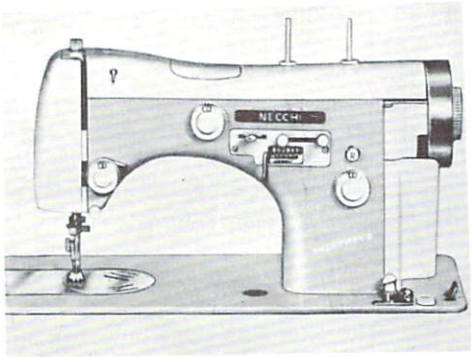


George Michael Pfaff, 1823 - 1893: Founder of the Factory



First Pfaff Sewing Machine Built in 1862

Necchi And Elna



Necchi Supernova Ultra Sewing Machine

Elna Zig Zag Machine

On a February morning in 1948, in a basement on lower Broadway in New York and in a small rented office a few blocks away, Necchi, a name few people in the United States had ever heard, opened its doors for business. Until that morning, the Necchi sewing machine was unheard of in this country.

But a man who had been in this country less than a year, a refugee from the war, was bound to change that. Leon Jolson, who had represented Necchi, an Italian sewing machine company in Poland, set up a sewing machine repair business in New York. When he found that women wanted something new in sewing machines besides the straight-stitch machines, he felt that Necchi was the answer.

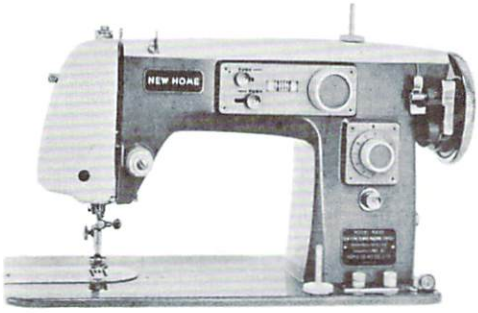
On that February morning, Jolson introduced a sewing machine that could perform over 20 sewing jobs automatically, wihtout any additional attachments:the first automatic zig-zag sewing machine. Not could it do simple and basic sewing jobs, but could embroider, darn, mend monogram, blindstitch, sew on buttons to any desired length.

In 1953 Jolson took over the American distribution right to a Swiss sewing machine, Elna, a precision-made unit known for its quality and convenient portability. An outstanding feature of the Elna is the new Life-O-Matic cabinet; the sewer need only lift his finger and watch the machine automatically glide up to sewing position.

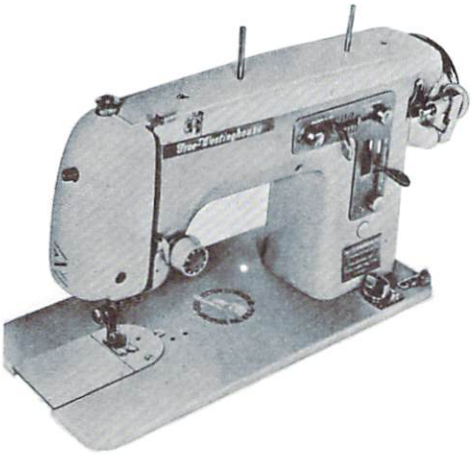
Although the first Necchi zig-zag machine is still sold(with many refinements and style improvements), the leaders in both lines are the Necchi Supernova Ultra and the Elna Supermatic. Both machines enable the sewer to make over 200,000 high fashion stitches as a result of Necchi's Triple Impulse Action and Elna's Magic Brain, the automatic nerve centers that free the sewer from almost 100 per cent of the manual effort.

Not long ago, Necchi brought out the Mirella, a straight-stitch machine that could be rapidly converted from flat-bed to free-arm, making it possible for all kinds of sewing work to be done on the same machine. The Mirella can be used with regular electric power or run manually if no power is available.

New Home And Free-Westinghouse



New Home Model 6033



Free Westinghouse Automatic Zig Zag Machine

The New Home Model 8033 is a fully automatic zigzag, which features a pattern selector lever, two fold-down spool pins, push button reverse, built-in *sew-lite*, and modern design.

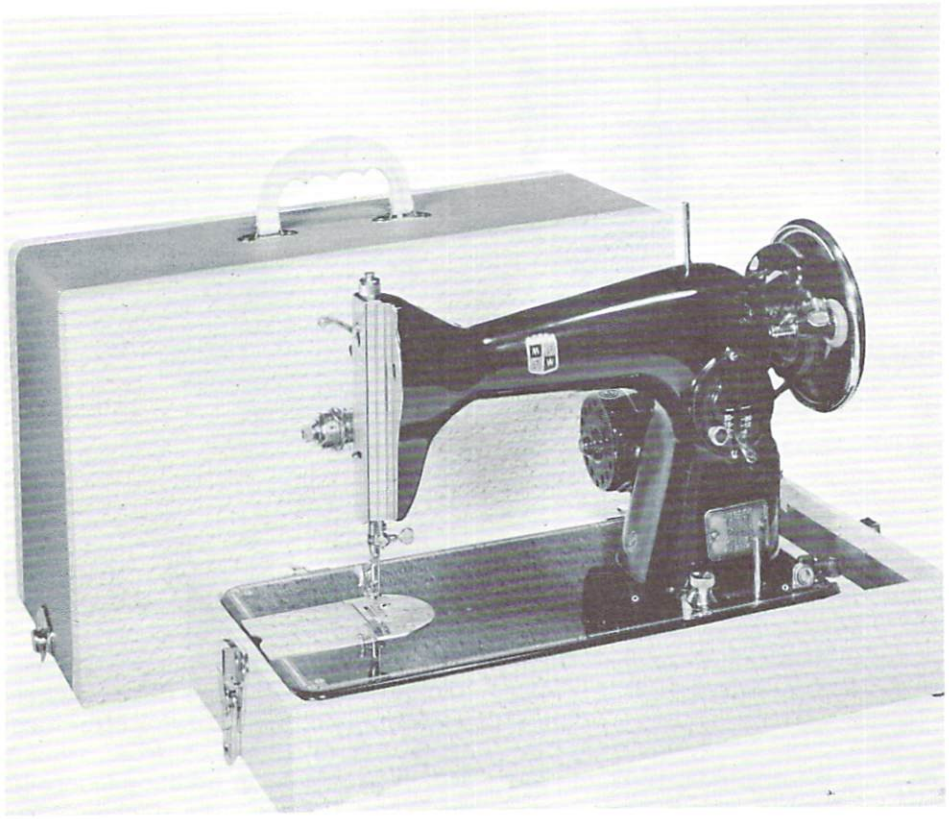
The New Home Model 1002, manufactured by Borletti, is a straight sewer equipped with a drop feed and reverse mechanism. The motor is made by Westinghouse, and the unit is available in portable, console, and desk models.

The Borletti-New Home Model 1102 is lightweight, full-size, and completely automatic.

The Borletti-New Home Model 1101 is identical in appearance with the 1102. However, it is not equipped with the mechanisms which permit automatic reversing of the direction of the material synchronized with the swing of the needle from left to right, or from right to left. It produces, in addition to straight sewing, all of the satin stitching effects obtainable on the automatic sewing machines.

The Borletti-New Home Model 1100 is similar to the Models 1101 and 1102. However, it is not equipped with the reversing feature, and the decorative stitches must be obtained by a manual control.

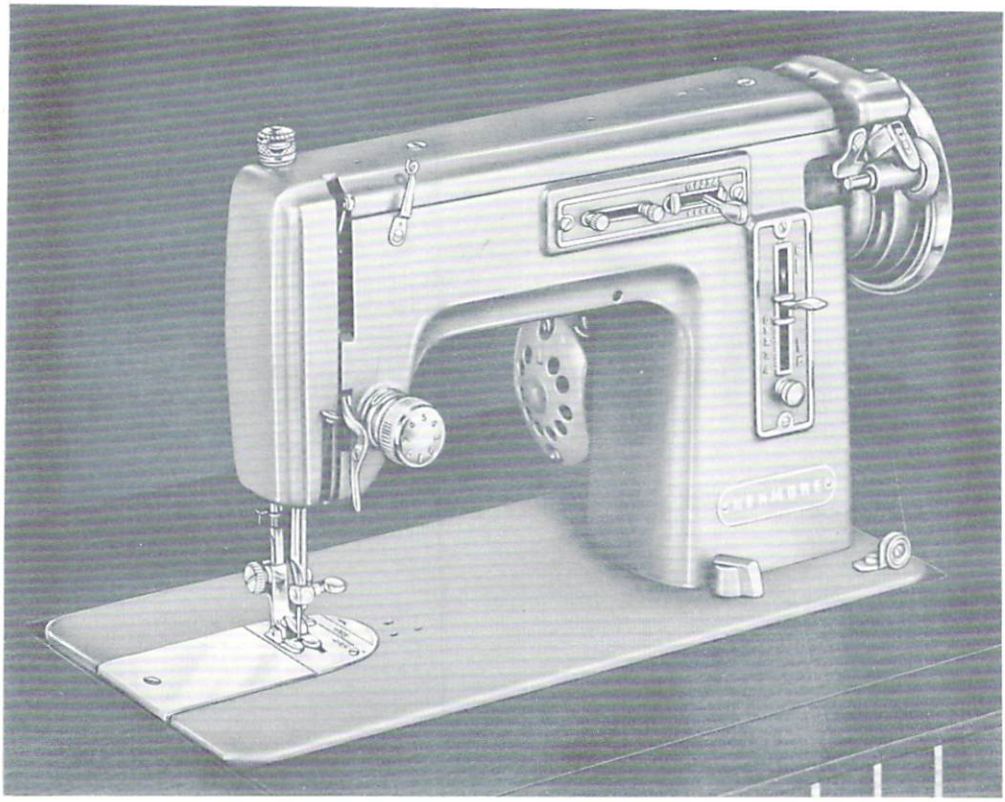
Montgomery Ward



Montgomery Ward's top machine is its automatic zigzag Model URR787. Models 185 and 385 are very similar in design and operation. The only difference is the outside appearance and threading.

The Model 185 head has a smooth, glossy, black frame which can be used either in a portable case or a console cabinet. The Model 385 sewing head comes in a soft, non-glare, infra-red baked enamel blue finish. Its full size head permits maximum underarm clearance.

Sears, Roebuck Automatic "Kenmore"



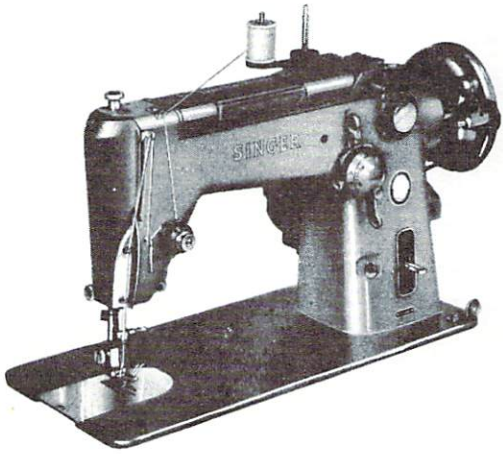
Model 44 Head
Kenmore Zig Zag Sewing Machine

When Sears Roebuck decided to add an automatic to its sewing machine line, its first concern was to find a machine which would excel in straight stitch sewing, the type of sewing, it was felt, for which the average housewife uses her machine 95 per cent of the times.

The Kenmore Automatic (No. 84) would appear to live up to its reputation as a "two-in-one" machine performing excellently as a straight stitcher and as a zig-zag.

Included in the Sears line is another "two-in-one" type—the model 71, a lightweight aluminum machine designed for use both as a portable or cabinet model.

Singer



Singer Sewing Machine Model 319W2

Top of the Singer Line is the Slant-O-Matic (401) which the company hails as the only automatic zigzag machine for home use, made entirely in this country. This machine features a built-in threading chart, a "drop-in" bobbin in front of the needle, a built-in eye-level stitch chart that permits the operator to "tune" the knob for the particular stitch desired, elevator-type multi-purpose calibrated throat plate, lever operated, for simplified darning, plus other features.

Singer continues to offer the popular Automatic 306, 301, and the Singer Portable.

BASIC COMPONENTS OF THE SEWING MACHINE AND GENERAL REPAIRS

MOST straight sewing machines can be fitted with attachments such as the one for buttonholes that shifts the cloth from side to side, creating a zigzag stitch. The zigzag sewing machine swings the needle bar from side to side, producing a stitch that can be used for a variety of effects. Most of these machines swing the needle to both sides of the center sewing line, while a few move only to the right or left side. A greater variety of decorative stitches is possible when the needle swings to both right and left. Skill in operation is required to develop a uniform pattern or design with the controls operated by hand. Many machines are built to use templates which automatically produce distinctive patterns. Although these machines are considered automatic, it requires a complete knowledge of the machine to utilize its varied operations. When purchasing a zigzag machine, test it for a good straight stitch and the ease for switching from straight to zigzag stitching.

Swing needle machines vary greatly in their versatility. Be sure that the machine you select can produce the designs you want.

Types of Motor Controls

There are two types of motor controls used with sewing machines—the step control and the carbon control. The step control changes the speed in a series of steps or jumps, usually 5 to 8, from slow speed to fast speed. With some machines the first step of this type of control does not provide the slow speed required at times in sewing operations. The carbon control increases the speed from slow to fast smoothly and uniformly, resulting in easier control of speed, especially when starting and at very slow speeds.

The reader will note that the following home repair section is concerned exclusively with the various classes of *straight sewing machines.* There are several reasons for the exclusion of automatics.

First automatic sewing machines are highly complex requiring the attention of skilled mechanics for proper servicing. Second, the vast majority of sewing machines in millions of homes throughout the country are straight sewers; therefore, information of the straight sewers is more important to the overwhelming majority of home sewers. And, finally, despite their complexity, automatics are generally trouble free and seldom require mechanical attention.

All tools which are mentioned throughout the book can be purchased at the average hardware store. The larger the store the better chance you have of buying the more complicated tools. For ordinary repair jobs, the usual household tools will suffice.

Home repairers of straight sewers should encounter no difficulties in obtaining replacements for worn or broken parts. Every fair-sized city lists at least one sewing machine shop that stocks basic parts for most models. And what the shopkeeper doesn't have, he can easily order for you. The simplest way to obtain the names and addresses of these shops is by consulting your classified telephone directory, which lists sewing machine supplies and attachments, replacements and repairs.

Parts for Singer, White, Domestic and other major makes will pose no problem. But even if your machine happens to be some unheard-of brand, there is no reason to panic about the possibility of getting parts. You will be interested to know that almost all parts are interchangeable with equivalent Singer parts. Merely take the item to be replaced to the store, and 99 times out of 100, the mechanic will be able to match it from stock.

Basic Components of the Sewing Machine

In this chapter, we will discuss the basic components of the sewing machine. While most of these parts differ in appearance in the various sewing machines, they have one thing in common: similar parts have similar functions. You should be able to repair any type of straight sewer (lockstitch machine) from the information contained in this chapter. Any differences will be noted in the chapter devoted to the individual machines.

The five essential parts necessary for the formation of the perfect stitch are (1) The Needle, (2) The Needle Bar, (3) The Shuttle, (4) The Thread Take-Up Lever, and (5) Stitch Formation.

(1) The Needle

In the early days of the sewing machine, each manufacturer's needle could only be used on his model, a state of confusion ultimately cleared up by an international agreement standardizing the different kinds of needles.

Of the 2,000 different types of needles, U.S.A.: Style 15 x 1 is the one almost invariably used for household machines. It is described below in detail:

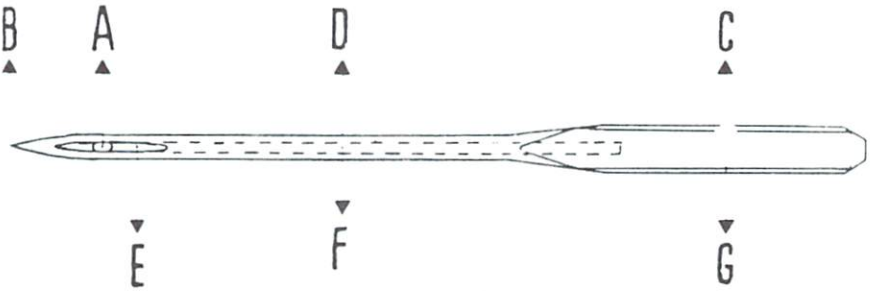


Fig. 1
A) eye
B) point
C) body
D) shaft
E) short groove
F) long groove
G) flat

A similar state of confusion involving 30 different ways of describing the *sizes* of needles prevailed until the introduction, some years ago, of the metric denomination. Under this system of numbering, the thickness of the needle shaft, measured halfway between the body and the eye, is given in hundreths of millimeters. Thus, if the diameter of the shaft is 0.70 mm., the needle is given the number Nm-70.

These new denominations comprise the thicknesses from 0.4 to 4.8 mm., with sizes 60 to 120 being most commonly used for household machines. They are used for the following different kinds of sewing:

60) Embroidery

70) Darning and sewing sheer fabrics
80)

90) Sewing medium fabrics
100)

110) Sewing coarse materials

120) For hemstitching

(2) The Needle Bar

The function of the needle bar is to hold and guide the needle. The needle bar is driven by an intermediate mechanism and executes an up-and-down movement, which is synchronized with the other moving parts of the machine.

Early type sewing machines are often equipped with square or prismatic needle bars, but all modern machines have round needle bars.

The needle is secured to the needle bar by a needle clamp and a needle clamp screw.

There are two types of needle clamps used on household sewing machines. They are:

The ordinary needle clamp, which holds one needle, and is used for all kinds of ordinary sewing work;

The twin-needle clamp, which holds two needles, and is used to sew tucks and for doing special kinds of decorative stitches.

(3) The Shuttle

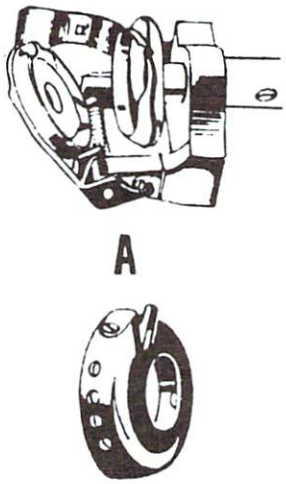
The earliest type of shuttle still in use on old models is the long shuttle, which moves back and forth in a straight line. The lower thread is wound on a long bobbin and placed inside the shuttle.

Other machines use a shuttle based on the same principle, but with the mechanism moving back and forth in an arc.

In this system, the bobbin, on which the lower thread is wound, follows the movements of the shuttle.

The invention of the rotary shuttle was a vast improvement over the other systems. This consisted of a shuttle hook with a bobbin in the middle, rotating simultaneously. On modern machines, the bobbin no longer follows the rotating movement of the shuttle.

These shuttles, rotating or oscillating on the end of a horizontal axle, must be equipped with a complicated fastening device called a "stop shield" to



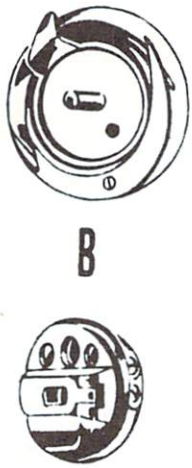


Fig. 2

A. top: Shuttle on a horizontal axle with stop shield.

bottom : Bobbin Case.

B. top: Horizontal axle shuttle without stop shield.

Bottom: special bobbin case with a latch instead of stop shield.

keep the bobbin in place; or, on more recent machines, a special bobbin case with a latch in place of the shield.

(4) The Thread Take-Up Lever

The thread take-up lever, which is built into the upper casing, has two functions:

A) To draw sufficient thread from the spool and feed it to the shuttle in order to form the stitch (downward movement);

B) Once the upper thread has passed around the shuttle, to pull it, as well as the lower thread, up into the fabric.

The earliest thread take-up levers were driven by the needle bar. The trouble with these was that they were extremely difficult to synchronize with the needle bar and shuttle.

The most widely used thread take-up systems in use today are the cam take-up levers, sliding take-up levers, hinged levers, and rotating disc thread take-ups.

(5) Stitch Formation

The lock stitch is formed by the upper and the lower thread continually crossing each other. After the upper thread has been threaded as far as the needle, it must be passed through the eye from the long-grooved side.

Regardless of which shuttle system is used, the upper thread on all lock-stitch machines must form the loop. When the threaded needle pierces the material, the thread slips into the two grooves of the needle. This is designed so that it offers the least amount of resistance when it passes through the material. However, this resistence increases on the side of the short groove, as the latter disappears in the material, because the thread is now no longer in the groove but is jammed between the body of the needle and the material. Thus the thread remains stretched until the needle reaches its lowest point. *See Fig. 3.*

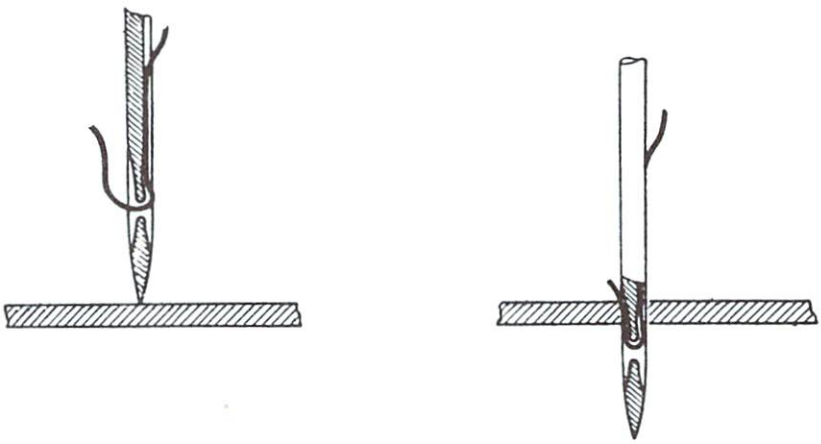


Fig. 3: Stitch Formation Downward Motion

When the needle starts moving upwards again, the thread in the long groove is able to slide without difficulty between the needle and the material. Since on the short-grooved side the thread is jammed, it cannot slide along with the needle and, consequently, forms a small loop on the same side.

At this point, the different shuttle systems come into play. All have the same function: to pass the bobbin with the lower thread through the loop. This is called *stitch formation.*

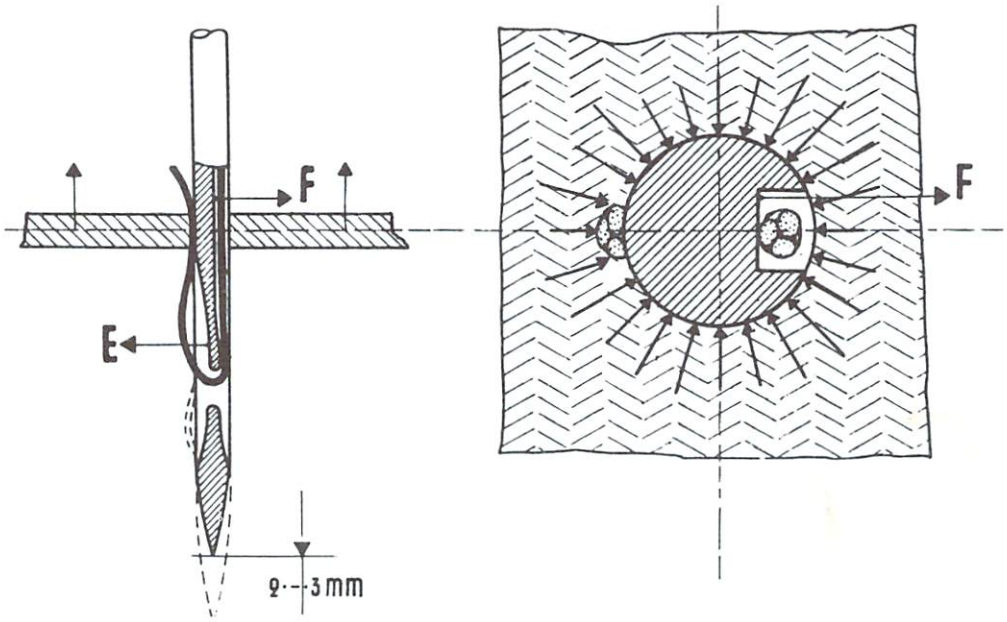


Fig. 4: Stitch Formation Upward Motion

Thread Tension Devices

A seam can be considered perfect only when the two threads cross each other in the middle of the thickness of the material, and are taut. If the threads do *not* cross in the middle of the material, and if they are *not* tight enough, the seam will not only look bad but won't wear well.

A perfect seam cannot be made using only the parts which form the stitches. In order to pull the lower thread onto the material with the upper thread, and to give them their proper tension, it is necessary to create a certain resistance to the freely unwinding thread from the spool (upper thread) and the bobbin (lower thread).

This resistance is called "tension": it retains the threads, and a certain force is needed to unwind them. This force is provided by the thread take-up lever. The functions of the tensions will be clearer if we first consider the different parts of the tension devices.

A) Lower Tension

The lower tension device is part of the shuttle and consists of a tension spring, which can be adjusted. When the bobbin is properly inserted, the thread must be forced to pass between this spring and the side of the upper guard ring. The tension to this spring then exerts an even pressure on the thread, which varies according to the size of thread used. Thus if very fine thread is used, the spring is only slightly displaced and the pressure on the thread is very slight.

On the other hand, if very thick thread is used, the spring will be considerably displaced, and there will be, therefore, a stronger pressure on the thread. To compensate these differences in the lower tension, caused by the different thread sizes, an upper thread tension device has been provided, which can easily be adjusted by the home sewing machine operator.

B) Upper Tension

All modern sewing machines are equipped with variable upper thread tension devices.

When the upper thread is inserted in the tension device, it passes between two tension discs, which are pressed together by a spring. The pressure of the spring can be regulated by means of a thumb nut or tension regulator. By tightening this part, the pressure exerted on the thread is increased; by loosening it, it is relaxed. When it passes between the tension discs, the thread is thus more or less held back.

When threading the machine, as well as when withdrawing the piece of work, the tensions discs must not be under pressure, otherwise the needle may break or a poor seam may result. To avoid this, sewing machines are equipped with an *automatic tension release* which acts as soon as the cloth pressure bar is raised.

To ease the sharp tugs of the thread take-up lever on the thread, the upper thread tension devices of all modern sewing machines are equipped with a check spring, which considerably reduces the danger of thread breakage.

How The Tensions Work

Let us now examine how the tensions function during the major sewing phases.

Phase I

In the first phase, the thread take-up lever is in its highest position and has pulled a sufficient amount of upper thread through the tension device, which it will furnish for the formation of the loop during its downward movement.

Phase II

In the next phase, the thread take-up lever arrives at the lowest position and starts to move upward again. The thread which passes through it, runs on one side towards the upper tension, and, on the other, down through the needle to the shuttle, where the loop is completely extended; this exerts a pull in both directions on the thread, as the take-up lever has to pull the thread from the spool, and at the same time, closes the loop.

Nevertheless, as on the side of the spool, the upper tension device is interposed, the two tension discs set up a resistance to the passage of the thread. Because the thread meets with much less resistance on the side of the loop, it is this portion of the thread that is drawn up by the thread take-up lever, and, consequently, the loop is closed.

Phase III

In the final phase, the lower thread is drawn up by the upper thread and begins to tighten under the influence of the lower tension.

The bobbin and the spool supply a certain amount of thread for each stitch formed depending on the length of the stitch and the thickness of the material. Just before the stitch is completed, the lower thread begins to slack, and with the pull of the thread take-up lever on the upper thread being stronger than the resistance set up by the lower tension, the upper thread pulls through the quantity of thread necessary to finish the stitch from the bobbin.

This supplementary traction, combined with the effort required to draw the lower thread into the material, causes the resistance of the lower thread to increase until it equals that of the upper tension. It is at this point that the upper thread needed to finish the stitch is drawn from the spool through the upper tension device.

As has aready been pointed out, the upper and lower threads should cross in the middle of the thickness of the material being sewn. This is the case when the upper tension is correctly adjusted. *See Fig. 5.*

Fig. 5
Correct tension

What Happens If The Upper Tension Is Too Tight?

At the moment the lower thread should be drawn from the bobbin to finish the stitch, its resistance is too weak in relation to the upper tension. The lower thread thus unwinds too freely and does not offer enough resistance to the pull of the upper thread. The upper thread withdraws entirely from the material and remains stretched on top of it, while the lower thread crosses through it. *See Fig. 6.*

Fig. 6
Tension too Tight

What Happens If The Upper Tension Is Too Weak?

At the moment the lower thread should be drawn from the bobbin to finish the stitch, its resistance becomes too strong in relation to the upper tension. Thus the upper thread is unwound before the lower thread is drawn into the material. The thread take-up lever no longer meets with enough resistance from the upper tension to enable the thread to cross in the material and the lower thread remains stretched. *See Fig. 7.*

Fig. 7
Tension Too Weak

Figure 8 shows the start of a perfect seam, then a skipped stitch (A), and then a broken thread (B). Skipped stitches occur when, for one reason or another, the point of the hook does not catch the loop of the upper thread.

Fig. 8
Skipped stitch & Broken Thread

Parts Needed For Feeding The Material

In sewing a seam, it is essential that the material be fed regularly for the formation of each stitch. The conveying of the material is done by the *feed* dog in conjunction with the *cloth presser bar* on which a *presser foot* has been fastened.

The Feed Dog

The function of the feed dog is to move the cloth on for a specified distance after each stitch has been made. This distance, called stitch length, can be accurately adjusted by means of a lever acting on the feed mechanism. The feed dog is equipped with small, sharp teeth.

Here are the most commonly used types of feed dogs:

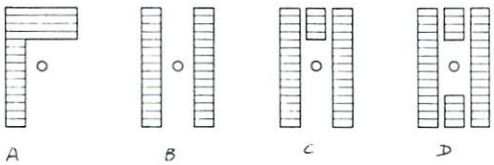


Fig. 9
Common Feed Dogs

A. This is the oldest type, found on sewing machines with vibrating shuttles. Its chief disadvantage is that it does not feed all kinds of work evenly.

B. This feed dog, containing a row of teeth on either side of the needle plate hole, is an improvement on the former, but does not feed narrow strips or hems well.

C. & D. Both of these feed dogs guarantee uniform feed of any kind of work or material.

The Cloth Presser Bar

In order to obtain a regular, continuous feed, the cloth must always be pressed against the teeth of the feed dog. This function is performed by the presser foot, which is attached to the cloth presser bar.

The cloth presser bar is continuously pressed down by a spring and can be raised or lowered with the presser bar lever. Slightly above where the feet are attached is an incision in the bar, with sharp edges, which serves as the thread cutter.

Square or prismatic cloth presser bars are still to be found on most older machines, but modern machines use round cloth presser bars exclusively.

Some sewing machines are equipped with cloth presser bars which have a skip mechanism for darning. Although this is a very complicated mechanism, it is necessary for those machines which require darning hoops for darning holes.

Such hoops must, necessarily, only have a very small diameter. The darning foot must be made small accordingly, for otherwise the hoop could not be moved sufficiently when darning. A mobile darning foot, as for instance, that of the Elna, naturally would take up too much room in a small darning hoop, and the skip motion needed for displacing the material while darning therefore has to be produced by the whole cloth presser bar.

With a skip-mechanism, the cloth presser bar must, furthermore, be equipped with an extension for fastening all presser feet other than the darning foot.

The Bobbin-Winding Mechanism

A lock-stitch sewing machine is always equipped with several bobbins on which the various lower threads are wound. Too much time would be lost if the thread has to be wound on the bobbin by hand, and this would certainly be done very irregularly, resulting in irregular lower tensions. For this reason, sewing machines are equipped with automatic bobbin-winding devices.

Many of these bobbin-winding devices are connected to the fly-wheel; oth-

ers are driven by the motor axle. In order to have the thread wound properly and evenly on the entire width of the spool, an additional thread guide arm is usually indispensable.

The Drive

The early sewing machines were driven by hand, which had the considerable disadvantage that the work to be sewn could not be guided properly. Although it may have been possible to do normal sewing jobs, darning and embroidery were out of the question, as these require both hands to be free to guide the material.

Thus it was necessary to improve the drive of the machines, and a solution was found whereby a treadle with a large flywheel and a driving belt were fitted into a table, on which the machine was placed. Powering the machine this way requires considerable effort in an abnormal posture, but on the other hand, the work could be done much faster, and it was easier to guide the fabric. Greater weight and unhealthy influnces are the big disadvantages of the treadle machine.

Electrical engineering was not very advanced at the beginning of the 20th century. In developing machine sewing many experiments were made with spring mechanisms, steam engines, hydraulic motors, etc., but these were all unsatisfactory, being too complicated and impractical. It was not yet possible to build small electric motors, so the treadle system was maintained for many years.

During World War I, the heavy and unsightly cast iron table housing the sewing machine gradually disappeared. (Raw materials were needed for war industries.) Wood was introduced as a new material and brought into fashion the cabinet sewing machine, equipped with drawers or small compartments. Still the cabinet was mainly designed to hide the unsightly foot pedal. This type of sewing machine is still widely manufactured in a number of different models.

In time most sewing machine manufacturers made use of electricity to power their machines, at first simply coupling an electric motor to them. Later, the treadle became superfluous and was replaced by the table sewing machine.

The Thread

Malfunction in the sewing machine can be caused by thread of poor quality, by use of the wrong kind of thread for the particular work you are doing, and by thread that has been allowed to deteriorate. Do not underestimate the importance of thread.

COTTON THREAD

The thread most commonly used on sewing machines today is made of cotton, the quality of which is judged by the length of fibers. The longer the fiber, the stronger the thread is. Cotton grown in Egypt has the longest fibers and is best suited for the manufacture of thread.

Mercerizing consists of soaking the thread in a lye bath. This strengthens the thread and renders it more suitable for coloring. This process also gives the thread a silky finish. Avoid using threads that are *not* mercerized.

Occasionally instead of being mercerized, the thread is glazed or left dull. Glazed thread is smooth and shiny in appearance, an effect achieved by dipping it into a liquid which penetrates the fibers. It is not as flexable as dull thread and is not recommended for sewing machine use since it wears out certain parts (the shuttle, for instance) more rapidly.

SILK THREAD

Silk is soft and supple to the touch and is particularly appreciated for its tensile strength and elasticity.

It is twisted to increase its tensile strength, and is known as sewing or darning silk, twist, etc. To give the silk more lustre, it is dipped in a hot bath, removing the sticky substance found between the layers of silk. This is called scoured or boiled silk.

Once the silk thread has been scoured, it can be treated once again in a special bath which renders it thicker and heavier. This kind of silk is used especially for luxury fabrics but has the disadvantage of being rather stiff and hard.

Spun floret silk is obtained by special processing of the waste from natural silk.

SYNTHETIC THREAD

Apart from the so-called rayon or artificial silk, which has been in popular use for many years, today the most popular synthetic materials are nylon and perlon. These two fibers not only have a very high tensile strength and a considerable elasticity (exceeding 20 per cent), but also great resistance to wear.

Although nylon and perlon have been used in the manufacture of ladies stockings for many years, considerable difficulties are still encountered when the thread of these materials is used on sewing machines. Because these materials are highly elastic, the upper and lower threads stretch when they are drawn through the upper and lower thread tensions.

Once the stitches have been formed in the fabric, the threads tend to retract and crimp the fabric. Moreover, despite their high tensile strength, these synthetic threads can break easily if they come in contact with parts of the sewing machine which are not absolutely smoothly polished. Even if the thread is only slightly injured, it will nevertheless tear under the slightest strain. This behavior has been compared to that of cellophane, which when undamaged, can hardly be pulled apart, but if cut only very slightly is quite easy to tear.

Still another serious disadvantage in the use of these synthetic threads is that they melt at a temperature as low as 350 degrees F. When sewing at a high speed considerable heat is caused by friction, particularly around the needle. If the needle temperature exceeds 420 degrees F., nylon or perlon thread will disintegrate. In comparison, cotton threads can be used for sewing cotton materials, even if the needle temperature should temporarily rise to 575 degrees F.

For these reasons, synthetic threads are used very rarely on sewing machines except for the new models of the Elna Supermatic and the Elna Transforma. Nylon or perlon can be used without any trouble on these Elna's which are models designed to accommodate synthetic fibers. In time, all sewing machines will compensate for these difficulties by providing an adjustable lower thread tension with scale, automatic thread releases, bobbin winder without tension, and extremely well polished thread passages.

Thread Twist

Depending on the kind of shuttle used, the twist of the thread is of great importance.

Using the Elna as an example again, if thread with a right-hand twist is used on this machine, it will unravel slightly when the stitch is formed, due to the direction of rotation of the shuttle. This naturally reduces the tensile strength of the thread. When darning with fine thread, remember to use only left-hand thread.

The difference between the two kinds of twist can be determined in the following manner:

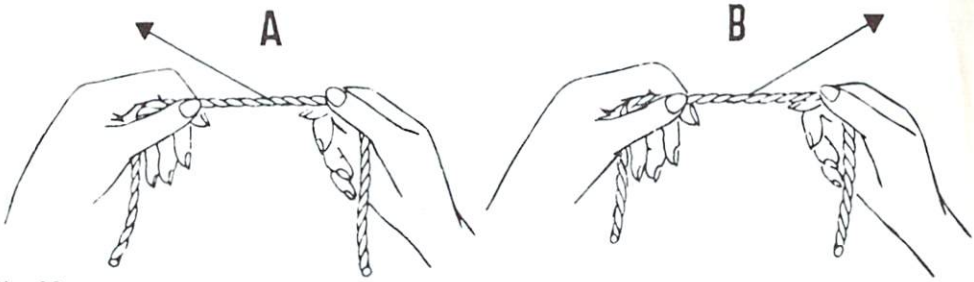


Fig. 10
Thread Twist

A. A thread is left-twist if, when held horizontally, the individual strands slant to the left from bottom to top.

B. A thread is right twist if, when held horizontally, the individual strands slant to the right from bottom to top.

Thread Storage

Cotton and silk threads contain a considerable amount of humidity. Cotton sewing thread is 22 per cent water. If, by long storage in a room that is too dry, this degree of moisture is reduced, the thread will become brittle and its tensile strength will diminish.

Thread should be stored in places where moist air will have access. If thread should become brittle, leave it near an open window overnight.

HOW TO REPAIR YOUR MACHINE

THE following chapter contains repair instructions for specified machines. To identify machines not previously mentioned refer to one of the four following categories:

1. The Long Shuttle
2. The Oscillating Hook Machine
3. The Oscillating Shuttle Machine
4. The Rotary Hook Machine

NOTE: All of the above are lock stitch machines and operate on the same general principle. To locate your type of machine refer to the chapter on Singer Sewing machines.

Domestic Sewing Machines

All two-thread lock stitch household sewing machine mechanisms are fundamentally alike. They all employ an upper shaft from which the needle bar and thread take-up is operated. Likewise, all use a lower shaft to activate the shuttle or hook. The upper and lower shafts are kept in proper synchronization by means of a vertical connecting shaft or its counterpart. *Figures 11* and *12* show these functional parts in a skeleton view as well as the names and locations of the parts visible in the average machine (or sewing head) assembly.

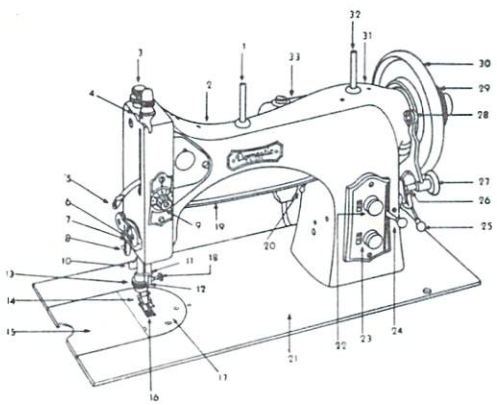


Fig. 11
Domestic Functional Parts

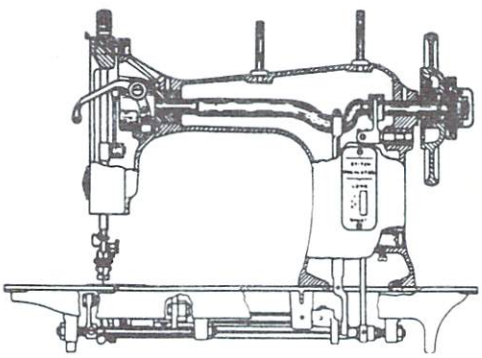


Fig. 12
Domestic Sewing machine

PARTS AND MAINTENANCE PROCEDURES

1. SPOOL PIN (REVOLVING): Holds spool of thread for sewing.

2. ARM: The upper part of sewing unit.

3. POP-UP PRESSER BAR RELEASE: Partial turn unlocks bar, completely releasing pressure on fabric under presser foot. Screw ring adjusts pressure on foot to unusual fabrics.

4. THREAD GUIDE: Guides upper thread to the tension.

5. THREAD TAKE-UP: Pulls up the slack in the thread and locks the stitch.

6. AUXILIARY SPRING: Assists the take-up in handling slack in the upper thread, as the needle descends.

7. THREAD HOOK: Guides thread to auxiliary spring.

8. PRESSER FOOT LIFTER: The lever which raises the presser bar and foot—releases the upper tension automatically.

9. DIAL TENSION REGULATOR: Controls the tension on the upper thread—set by number, not by guess.

10. THREAD CUTTER: A knife attached to the presser bar for cutting threads.

11. OIL DRIP CUP: Prevents excess oil from needle bar soiling materials.

12. NEEDLE CLAMP: Holds the needle in proper position.

13. ATTACHMENT HOLDER NUT: For securing the attachment to presser bar.

14. ROCKING PRESSER FOOT: Guides and holds the fabric in position. Self-adjusting for thick or thin material.

15. HANDHOLE COVER PLATE: Removable plate permitting access to bobbin case and bobbin.

16. FOUR POINT FEED DOGS: Grip and move the fabric along after the completion of each stitch.

17. NEEDLE PLATE: The plate through which the needle passes—and the feed dogs operate.

18. NEEDLE CLAMP SCREW: Opens and closes the needle clamp.

19. BUILT-IN SEWING LIGHT.

20. SEWING LIGHT SWITCH: On or off regardless whether machine is operating.

21. BED: The base of the sewing unit.

22. REVERSE STITCH DIAL: To set length of reverse stitch—independent of forward stitch.

23. FORWARD STITCH DIAL: To set length of forward or normal stitch (The larger the number, the longer the stitch).

24. SHIFT LEVER: For reversing feed to sew backward. Returns to normal position automatically.

25. BOBBIN WINDER LEVER: To engage the automatic bobbin winder for operation—disengages when bobbin is full.

26. BOBBIN SPINDLE: Holds bobbin for winding.

27. BOBBIN WINDER PULLEY: Drive for bobbin winder.

28. BOBBIN WINDER THREAD GUIDE: Guides the thread properly for even, level winding.

29. CLUTCH RELEASE: Disengages sewing mechanism for winding bobbin.

30. DISC WHEEL: The balance wheel for the mechanism.

31. MOTOR DRIVE PULLEY: (Not shown) Transmits power from motor to machine.

32. BOBBIN WINDER SPOOL PIN: Holds spool of thread, making it unnecessary to unthread machine when winding bobbin.

33. MOTOR: Air-cooled—furnishes power for machine operation. Quickly detachable if necessary.

Cleaning

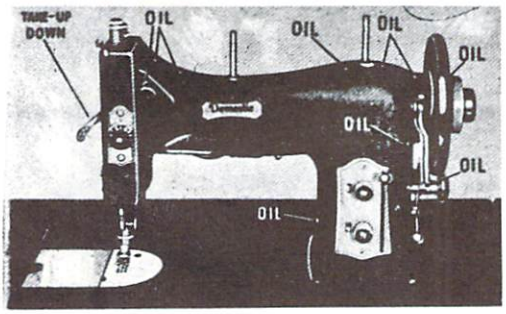


Fig. 13
Oiling and Cleaning

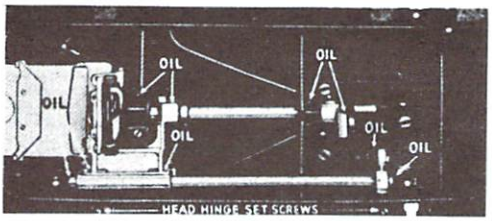


Fig. 14
Motor Oiling Holes

FOR ALL MACHINES

To get perfect performance the machine must be clean. To clean, remove all parts and immerse in a dish of cleaning fluid. Wipe dry and clean with cloth. Use oil can filled with cleaning fluid and saturate the machine's working parts through oil holes. Run the machine until dirt and gummy oil are flushed out, then wipe dry. DO NOT SOAK MOTOR, AS THIS SHOULD BE KEPT DRY.

The needle should be the first part examined. The needle should be sharp, straight, and true. In order to insure that the needle is perfect, insert a new one. Make all checks and adjustments using a new needle. After removing the old needle, select the correct new one and

The Needle And Clamp

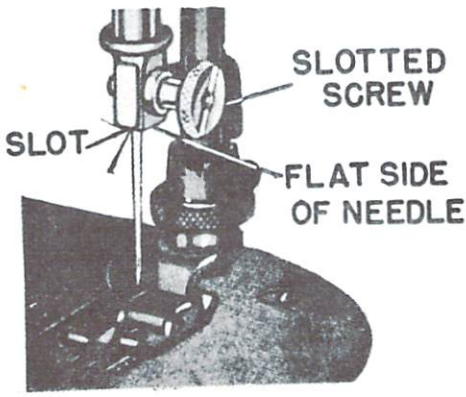


Fig. 15
Needle Clamp Screw

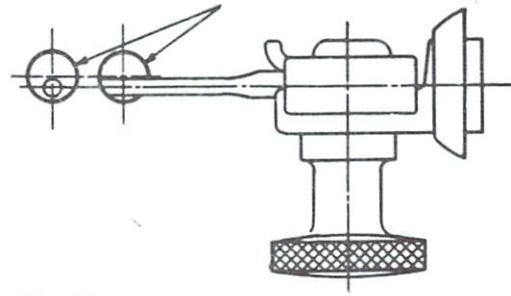


Fig. 16
Hole In Needle Plate

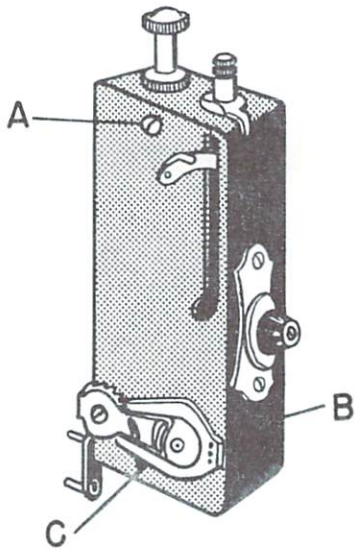


Fig. 17
Front to Back Adjustment Screws

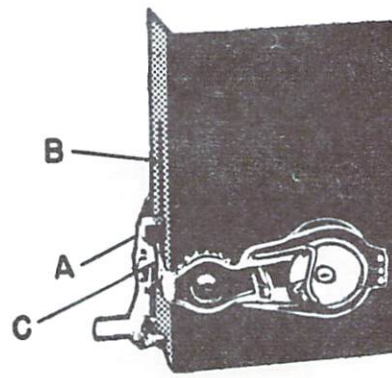


Fig. 18
Presser Bar Lifter

insert with flat side of shank toward needle clamp screw *(Fig. 15)*. Be sure it is pushed firmly all the way up into the needle hole. Always be sure that needle clamp and slot in needle bar are clean.

The needle should enter the needle plate exactly in the center from front to back and a little to the right of center from the right to left facing the machine *(Fig. 16)*. Regardless of needle size, the relation of the flat side of the needle shank to shuttle is always maintained. Faulty needle position is corrected by adjusting the face assembly. For front to back adjustment, loosen screws A and B *(Fig. 17)*. Position needle properly in needle hole and retighten screws A and B. For adjusting position to left or

right loosen screws A and B *(Fig. 17)*. Change left-right position by turning screw C slightly in or out. Screws A and B retighten securely.

Presser Bar Lifter

Occasionally, the set screw holding the lifter block in position on the presser bar becomes loose. This lessens the clearance under the presser foot when it is lifted or the lifter lever fails to lift the foot entirely. In either case, to reset the lifter block A *(Fig. 18)* insert small screwdriver in slot B and loosen set screw on lifter block sufficiently to allow lifter block to move freely on presser bar. Now with lifter lever down and presser foot down on feed, push block into position downward against lifter cam C *(Fig. 18)* and tighten set screw.

The Shuttle

The Domestic rotary shuttle operates in the shuttle race *(Fig. 19)*, and is driven by two shuttle driving pins A and B *(Fig. 20)*.

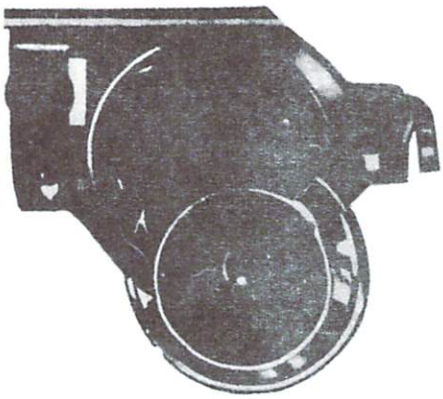


Fig. 19
Domestic Rotary Shuttle in Shuttle Race

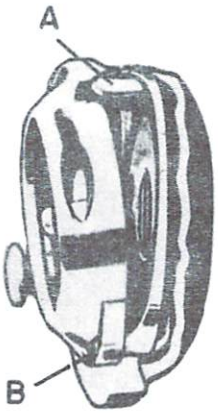


Fig. 20
Shuttle Drawing Pins

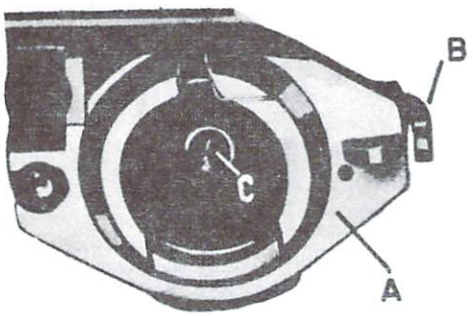


Fig. 21
Shuttle Race Cover (A); Removal Button (B)

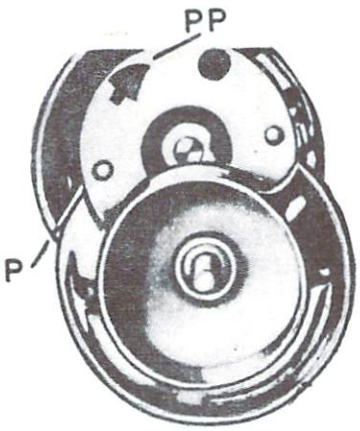


Fig. 22
Shuttle Removing Procedure

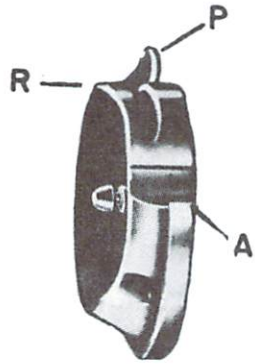


Fig. 23
Thread Pull Off Points

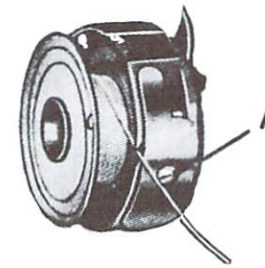


Fig. 24
Timing Adjustment and Bobbin Threading

The shuttle is held in the shuttle race by the shuttle race cover A *(Fig. 21)*, and is easily removable without tools merely by pressing latch B *(Fig. 21)*. This releases the race cover which is then lifted off the rear retaining pin. Grasp the shuttle firmly with the thumb and forefinger by the shuttle center pin C *(Fig. 21)*, and pull it out of the race. The shuttle is replaced by reversing the above procedure making certain that the shuttle point P *(Fig. 22)* position coincides with that of arrow cut-off PP *(Fig. 22)* in copper shield.

Apparent binding or stiffness of the machine in operation indicates a need for cleaning the shuttle race.

In addition to the point P *(Fig. 23)* for cutting out lint accumulation, the inner rim R is milled to an irregular contour to accomplish the thread pull-off. The pull-off is necessary to provide sufficient slack to complete a stitch and permit movement of the goods for the succeeding stitch. In most other machines, the pull-off function requires installation of a separate mechanical contraption of many extra parts to operate a finger which moves back and forth.

The Lower Tension

The lower tension is properly a part of the complete shuttle assembly consisting of shuttle, shuttle race, race cover, bobbin, and bobbin case. Tension adjustment on the lower or bobbin thread is made by loosening or tightening screw A *(Fig. 24)*. Turning the screw clockwise tightens the tension, and turning it counterclockwise loosens it. Correct lower thread tension is necessary for proper sewing. Too tight a tension on the lower thread results in pulling the upper thread downward entirely through the cloth and appears on a finished seam as in *Fig. 15*. On the other hand, too loose a lower tension will allow the lower thread to be pulled upward through the cloth and appear as in *Fig. 16*. Thus correct tension is essential.

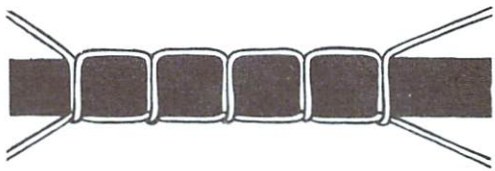


Fig 25

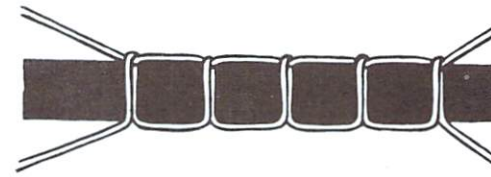


Fig. 26

Fig. 27

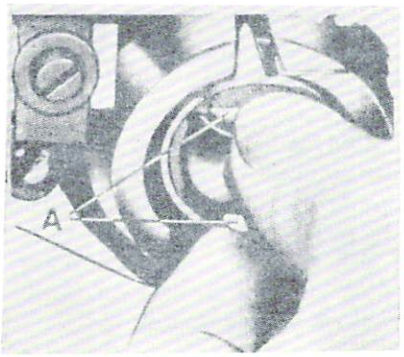


Fig. 28
Bobbin Case Removal

Domestic's design of the lower tension on the machine under discussion is semi-automatic in operation. and under normal use no adjustment is necessary. The tension spring adjusts itself to the proper tension for each of the common thread sizes. Occasionally an adjustment will have to be made to use elastic thread or for unusual sewing operations. In actual sewing use, variations of the upper tension by the operator is reflected in automatic variation of the lower tension. Stitching as it appears with the correct balance between the two tensions is shown in *Fig. 27.*

To remove the bobbin case and the bobbin from the shuttle, grasp the finger latches (A, *Fig. 28)* between the thumb and forefinger. A slight pressure releases the latch from the shuttle pin and it is easily slipped out. Loosening the grip on the finger latches then allows the bobbin to fall out of the case.

The bobbin case must be threaded correctly (see *Fig. 24).* In placing the bobbin in the bobbin case, be sure that the thread comes off clockwise, as shown. In this way, rotation of the shuttle tends to keep the bobbin thread taut and prevents possible snarling.

To achieve proper lower tension, set upper tension indicator at No. 4 position. On some machines No. 4 position may be too tight or too loose. Establishing a correct tension is largely a matter of "feel"—in other words, checking the feel or tug of the thread on machines which you know are sewing correctly at an average setting. An inspection of the finished seam shows immediately whether it is too loose or too tight.

To set the lower tension accurately, remove the bobbin and case from the shuttle. Be sure that it is properly threaded. Withdraw the upper thread from the needle but make sure the thread is correctly threaded through the rest of the upper head. Tie the ends of the two threads together. Set upper tension at No. 14 position and lower the presser foot. The presser foot must be lowered before the tension is actually exerted on the upper thread.

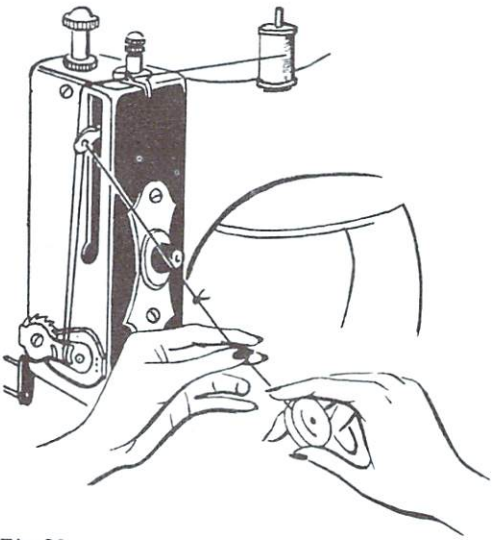
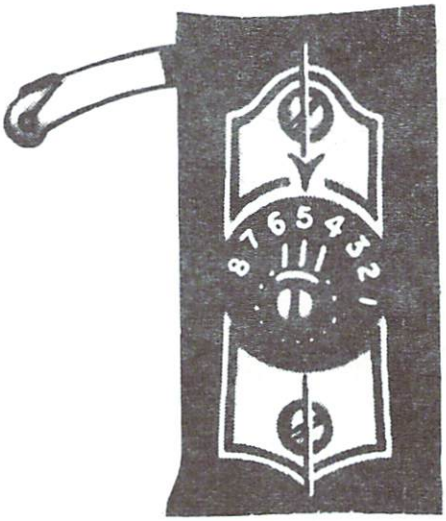


Fig.29
Tension Setting



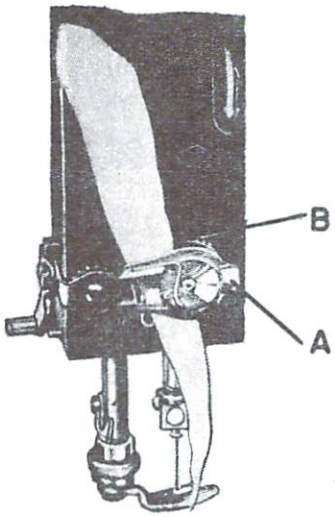


Fig. 31
Dial Type Tension Release Points

Hold the bobbin case in the right hand and grasp the thread between the thumb and forefinger of the left hand as in *Fig. 29.* Now tug first from the upper thread side and then tug from the bobbin case side. When the tugs indicate that equal pressure is being exerted on both sides, the tension should be in correct balance.

Upper Tension

The relationship and coordination of the upper and lower thread tensions are now apparent. Just as too tight or too loose a lower tension results in imperfect stitching, improper upper tension produces the same results conversely.

Unlike the lower tension, changes are frequently made on the upper tension by the operator. The Domestic model under consideration contains a dial type tension indicator *(Fig. 30)* enabling the operator to vary the tension at will for the various sewing operations.

Because of the variable adjustment provided by the dial, no further mechanical adjustment of the upper tension is practicable. Occasionally, a piece of lint or thread may lodge between the discs and prevent the tension from operating properly. This can be cleaned out in the following manner easily and quickly: Raise the presser foot by the lifter to release the tension. Notice that the tension can only be released by the action of the presser foot lifter lever, and not by merely lifting the presser foot or presser bar. Turn the dial indicator to No. 1 position, cut a piece of bias cloth to a point and draw it downward through tension plate A and washer B, as illustrated in *Fig. 31.* Access for the cloth can be more easily obtained by holding tension plate A and washer B apart with the point of a screw driver. With the strip of bias cut cloth in position, remove the screw driver, drop the presser foot lifter, and set the dial to No. 8 tension position. Now draw the cloth up and down several times and it will remove any obstructions.

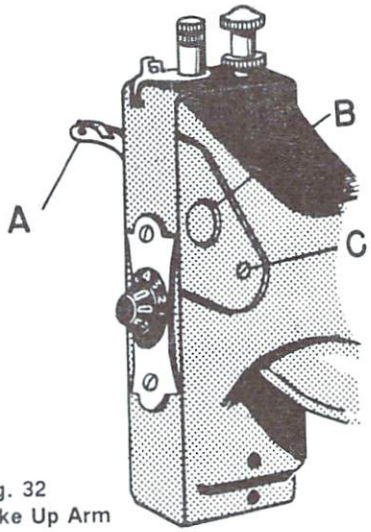


Fig. 32
Take Up Arm

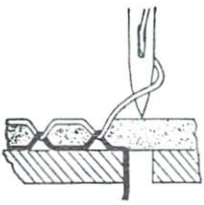


Fig. 33

Fig. 34

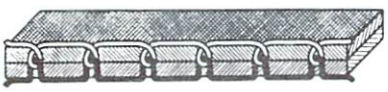


Fig. 35
Half Stitch and twist Stitch Threading

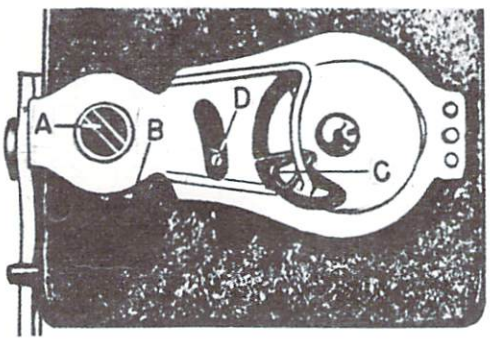


Fig. 36
Close Up Tension Adjustment

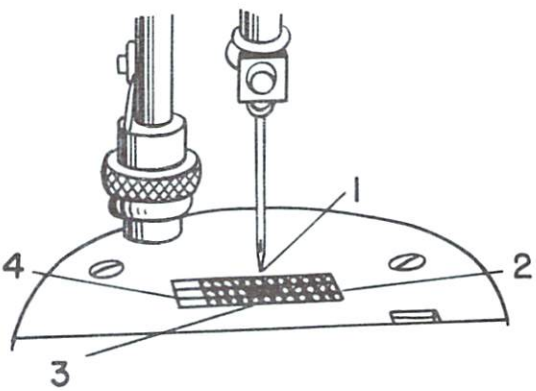


Fig. 37
The Four Point Feed

Take-Up and Auxiliary Spring

The take-up arm (A, *Fig. 32*) serves only to pay out and draw in thread as required to complete stitching. It is cam operated. To replace the take-up, access is obtained under cover. *B (Fig. 32)* Remove screw *C (Fig. 32)*, and the old take-up can easily be lifted out. Insert new one and replace cover and screw C. Excepting actual damage or breakage, the take-up never need be replaced.

Contrary to general opinion, the auxiliary spring plays no part in controlling the upper tension. Although it is mounted in the tension assembly, its action is to assist the take up in controlling the upper thread assembly, at the time the needle is about to enter the cloth. The upper thread must be tight from the time the needle starts on its downward course until it actually pierces the cloth. A slack thread or an inactive auxiliary spring could allow the thread to whip around the needle point resulting in a half stitch or twist stitch as shown in *Fig. 33, 34, 35.*

The tension of the auxiliary spring C, *Fig. 36,* should only be sufficient to

overcome the friction of the thread passing through the eye of the needle. If its action is so stiff that the slightest tension fails to lift it, then it fails to perform its function and irregular sewing results.

Adjustment is made by loosening screw A, *Fig. 36,* and turning notched washer B clockwise for greater tension, and counter-clockwise for less tension. Replacement is made by removing screw A and washer B. Insert new spring in notched washer and reassemble. Auxiliary spring must be on top of pin D, *Fig. 36.*

The Feed

The four point feed *(Fig. 37)* provides feed dogs in front, behind and at both sides of the needle to feed the cloth evenly and as straight as possible. Its action is quick and smooth—exact rather than erratic, because the cam operating the feed fork has the same dimensions in each radial measurement.

It might be well to mention here that reverse sewing and stitch length is regulated by moving the feed fork connection A *(Fig. 38)* in or out on radius bar on feed fork B. At the extreme outward position of the feed connection, the maximum stitch is produced, while at its closest position to center the shortest stitch is made. Moving the feed connection past center reverses the direction of the feed. Moving of the feed connection is accomplished by the external lever provided. Positive setting of feed connection is made possible by the dial-type control of both forward and backward stitching. This explanation is given as information only. Adjustment or repair of this internal mechanism is not practical.

Factory adjustment of the feed dogs A, *Fig. 39,* is made according to set standards, so that field adjustment is seldom required. The feed must occasionally be reset and the following procedure should be followed:

Best feed results are obtained when the top of the teeth come 1/32″ above the level of the needle plate D, when the feed is in its highest position. Loosen screw B, *Fig. 39,* but do not remove. To raise feed, pry with screw driver between feed A and feed bar C. To lower feed, pry with screw driver between feed A and needle plate D. Care should be taken when prying against needle plate not to bend or damage needle plate D.

The Motor

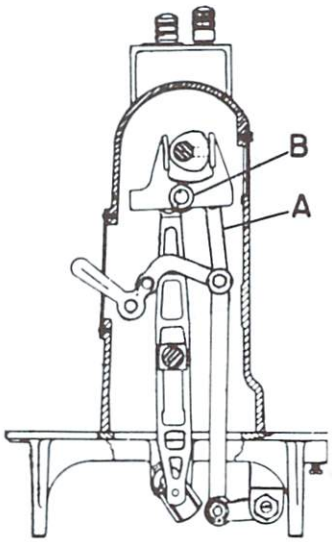


Fig. 38
Feed Fork Connections

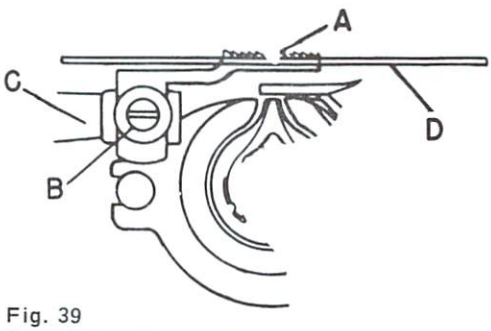


Fig. 39
Feed Adjustment Points

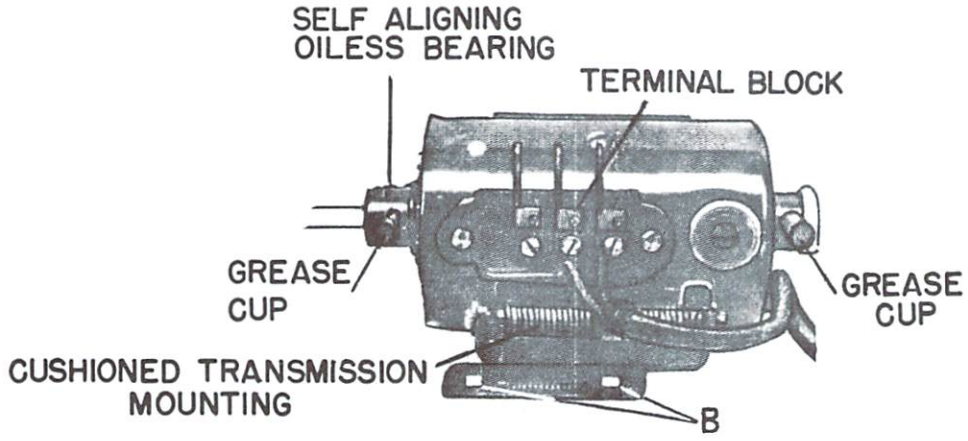


Fig. 40
Air Cooled Motor-Universal type

The air-cooled motor, *Fig. 40,* is of the universal type, operating on 110 volt AC or DC current and cycle variation up to 75. Thus the machine can be used in almost any locality.

Self-aligning, oil-less bearings of the floating type are used. Lubrication wicks are provided at both ends and should occasionally be repacked with vaseline.

A commutator and brushes are used in the motor and may need service after long use. It is a simple matter to remove the armature and clean the commutator, and easy to replace the brushes when necessary.

To remove the motor from the machine arm, remove the three connector plugs and take out screws B, *Fig. 40.*

Domestic Long Shuttle Sewing Machines

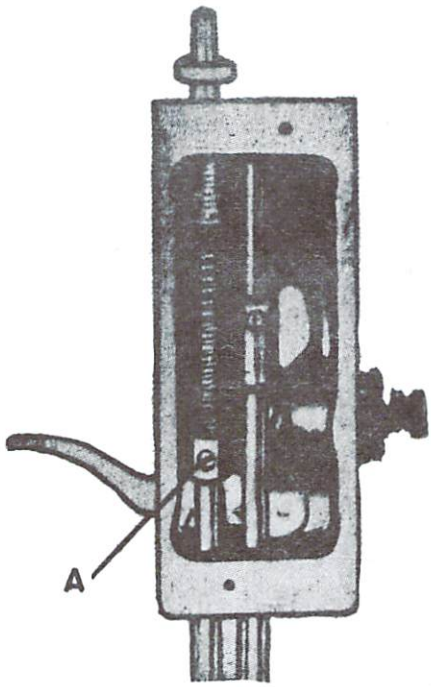


Fig. 41
Domestic Long Shuttle—Presser Bar and Sewing Foot Set Screw (A).

Fig. 42
Cradle or Shuttle Carrier

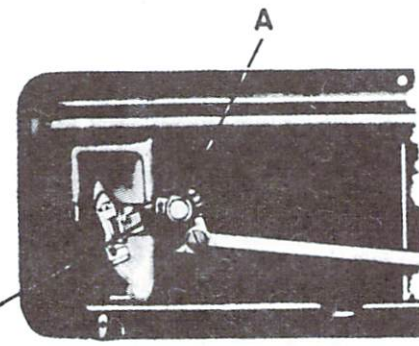


Fig. 43
Shuttle Bell Crank A

The Needle

As with the rotary mechanism, all adjustments should be made after first inserting a new needle. Select a straight and true needle and pass it upward between the clamp and needle bar as far as it will go—flat side to the right—then tighten the needle clamp screw with a screwdriver.

Presser Bar And Presser Foot

To adjust alignment of the foot in relation to the needle, remove the face plate, and raise the lifter so that the foot is up. Then loosen set screw A, *Fig. 41,* in the presser bar and swing foot as required and tighten the set screw. Care must be taken not to disturb the height of the foot, the under face of which should be ¼" above the needle plate when the lifter is up.

This can be checked by turning the machine until feed is below the needle plate. Select any flat object ¼" thick, and place it under the foot. The foot should just touch this object when the lifter is in its raised position.

The Shuttle And Shuttle Carrier

The Domestic long shuttle is designed to accomplish the same function as the rotary shuttle—namely, to pass the lower thread through the upper thread loop formed by the action of the needle.

Fig. 42 illustrates the cradle or shuttle carrier. It is fastened to the shuttle bell crank A, *Fig. 43,* by screw B, *Fig. 43.* The shuttle carrier may become bent through carelessness or accident. In the event it requires replacing, remove screw B, *Fig. 43,* slip carrier out of slot, and replace with a new one making sure to tighten screw B securely.

Shuttle carrier should be set so upper thread loop will pass over and around shuttle freely, but without shuttle being too loose in carrier. To adjust, loosen screw B, *Fig. 43.*

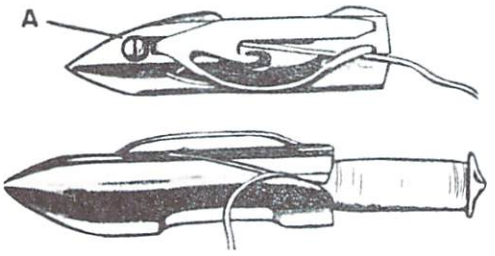


Fig. 44
Lower or Shuttle Tension Screw A

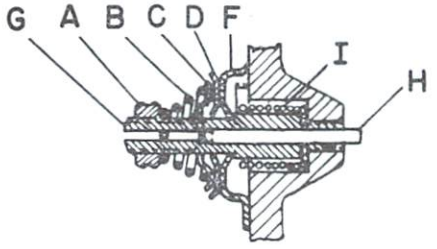


Fig. 46
Auxiliary Spring Removal Points

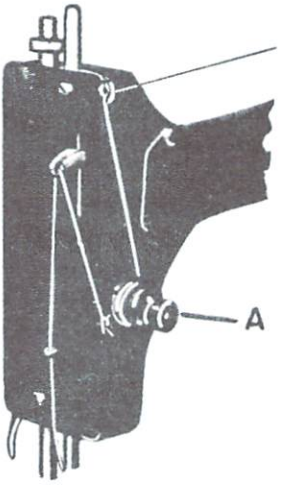


Fig. 45
Upper Tension Thread Adjustment Thumb Nut A

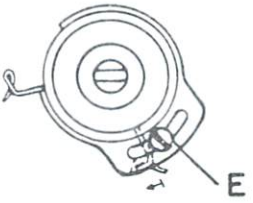


Fig. 47
Tension Disc Adjustment Screw

Lower Or Shuttle Tension

With the bobbin in place and the shuttle threaded correctly, tension is easily adjusted by turning screw A, *Fig. 44.* To tighten tension, turn screw clockwise. To lessen tension, turn screw counterclockwise. Proper tension is a matter of feel to the sewing machine operator and the proof of correct tension is found by sewing a few stitches and then examining them. (See *Fig. 29* for another way of obtaining equal tension on upper and lower threads.)

Upper Tension

Tension adjustment of the upper thread is made by turning thumb nut A, *Fig. 45,* right or left to tighten or to loosen tension as may be required. There

is no indicator and correct tension can be judged only by examination of the completed stitch.

Take-Up and Auxiliary Spring

The replacement of the take-up on the long shuttle machine is the same as for the rotary type described earlier. The action of the auxiliary spring is also the same as on the long shuttle machine; however, its adjustment or replacement is different.

To replace auxiliary spring, remove nut A, *Fig. 46,* tension spring B, tension release C, tension disc D, screw E, tension disc and regulatory plate F. Unscrew tension stud G by inserting screw driver blade in slot close to bottom. Be careful not to spread the slot. Tension release pin H and auxiliary spring I will come out with stud G.

Slip new auxiliary spring on stud G and screw stud back into place, making sure that tension release pin H is in hole in stud. Before tightening stud, hold auxiliary spring without any tension on it so that the loop will stand approximately in the dotted line position as shown in *Fig. 47.* Hold the spring in this position while tightening the stud.

Move eye of spring to the position shown by the full lines in *Fig. 47* and replace plate F, *Fig. 46.* When this is done, the arm on the auxiliary spring will come within the slot on the flange on the plate. The other tension parts can then be replaced in the order shown in *Fig. 46.* Then, thread machine, adjust tension, and sew.

Adjust tension disc and regulator plate F with screw E until auxiliary spring comes to its stop. When the needle is in thin goods, about 1/32″, thereby avoiding twist stitches.

To adjust tension on spring only, remove tension parts as described above and note position of auxiliary spring when it comes to rest somewhere in the vicinity of the dotted line, *Fig. 47.* Then unscrew tension stud G until the auxiliary spring is free and move to the right or left from the dotted line position as circumstances require; moving to the right will make a stiffer auxiliary, and to the left, a lighter auxiliary.

These instructions for adjustment of the spring would apply to a new spring also if the right tension on the spring is not accomplished at the first trial.

The Feed

The feed, which pushes the material along, seldom needs replacing. How well it works depends upon the setting of the feed and the adjustment of the pressure on the presser foot.

If the feed is set correctly, at its highest position, the bottoms of the notches formed by the teeth will be even with the top surface of the throat plate. If it is set too high, it will cause material to pucker along the line of stitching. To adjust, loosen screw A, *Fig. 48,* that holds the feed in place, move the feed to the correct position and tighten the screw.

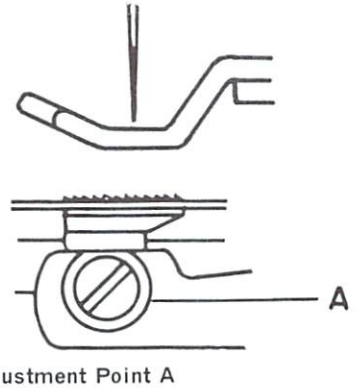
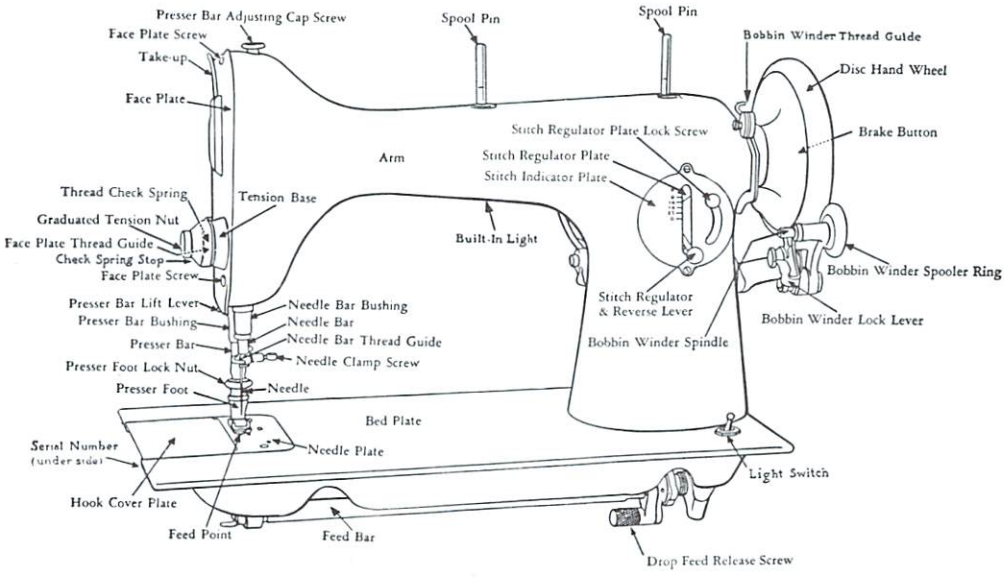


Fig. 48
Feed Adjustment Point A

The Motor

The motor used on long shuttle machines is the same as that used on rotaries. (See *Fig. 40.)*

New Home (Model NLB)
And
Free-Westinghouse (Model ALB)



THE NEW HOME AND FREE-WESTINGHOUSE ARE BASICALLY THE SAME. *FIG. 49* SHOWS THE HEAD FOR BOTH MACHINES.

PARTS AND MAINTENANCE PROCEDURES

To Remove the Bobbin Case

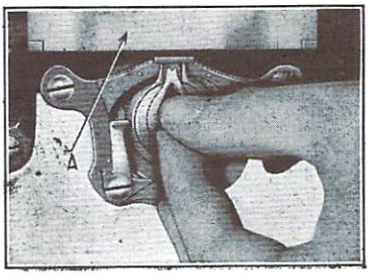


Fig. 50
Bobbin Case Removal

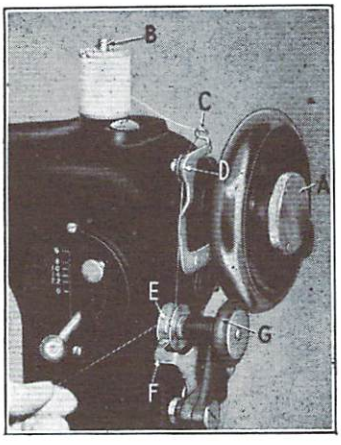


Fig. 51
Bobbin Winding

First, raise the take up to its highest position by pushing the disc hand wheel away from you with your right hand. Then raise the hook cover hinge plate *(A)*—located on the left of base. Grasp the bobbin case with the thumb and forefinger of left hand, as shown. Pull out the bobbin case, tilting it slightly upward to prevent the bobbin from falling out. Remove the bobbin from case for winding.

Winding The Bobbin

Holding hand wheel with left hand, loosen brake button *(A)* by turning button towards you. This stops the sewing mechanism. Place bobbin *(E)* on winder spindle, locating hole in side of bobbin on the bobbin driving pin. Press lock lever *(F)* until it goes between flanges of bobbin, and the spooler ring *(G)* is in contact with the hand wheel. Place thread on spool pin *(B)*. Draw thread through thread guide *(C)*, and between tension discs *(D)*. Insert thread through hole in bobbin *(E)*, hold thread in left hand as shown, and start motor as if sewing. After a yard or so of thread has been wound, pull sharply on the thread hold in left hand, which will break the thread off at hole *(E)*. Bobbin will be automatically released when filled. Now tighten the brake button *(A)*, and the sewing mechanism is once more connected.

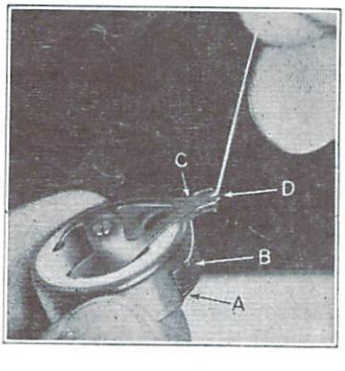


Fig. 52
Bobbin Case Threading

To Thread The Bobbin Case

Place the wound bobbin in the case leaving three or four inches of thread dangling. Hold the bobbin case open side down with the thumb and the forefinger of left hand, as shown in *Fig. 4*, with the middle finger supporting the bobbin to keep it from falling out. Draw thread into slot *(A)* until it comes out at *(B)*. With the same motion, swing the thread under the projection at *(D)* all the way around into slot at position *(C)*. Then pull thread back toward you, and it will come out from under spring at tongue *(D)*. See that thread comes out of the V at end of spring *(D)*. Then pull on thread to make sure that bobbin is revolving freely in case. Leave three or four inches of thread dangling from the tongue.

NOTE: Do not wind the bobbin too full, or so full that the thread rises above the sides of the bobbin.

To Replace The Bobbin Case

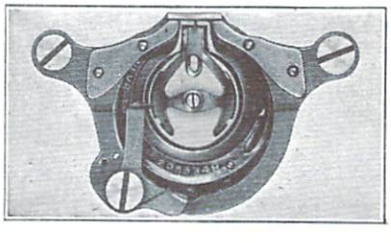


Fig.53
Bobbin Case Replacement

Hold the bobbin case between the thumb and forefingers with the open side slightly upward. Place the bobbin case on the central pin or stud of the bobbin case base with the tongue of the bobbin case at the top, and press the bobbin case in as far as it will go. The latch will hold it in place.

To Thread Upper Sewing Mechanism

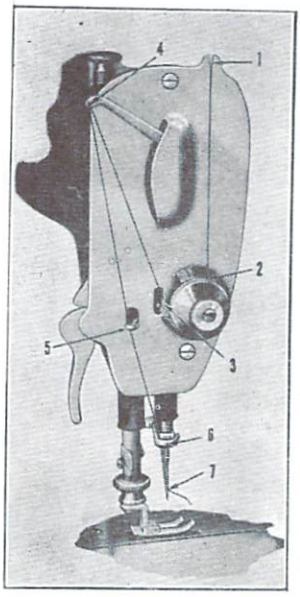


Fig. 54
Threading Upper Sewing Mechanism

Raise the presser foot. Move the hand wheel away from you until take-up *(4)* is at its highest point. Place thread on forward spool pin. Keep right hand on spool, allowing the spool to slip gradually through the hand as needed. Draw thread through guide *(1)* then down between tension discs at *(2)*, and then around and up against spring *(3)*. Now release the pressure of the right hand on the spool. Continuing with the left hand, pass the thread up through the hole in the take-up *(4)* from left to right.

Now bring the thread downward through the face plate thread guide *(5)*, then through the needle bar thread guide *(6)*, then through the eye of the needle *(7)* from left to right. Allow three or four inches of thread to issue from the needle.

To Draw Up The Under Thread

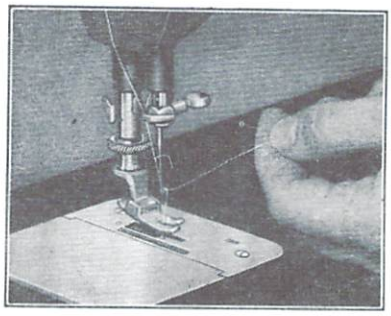


Fig. 55
Drawing up the Upper Thread

Raise presser foot. Hold end of the upper thread(the thread coming through the needle) and slack with the left hand. Turn disc hand wheel away from you with the right hand until needle moves down, then up again, and the take-up is at its highest point. The needle thread has been carried around the under thread, having drawn it up through the hole in the throat plate. Now pull both threads to the back of, and underneath, the presser foot.

Correct Needle Information

If stitching is not as it should be, the first thing to examine is the needle; it may be bent or blunt. A bent needle may cause the machine to skip stitches or break thread. A blunt needle may cause uneven stitching, or punch through the material causing the woven thread in the material to break or pull. All recent models of the New Home rotary and Free-Westinghouse rotary models use a needle manufactured especially for them (No. CC1221). They are much shorter than those used on other lock stitch machines and have a special scarfing on one side just above the needle eye. This special scarfing enables the hook to be set closer to the needle in timing.

No. CC1221

Fig. 56
Exact Length of Needle for this Sewing Machine

To Set Needle

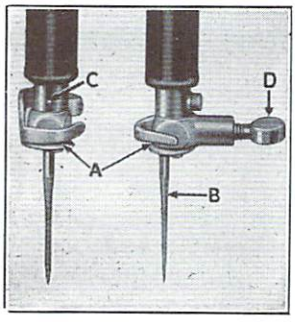


Fig. 57
Neddle Setting

Raise the take-up to the highest point by turning the disc hand wheel away from you. Take the needle between the thumb and forefinger of your left hand and pass the shank of the needle up through the needle clamp *(A)* with the flat side of the shank *(B)* to your right. The end of the needle must go clear into the groove of the bar until it sets firmly against the stop pin *(C)*. Then clamp the needle securely with the needle clamp screw *(D)*.

Testing The Needle

Check the needle for defects by placing the flat side of the shank on any perfectly flat surface. The point of a perfect needle will be in line with the shank. The point of a crooked or bent needle will be closer to or farther from the testing surface at the point. The correct size needle together with the proper thread will help to produce a perfect stitch. Both needle and thread should be selected to suit the fabric to be stitched. The length of the stitch should also be regulated according to the thickness of the material that is to be sewn. Heavier thickness requires a longer stitch while a shorter one may be used for lighter materials. If the needle is too fine for the thread that is being used, it will more than likely cause the thread to ravel and break. This is particularly true when passing over seams. Too large a needle on fine material will make large perforations in the material and will show on the finished work.

The Tensions

Tension means pressure on the thread, which prevents the machine from drawing off more thread than is necessary to form a stitch. The tension of both threads should be thght enough only to make a smooth, firm seam. The tension of the lower thread must be light, considerably lighter than the tension on the upper thread. The thread should lock in the center of the material. If the upper tension is too tight, with lower tension too loose, the upper thread will lie straight on the upper side of the goods. If the upper tension is too loose, or lower tension too tight, the lower thread will lie straight along under side of goods.

To Regulate Upper Tension

Always regulate the tension by adjusting the upper tension if possible. First, lower the presser foot. Turn the graduated tension nut clockwise, the top of nut towards you, to tighten the tension. The numbers on the nut will serve as a guide, enabling you to duplicate exactly any tension desired. The tension is automatically released when the presser foot is lifted.

To Regulate The Lower Tension

The tension of the lower thread must be light, considerably lighter that the tension of the upper thread. The lower tension is adjusted at the factory, and as this adjustment is very delicate, should not be changed unless necessary. In case it is necessary, remove bobbin case from machine. Turn small screw in the bobbin case tension spring to right to tighten tension, to the left to loosen.

NOTE: Be sure that the machine is correctly threaded, that the bobbin is wound smoothly but not too full, that the needle is the correct size, and that the same kind and size of thread is used for both threads.

Lower Tension Adjustment

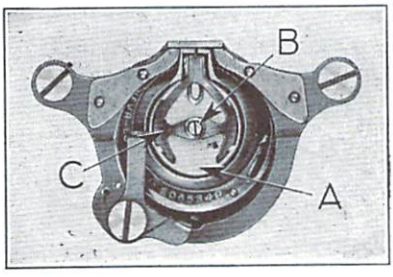


Fig. 58
Lower Tension Adjustment

To adjust tensions it is best to begin with the lower tension. Remove the bobbin case (A) *(Fig. 10)*. Unscrew the tension spring screw (B). The spring (C) will then come off. Carefully clean out all lint and dust. Assemble the bobbin case, taking care that the tension screw is screwed in about one and one-half turns. At this point, insert the bobbin and thread in the ususal way. Hold the thread so as to cause the bobbin case to be suspended. If the tension is too loose, the weight of the bobbin and case will cause the bobbin to unwind. From this point on, tighten the tension screw one-eighth of a complete turn until the combined weight of the case and bobbin *just ceases* to cause the bobbin to unwind. When this stage is reached, make the tension screw exactly one-eighth turn tighter. The bobbin case tension is now correct.

Insert the bobbin case in the machine and proceed with upper tension adjustment.

It is extremely important that the thread be properly wound on the bobbin. When filling the bobbin, be certain that it has been completely cleared of any old thread.

Upper Tension Adjustment

If the tension ceases to function, first check to see if it is free from lint and dust by removing parts, A, B, C, D, and L of upper tension as shown in *Fig. 59.*

Clean out any accumulated lint that may be present, and reassemble as illustrated. Lint may be found between parts D and E. In assembling, Part A should be placed on the tension stud *(G)*, only enough to hold it without falling off. Thread the machine in the usual manner, and begin to sew on a doubled piece of testing material. If the upper tension is too loose, the stitching on the under side of the cloth will be very loose and bunched. Adjustment should be made by tightening the tension three numbers at a time, and sewing each time after the tension is adjusted. By examining the underside of the cloth after each tightening, it will be noted that the looseness on the under side gradually diminishes. When proper tension has been reached the underneath stitching will be flat against the material. If, by chance, the proper tension point is passed, and too much tension is being

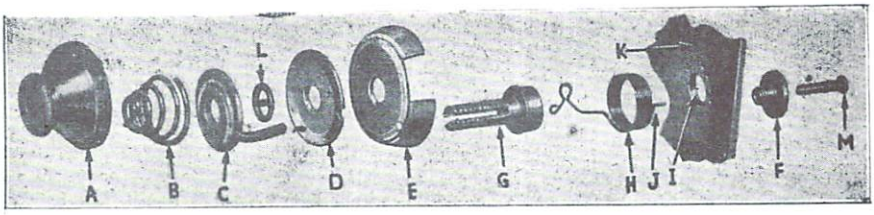


Fig. 59
Upper Tension Adjustment

chance, the proper tension point is passed, and too much tension is being used, the material will show a slight pucker. After the upper tension has been adjusted to suit, do not make any further changes. If loop should appear on under side of goods, it is a clear indication that the upper tension is too loose, or that the lower tension is too tight. An opposite of this condition may be remedied by a reverse procedure.

Tension Release Lever

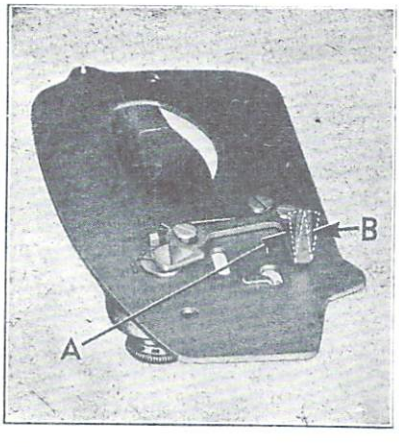


Fig. 60
Tension Release Lever

If tension is still too loose after completely tightening the tension nut, remove face plate, and bend tension release lever approximately 1/16 inch (A) *(Fig. 60)* to left viewed from the bottom of face plate on reverse side.

If there is too much tension on thread, move tension release lever to right 1/16 inch (B) *(Fig. 60)*.

Instructions For Oiling

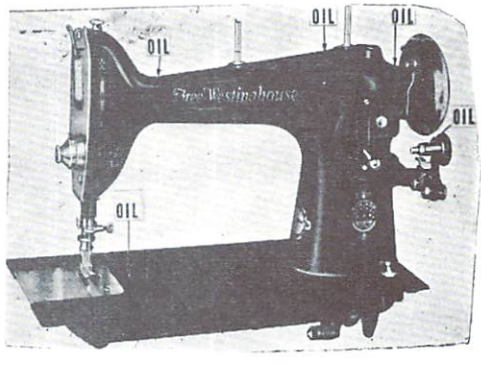


Fig. 61
Machine Oiling Free Westinghouse

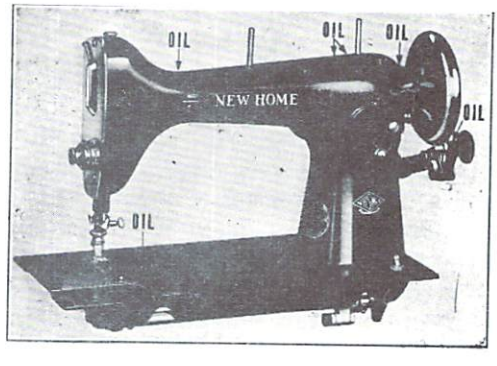


Fig. 62
Machine Oiling New Home

One drop of oil at each point, as shown in *Figs. 61 and 62*, is sufficient. If machine is in continual use, it should be oiled daily.

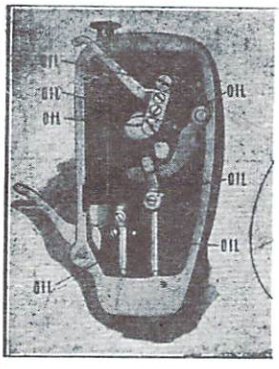


Fig. 63
Under Face Plate Past Oiling Points

To oil parts under face plate, remove plate *(Fig. 63)*. The face plate is held in place by the two face plate screws, one at the top and the other at the bottom of the face plate. Remember, one drop of oil at each point is enough, or oil may run down the bar onto the material.

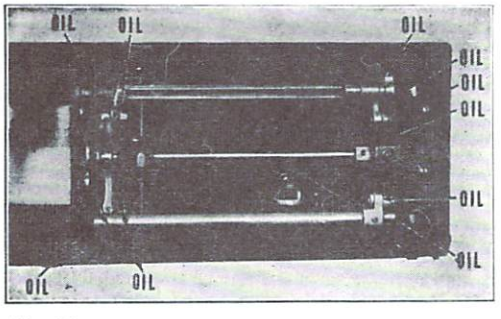


Fig 64
Underneath Mechanism Oiling Points

To oil underneath mechanism, tip the head back on its hinges, as shown in *Fig. 64,* and place one drop of oil at each point indicated. Too much oil in the motor will cause the motor to heat as the excess oil is consumed *(Fig. 65)*.

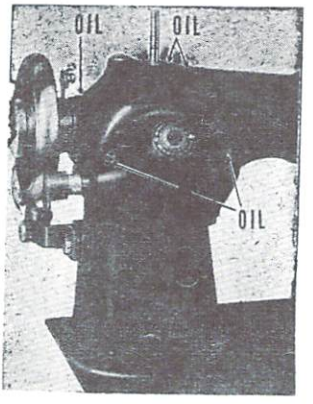


Fig. 65
Motor Oiling Points

To oil floating gib hook mechanism, tip the head back on its hinges. Remove the bobbin case ("7" in *Fig. 66),* and apply a drop or two of oil through one of the holes in the bobbin base *("4," Fig. 66)*. These holes can be seen after removing bobbin case and bobbin. This mechanism should be oiled regularly.

To remove gummed oil, or to clean the machine if it has stood idle for some time, remove needle and bobbin case.

Use a little kerosene at all oiling places (except in motor), run the machine rapidly for a few minutes, wipe clean, and then put a drop of oil at each point indicated.

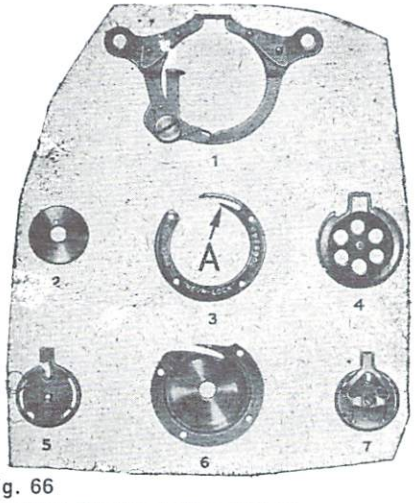


Fig. 66
Floating Gib Hook Mechanism

IMPORTANT PARTS OF THE HOOK AND BOBBIN CASE MECHANISM

(As illustrated in fig. 66)

1. Bobbin case stop shield (AAE483BA), with bobbin case latch
2. Bobbin (AAE448)
3. Gib (AAE488)
4. Bobbin case base (AAE331A)
5. Bobbin case, with face upward
6. Hook (AAE332)
7. Bobbin case, complete (AAE330BA). Face downward, showing tension spring and tension spring screw.

Cleaning the Gib Hook Assembly

Lack of oil in this part of the machine will cause a decided rattle. To oil the gib hook, a few drops of oil should suffice. Then tilt the head of the machine back on its hinges. You will notice four small screws which attach the gib to the hook. Use a small screw driver against the head of screw to push the gib away from the hook. In the opening thus created, use a tooth pick or old tooth brush to remove lint and thread. Repeat the same procedure with the remaining three screws until the entire space between the gib and the hook has been cleaned of foreign matter. Then add a few drops of oil through the holes in the bottom case base. Remember, it is very important to keep the hook properly oiled.

Skipping Of Stitches

Normal causes for skipping stitches should be checked before making any adjustment. These causes are (1) Wrong needle; (2) Bent needle; (3) Improperly set needle; (4) Too fine a needle for the type of sewing; (5) Presser foot not securely attached to presser foot bar, causing needle to be pushed out of line as it is going down into the material; (6) Use of glazed or imperfect thread; (7) Using a stitch length that is too short for heavy material. If all the foregoing are in order, the trouble then may be laid to any of the following possible causes:

1. Needle bar too high.
2. Lint and threads in between gib and hook.
3. Hook out of time.
4. Point of hook broken off.

Re-Timing Rotary Machines

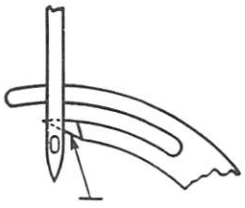


Fig. 67
Rotary Machine Re-timer

At no time should the set screws holding the upper or lower gears in place be loosened, or the gears taken out of mesh, as this will necessitate re-timing of the hook. If for any reason the gears have been taken out of mesh, the drilled spot in the lower shaft used for timing the hook must be disregarded and the hook timed exactly according to the following instructions. After gears have been put in place and screws firmly tightened, hold the hexagon collar on lower shaft against the rear (right hand) bearing, and pull the shaft to the left as far as it will go. Then tighten the collar set screws firmly. Be sure that neither of the set screws in the collar enters the spot that is drilled in the lower shaft.

Remove the needle plate. Put a new needle in the needle bar, being sure that it is straight and up against the stop pin. Loosen both set screws in hook and put it on lower shaft. Leave screws loose on the shaft. The bobbin case base stop shield must be in place before starting to re-time the machine. Be sure that the tongue or bridge of the bobbin case base is in the slot provided for it in the stop shield. Tip the machine back on its hinges, and take out the bobbin case. Turn the hand wheel until the needle has reached its lowest point and risen 1/16″. (If a mechanic's scale or a ruler is handy, check this for 1/16″. Do not guess.) Hold the hand wheel to prevent the needle from moving, and turn the hook from you until the point of the hook has moved past the needle. Now turn the hook back or toward you until it appears, as indicated in *Fig. 67*, with the tip of the point barely visible past the needle when looking towards the end of the machine or facing the face plate. Now move the hook to the left on the shaft until the point almost touches the needle. Note that the hook is held on the shaft by two set screws, one cone end screw, the other flat end. Tighten the flat end set screw lightly.

To make certain the needle is close enough to the hook point, set the hook point as shown in *Fig. 67*, and press the needle towards it. There should be practically no movement on the needle, as it should be almost touching the hook point. Now turn the hand wheel several revolutions, and stop when the needle has risen 1/16″ from its lowest point. This should bring the needle and hook point back to the same position as before, as shown in *Fig. 67*. The hook point should be slightly above the eye of the needle. If hook timing is correct, tighten set screws firmly, first seating the one previously set lightly. Be sure that neither of the set screws in the hook enters the spot that is drilled in lower shaft. This timing spot was correct before the gears were taken apart, but cannot be used after gears are reassembled.

The hook point should be slightly above the eye of the needle. It will never be necessary to raise or lower the needle bar unless for some reason the machine has previously been dismantled. If the hook point does not come slightly above the eye of the needle after the above instructions have been followed carefully, the needle bar can be raised or lowered to suit. However, the needle bar should never be moved unless absolutely necessary. Remember, do not pay any attention to the eye of the needle until after the hook has been re-timed to the needle.

Instructions For Checking Timing Of Rotary Machines

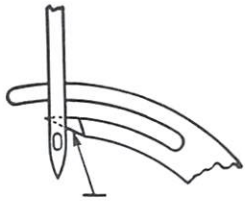


Fig. 68
Correct Position-Needle and Hook for Timing

Remove needle plate. Insert a new needle in the needle clamp, making sure that it is straight and up against the stop pin. A No. 1 needle for 40-60 thread should be used for best results in the timing process. Tip the head back on its hinges and remove the bobbin case, turning the hand wheel from you (the normal forward motion) until the needle has reached its lowest point and risen 1/16″ (use a mechanic's scale or rule). This will bring the needle and hook point into position as shown in *Fig. 68*. The point of the hook should appear above the needle eye, and the tip of the point should extend beyond the needle 1/32″. The point of the hook should be set as closely to the needle as possible without striking it. To make certain that the hook

is set close enough to the needle, one of two procedures may be followed. One way is to press the end of the needle toward the hook point, in which case there should be practically no movement of the needle as it should be almost touching the hook point. Another way of checking, which is probably more accurate, is to place a piece of white paper, or better still, a flexible white card behind the needle as a background to enable you to watch the position of the hook as it approaches the needle. The tip of the hook point should pass the needle leaving only enough clearance so that the white background of the card may be visible.

It will never be necessary to raise or lower the needle bar unless for some reason the machine has previously been dismantled. If the hook point does not come slightly above the eye of the needle after the above instructions have been carefully followed, the needle bar can be lowered or raised to suit. However, needle bar should never be moved unless absolutely necessary.

If, for some reason, the hook has been taken from the lower shaft, be sure when replacing it on the lower shaft that the cone end screw holding the hook on the shaft is put in the screw hole in the hook which is at the greatest distance from the hook point, and that this screw enters the spot drilled in the lower shaft at the factory. This will bring the hook back in correct timing. Timing of the machine can then be checked according to instructions given above.

Breaking Of Thread

Breaking of upper thread may be caused by:

1. Incorrect threading.
2. Thread from bobbin case brought up incorrectly.
3. Upper tension too tight.
4. Needle imperfect, or set incorrectly.
5. Needle rubbing against attachments or presser foot.
6. Needle eye too small for thread.
7. Starting the machine at full speed.
8. Poor quality of thread
9. Stitch length too short on heavy material

Breaking of lower thread may be caused by:

1. Incorrect threading of bobbin case.
2. Too tight a tension.
3. Bobbin wound to full to revolve freely.
4. Thread form bobbin case brought up incorrectly.
5. Hole in the needle plate rough, caused by needle striking the plate.

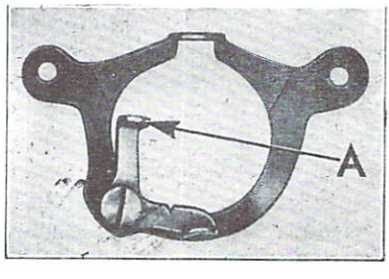


Fig. 69
Bobbin Case Latch

Bobbin case latch should be about 1/32″ from the bobbin case at point "A" *(Fig. 69)*. If it is too tight against the bobbin case, the loop of thread on its way to completing the stitch will be caught between point (A) and the bobbin case, causing loose under stitch or breaking of thread.

In the event that all of the above possible causes have been checked and found to be in order, it is advisable to clean hook assembly as described under "Cleaning the Gib Hook Assembly."

BOBBIN WINDER ADJUSTMENTS

Bobbin Winder Does Not Wind

Fig. 70
Bobbin Winder Adjustments

Oil at point "A" *(Fig. 70)*. Check to see if spooler ring makes contact with hand wheel. If it does not make contact, or is too tight against the hand wheel, the winder will not operate. If spooler ring is too loose, or no contact with the wheel prevents the spooler from revolving, and too much pressure against the wheel retards the winding speed of the bobbin winder, it will not operate. In both cases, the winder must be properly adjusted *(see below)*. If the spooler ring is flat in one or more spots, discard it, and put on a new one.

Bobbin Winder Position Adjustments

Loosen the screw farthest from you which attaches the winder to the machine. Note that the entire winder can now be moved up and down. While the winder is loosened, push upward under bobbin winder lock lever, causing the spooler ring to make contact with the hand wheel. At this point, care should be taken in determining the amount of pressure which the spooler should exert on the hand wheel. There should be just enough pressure to cause the hand wheel to revolve the spooler with no binding, and yet enough contact to efficiently turn the spooler. Then tighten the screw to the proper adjustment.

Bobbin Winder Releases Too Early Or Too Late

Examine bobbin winder lock lever to see that it clears both sides of the bobbin when the winder is in winding position. If it scrapes against one side or the other, bend to the right or left as necessary. If bobbin winder releases too early, bend bobbin winder lock lever downward; if too late, bend upward.

To Replace Light Bulb

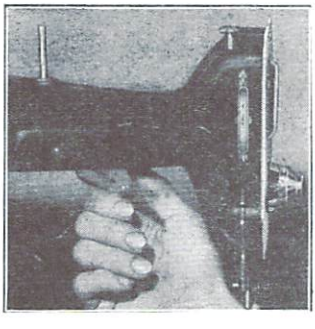


Fig. 71
Light Bulb Replacement

Loosen screw on the back side of the built-in lamp housing ¼ to ½ turn to the left, insert your finger at the front end of the bulb, and tilt the bulb down, as illustrated in *Fig. 76*. Release the bulb from the socket by slightly pressing in and turning to the left.

Motor Adjustment

If the motor runs too slowly when the rheostat is depressed all the way, determine first if the fault is in the motor or the rheostat. This is done by plugging the cord leading from the motor directly into a convenient outlet. In this manner, the rheostat is cut out of the circuit entirely. If the motor now runs with sufficient speed, the trouble evidently is in the rheostat, and it should be replaced. If the motor still runs slowly, the trouble may be one or more of the following:

1. Imperfectly aligned bearings.

2. Brushes and commutator fouled with oil and dirt. (Evidenced by smoke, sparking, sputtering within the motor.)

3. Defective motor.
   Spin the motor shaft between the fingers. It should revolve freely. If the bearings are imperfectly aligned, the shaft will turn only with some difficulty.

To correct bearing alignment in the bracket type motor, tap the back of the motor sharply with a wood mallet or block of wood. This usually solves the problem.

In cases where the motor is fouled with oil or dirt, the only practical procedure is to take the motor apart for cleaning. Since new fields or armatures are unavailable, should these parts go bad, a new motor must be purchased.

Changing The Motor Pulley

In replacing a worn-out motor pulley, sometimes the metal part of the pulley becomes frozen to the shaft of the motor, and is difficult to remove. Loosen the motor pulley set screw and remove the motor entirely from the pulley. Hold the flame of a candle under the metal part of the pulley. The heat will expand the metal portion of the pulley allowing it to be removed with ease.

Other Common Motor Complaints

Oil on the motor pulley will cause it to slip against the hand wheel. Flat spots on the pulley will cause noise. To remove flat spots, press the motor away from the machine, so that the pulley is clear of the hand wheel. Run the motor at full speed, and at the same time apply medium sandpaper to the pulley until they are removed. If this is not satisfactory, replace the old pulley with a new one.

WIRING DIAGRAM FOR MODEL ALB AND MODEL NLB CONSOLES

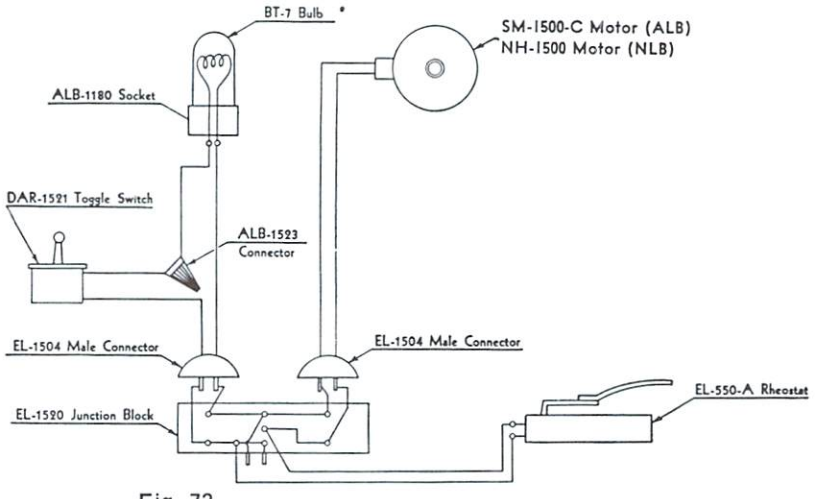


Fig. 72
Wiring Diagram For Model ALB and Model NLB Consoles

CLUTCH ADJUSTMENT AND CLEANING

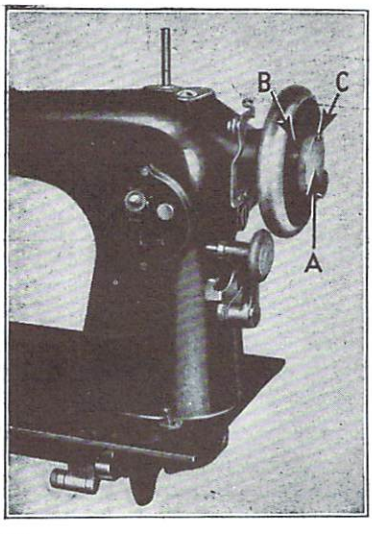


Fig. 73
Brake Button (A); Clutch Assembly (B); Brake Button Holding Screw (C)

If the brake button (A) has been loosened and still does not disengage the sewing mechanism, apply a few drops of oil in oil holes situated on side of the hand wheel (B). If this does not help, the clutch assembly is either gummed, or the hand wheel brake collar clutch is not in proper position. To clean, first unscrew the small screw (C) which is located in the hand wheel brake button (A). Holding the hand wheel firmly, turn the brake button counter-clockwise until it comes off. Remove the collar clutch; remove the hand wheel simply by pulling it off. Wash the shaft and all other parts in kerosene to remove all traces of gummed oil. Wipe dry—place a few drops of oil on the head shaft. Replace hand wheel. Replace collar clutch so that the prong on inside circle of clutch fits into the depressions in the hand wheel. Replace brake button screw. If the screw does not go in entirely, or if the clutch still does not operate correctly, the collar has not been put on properly. Remove the brake button again, and replace the collar so that the prongs on the inner circle of collar are no longer in the same hand wheel depressions as previously. Proceed as before to replace brake button and screw.

Singer Sewing Machines

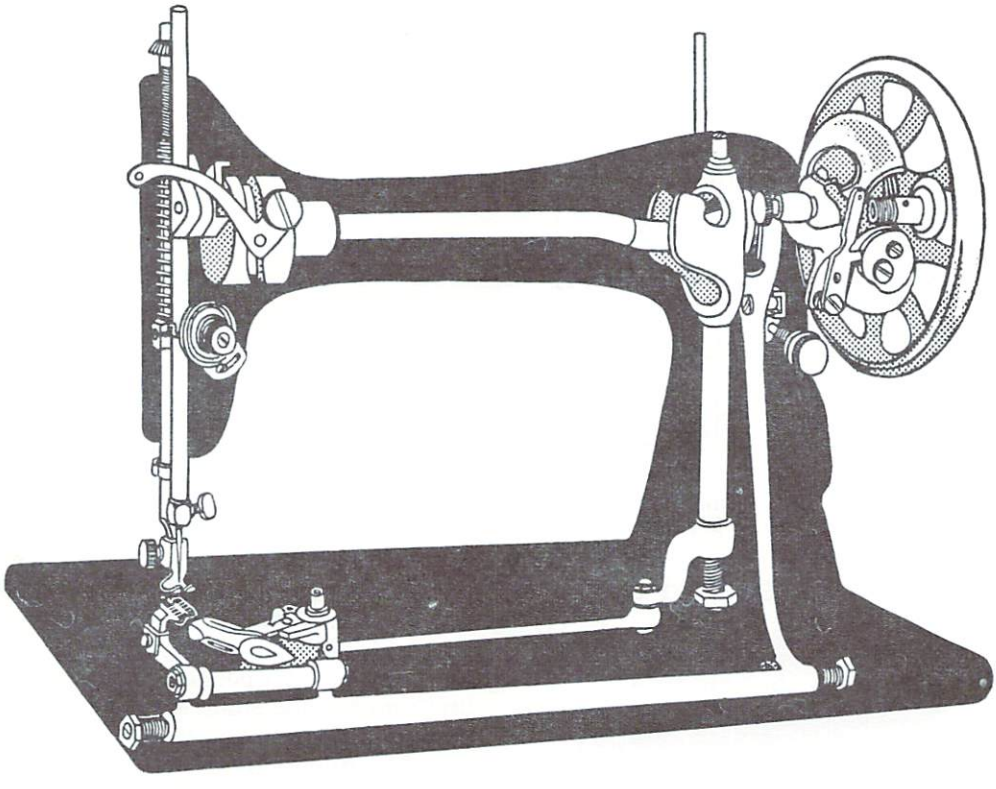


Fig. 74

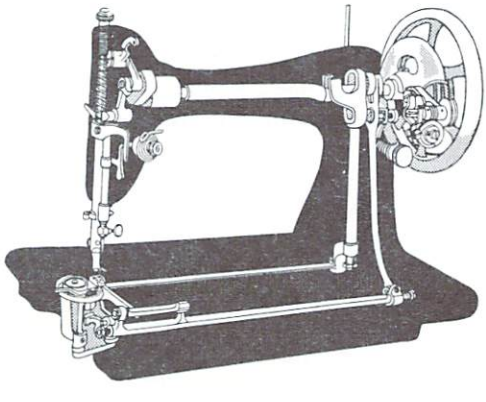


Fig. 75

There are four principal Singer sewing machines in use in millions of homes all over the world. They are the Long Shuttle *(Fig. 74);* the Oscillating Hook Machine *(Fig. 75);* the Oscillating Shuttle Machine *(Fig. 76)* and the Rotary Hook Machine *(Fig. 76).*

Timing The Shuttle And Hook

To determine if the needle is correctly timed in relation to the shuttle or hook, remove throat plate and slide plate, and proceed as follows: turn the balance

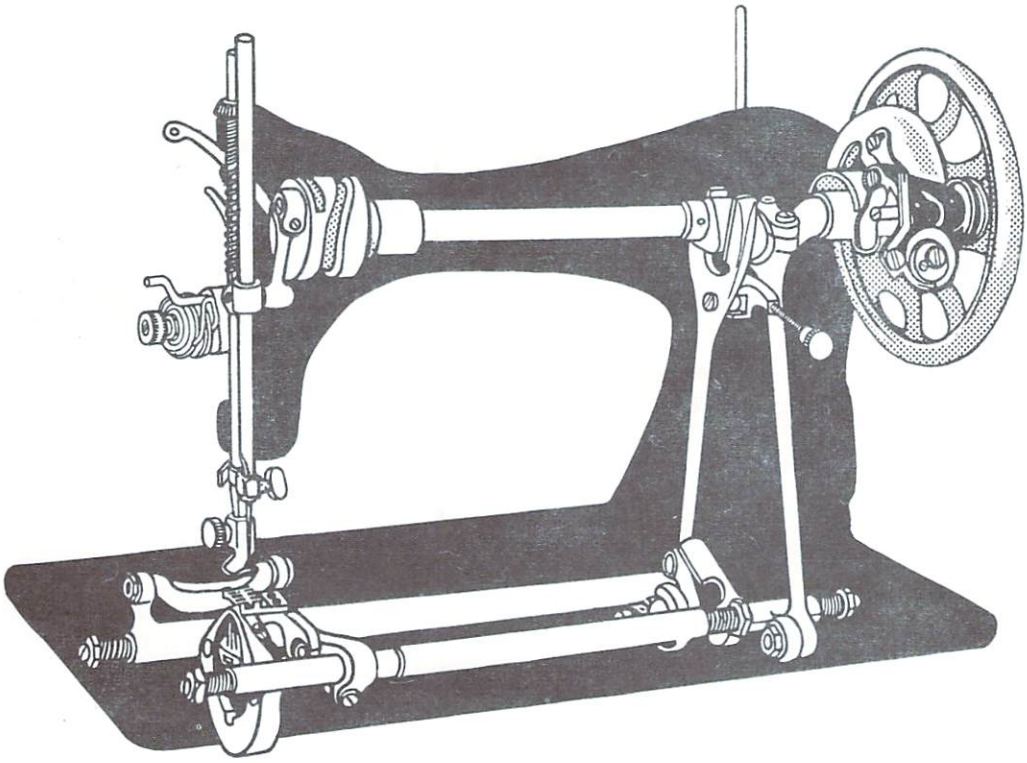


Fig. 76

wheel by hand until the needle is about 3/32 of an inch from its lowest position. At this point the tip of the loop taker (Shuttle or Hook) must be exactly at

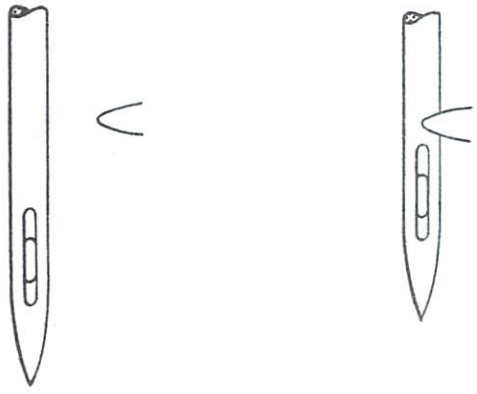


Fig. 78
Timing the Shuttle & Hook Needle Positions

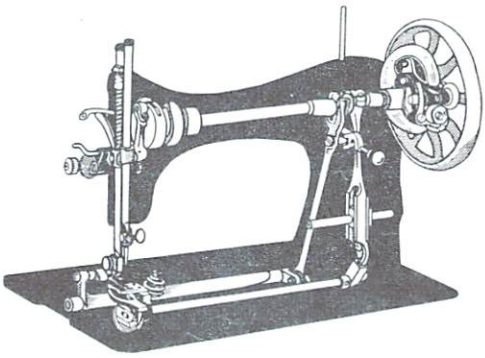


Fig. 77

the center of the rising needle and be about 1/16 of an inch above the needle eye. (See *Figs. 78* and *79.*)

Timing The Feed Dog

Adjust the feed dog so that it starts to move away form you at the same time that the needle begins to go down

from its highest position. To time, proceed as follows: Adjust stitch regulator for the longest stitch, then open the round cover plate at the rear of the machine arm. Loosen the set screw ("S") in the feed cam and turn the feed cam on the arm shaft until the feed dog is correctly timed. Tighten set screw after adjustment *(Fig. 80)*.

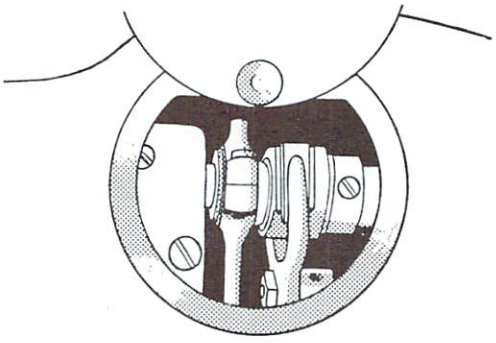


Fig. 80
Timing the Feed Dog

Adjusting Thread Take-Up Spring (Check Spring)

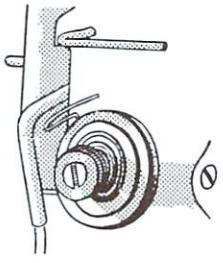


Fig. 81
Thread Take-up Spring

This spring must be adjusted so that the loop of the spring has completed its upward movement at the time the needle starts to penetrate the fabric being sewed. (See *Figs. 81* and *82.)* To adjust the "throw" of the spring, loosen set screw ("S") holding upper tension mechanism in arm or in face plate of machine. If additional movement of spring is necessary, turn tension stud in the direction which causes the loop of spring to move upward. For less movement, turn tension stud in opposite direction. Tighten set screw after adjustment.

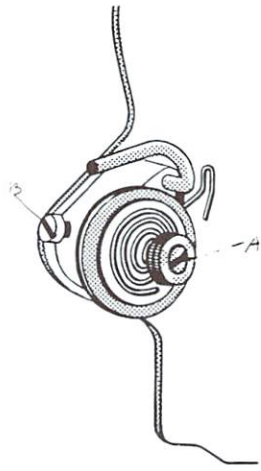


Fig. 82
Tension Adjustment Screws

To adjust tension of spring, loosen tension stud sufficiently for spring to be turned around tension stud. Turn spring downward or upward as required, then tighten tension stud. Now test to see if spring has proper tension. Continue to repeat procedure until correct tension has been obtained.

The Thread Take-up Spring should have sufficient tension to take up the slack of upper thread until the needle starts to enter the fabric.

Singer Machine Class 31-15

DESCRIPTION

A. The Hook

1. The hook has an oscillating motion.

2. The front of the hook picks up the loop and releases it from the rear.

3. When the hook completes the above operation, the top thread winds around the bobbin thread, thus forming the lock stitch.

B. The Carrier

1. As its name implies, this part carries the hook through its motions.

2. Carrier and hook together form a circle; thus, when the hook picks up the loop, the carrier forces an opening to let the loop through. The loop then passes around the hook, over the bobbin case, and finally through the rear of the hook to pick up the bobbin thread to form the lock stitch.

C. Complete Race

The race body and its component parts have one express purpose: to retain the hook so that it can go through its motions properly.

D. Fork Assembly

1. The fork determines the size of the stitch.

2. The fork motions are controlled by the eccentric.

3. The correct setting of the eccentric will result in a properly functioning fork.

4. When the eccentric is not functioning properly with the fork, the result will be a loose bottom stitch.

PARTS AND MAINTENANCE PROCEDURES

Thread Take-Up Spring

The thread take-up spring must be set so that when the eye of the needle reaches the material on the downward stroke of the needle bar, the spring will rest against the stop on the thread take-up spring regulator. If the thread take-up spring is incorrectly set, loosen the set screw in the arm of machine and turn tension stud to the *right* for easier movement, and to the *left* for less movement. After the spring is set correctly, securely tighten the set screw.

The tension on the thread take-up spring is regulated by turning the tension stud to the *right* to increase the tension, and to the *left* to decrease the tension. The tension on the thread take-up spring must be sufficient to take up the slack of the needle thread until the eye of the needle reaches the material on its downward movement.

TENSIONS

A. Stitch Characteristics

1. For ordinary stitching, the needle and bobbin threads should be locked in the center of the thickness of the material.

2. If the tension on the needle thread is too tight, or if that on the bobbin thread is too loose, the needle thread

will lie straight along the upper surface of the material.

3. If the tension on the bobbin thread is too tight, or if that on the needle thread is too loose, the bobbin thread will lie straight along the under side of the material.

B. To Adjust The Tensions

CAUTION: Make sure that the presser foot is *down* when you regulate the needle thread tension.

1. After lowering the presser foot, turn the small thumb nut at the front of the tension discs to the right to *increase* the tension. To *decrease* the tension, turn the thumb nut to the left.

2. The tension on the bobbin thread is regulated by the screw in the tension spring on the outside of the bobbin case. To *increase* the tension, turn the screw to the right; to *decrease* the tension, turn the screw to the left.

3. When the tension on the bobbin thread has been properly adjusted, it is seldom necessary to change it, since a correct stitch can usually be obtained by varying the tension on the needle thread.

THREAD BREAKAGE

A. Check Needle

1. If bent, replace.

2. If the thread is shredding, needle hole may be sharp. Replace the needle.

3. Always replace the needle first, even if there are no obvious defects. This may save you looking for further troubles.

B. Remove Race and Hook

To check hook, observe the following procedures:

1. If the point, or any part of hook, is nicked or has sharp spots, polish with emery and crocus cloth.

2. If the point of the hook is broken, even to the slightest degree, replace it.

3. If the walls of the hook show wear, and continues to be troublesome even after polishing, then replace it.

4. If the hook shows extensive wear, replace it.

To check the Carrier, observe the following procedures:

1. If ends of Carrier are sharp or nicked, polish them with emery and crocus cloth.

2. If thread breakage continues even after ends of the Carrier are polished, replace the Carrier.

C. To Check Race Ring

1. If there is abnormal side play in the hook, even though the hook does not show excessive wear, side play may be reduced by polishing down to eliminate the groove worn into the surface of race ring.

2. Polish surface edge of race ring to remove possible sharpness.

D. To Check Race Body

1. If the hook continues to have abnormal side play even after polishing, and the machine continues to skip or break thread, the race body should be replaced.

2. If the running surface of the race body is broken or worn in spots, the machine will run noisily, and the race body should be replaced.

E. To Check The Timing

1. With the needle bar at its lowest point, the carrier should be approximately ¼" from the needle.

2. With the needle bar at its lowest point, the needle eye should cover the carrier so that you cannot see through it.

SETTING THE ECCENTRIC

The eccentric must be set so that the machine does not feed while the needle is in the material. Also, the feed dog must drop before the needle enters the material. Should the machine feed while the needle is in the material, the needle or thread will break. Should the feed dog fail to drop before the needle enters the material, a loose bottom stitch will result.

SETTING THE 31-15 FOR OPERATION

A. Wind The Bobbin

1. Place the bobbin on spindle.

2. Thread the bobbin winder.

3. Fill the bobbin.

B. Insert The Bobbin Case

1. Thread the bobbin case.

2. Insert the bobbin case.

C. Thread The Machine

1. Place the spool of thread on the spindle on right of cotton stand.

2. Loop thread through hole on top of cotton stand.

3. Thread machine, as shown in *Fig. 1.*

D. Raise Bobbin Thread

1. Hold top thread with left hand, leaving slack.

2. Turn balance wheel counter-clockwise until bobbin thread is raised.

3. Place both bobbin and top thread between and under presser foot.

E. Insert Material Under Presser Foot

1. Insert material.

2. Drop presser foot.

3. Set foot bar pressure screw.

F. Operate Machine

1. Sew slowly until control is gained.

2. When end of material is reached, make turn without stopping machine.

3. Increase sewing speed gradually.

G. When Testing And Setting Machine For Operation, Follow These Work Methods

1. The balance wheel must always turn toward operator.

2. Never run machine with presser foot resting on the feed without material under presser foot.

3. Do not run machine when bobbin case and needle are threaded, unless there is material under the presser foot.

4. Do not pull on material while machine is feeding, for this might bend the needle.

5. When machine is in operation, always make sure that the slide over the bobbin case is closed.

Singer Machine Class 95-1

To Rebuild The Fork Assembly

After disassembling the entire machine, rebuild the fork assembly by taking the following steps:

1. Remove link.
2. Remove stitch regulating arm.
3. Replace stripped or worn screws and nuts.
4. Tighten link and stitch regulating arm.
5. Insert fork assembly into machine.
   a. Insert stitch regulating screw in stitch regulating arm.
   b. Move screw up and down to test tightness of fork assembly.
   c. Tighten fork holding screw with more than usual pressure.
   d. If fork is too loose, file fork holding screw.

Rebuilding Eccentric Connection

1. Fit eccentric connection by taking down the cap with an oil stone.
2. Oil eccentric connection and be sure that it turns easily on the eccentric.

Rebuilding Hook Assembly

1. Disassemble hook, then:
   a. Remove base holding gib screws.
   b. Remove base holding gib.
   c. Remove base.
   d. Remove hook thread guide screws.
   e. Remove hook thread guide.
   f. Remove hook holding screws.
   g. Clean all disassembled component parts.
   h. Polish parts of hook causing thread breakage.
   i. Polish point of hook, hook thread guide, and all component parts on wire buff.

To Remove The Hook

1. First remove slide plate, needle plate, presser foot, and bobbin case.
2. Take out bobbin case holder position bracket screw, and remove the bobbin case holder position bracket.
3. Loosen the three set screws in the hub of the hook.

4. Turn the balance wheel toward you until the feed bar holding the feed dog reaches its highest point.

5. Turn the hook until the thread guard is at the bottom and turn the bobbin case holder so that the hook will clear the feed bar. The hook may then be removed from the hook shaft.

To Replace A Worn Hook

When the hook is in position on the shaft, turn the bobbin case holder until the notch is at the top, then replace the bobbin case holder position bracket (being careful that the position stud enters the notch at the top of the bobbin case holder); then fasten securely the position bracket by means of the screw. Replace the needle and time the hook, as instructed later in the chapter.

NOTE: When tightening the three screws in the hub of the hook, draw the hook shaft towards the balance wheel so as to take up the end play in the shaft. Then replace the bobbin case and slide plate.

To Remove And Replace A Bent Hook Shaft

Loosen the two set screws in the bottom belt sprocket, then insert the new hook shaft into the belt sprocket from the right hand end, pushing the old shaft out of the sprocket towards the needle bar by the action of the new shaft being inserted. By removing the old shaft in this manner, there is no possibility of marking the bushings with punch burs. When placing the new shaft into the machine, make sure that the flat portion near one end of the shaft is at the right, so that one of the set screws will bear against it when the sprocket is fastened into position on the shaft. The shaft should be so set that the left end is flush with the body of the sewing hook. It is advisable to remove the rotating hook section and take out the bobbin case holder, so that you can determine whether the end of the shaft is flush with the body of the hook. When the shaft is correctly set, securely tighten the two set screws in the sprocket. Care must be taken so that one of the two set screws bears against the flat portion of the shaft. Then replace the belt, time the hook, and replace the bobbin case holder and rotating hook section.

To Time The Needle Bar

1. See that the needle is pushed up into the needle bar as far as it will go before removing the face plate.

2. Examine the needle bar to locate two timing marks near the top of the bar.

3. Turn the balance wheel clockwise until the needle bar is at its lowest position.

4. Center the upper timing mark on the needle bar with the lower end of the upper needle bar bushing.

If the timing of the needle bar is done correctly, but the machine continues to skip stitches, it may be due to the disturbance of the needle bar bushing setting, making it impossible to set the needle bar at its correct height, by centering the upper timing mark with the lower end of the needle bar bushing. If this is the case, turn the balance wheel to bring the hook point to the center of the needle, loosen the screw in the needle bar clamp, and move the needle bar up or down to bring the needle eye about 1/32 inch below the point of the hook, and then securely tighten the screw in the needle

bar clamp. Loosen the needle bar bushing set screw at the top of the machine arm and while the point is at the center of the needle about 1/32 inch above the top of the needle eye. Then move the needle bar bushing up or down to bring its lower end exactly even with the lower timing mark on the needle bar. Securely tighten the needle bar bushing set screw.

The above adjustments apply to the following Singer classes: 95-10, 95-12, 95-40, 95-45, 95-60, 95-80, 95-85, 95-100, 96-1, 96-2, 96-3, 96-4, 96-10, 96-18, 96-SV-25, 96-45, 96-47, 96-80, 96-87, 241-1, 241-2, 241-3, 241-11, 241-12, 241-13, 245-1, 245-2, 245-3, 245-4.

To Time The Hook

1. Place a new needle in the machine.

2. Turn the balance wheel clockwise until the lower timing mark on the needle bar is centered with the lower end of the needle bar bushing, when the needle bar is on its upward stroke.

3. When the needle bar is in the above position, the point of the hook should be at the center of the needle.

4. If the hook is *not* correctly timed, loosen the three screws in the hub of the hook. These screws may be reached from the top of the machine when the needle plate is off. Turn the hook on its shaft to bring the point to the center of the needle, ther tighten the three hub screws.

To Set The Eccentric

The eccentric must be set so that the feed dog is completely out of motion, and drops only upon the needle's entrance into the material. If the machine is feeding while the needle is in the material, the needle may break. If the feed dog drops before the needle enters the material, a loose bottom stitch will result.

Quick First Aid For Some Of The Most Common Troubles

MACHINE RUNNING ROUGHLY OR SLOWLY

1. Cause may be lubrication, etc. (See your operating manual).
2. Drive belt may be too tight.
3. Thrust collar too tight against upper arm and bearing.
4. Improper mesh of gears.
5. Thread caught in various gears (visual inspection).
6. Reduction gear not running freely.
7. Slide block set too closely to feed fork, thereby pushing it against eccentric.
8. Lint between rows of teeth on feed dog (clean out).

MACHINE NOT FEEDING PROPERLY:

1. Make sure stitch length control is not set at 0.
2. Feed dog may be lowered. Mark of drop feed knob should be uppermost on class 21. On 51, 71 and 7, the drop feed dog should be turned so that the stitch symbol is in front.
3. Insufficient pressure on presser foot. Increase pressure by turning the regulator screw to the right.
4. Needle in cloth as feeder is moving cloth.
5. Needle moving sideways (zig-zag) while in the cloth.
6. Presser bar too high and not resting on material when in lowered position.
7. Feed dog set too low.

NEEDLES BREAKING:

1. Improper size needle being used for cloth sewn.
2. Improper length needle being used.
3. Needle not inserted correctly.
4. Poor quality needle being used.
5. Operator pulling cloth.
6. Feed timing wrong.
7. Needle bar not centered.
8. Starting position improperly set.
9. Hook driver set too close to needle.
10. Race cover too far back.

UPPER THREAD BREAKS (See your operating manual)

1. Needle not inserted properly.
2. Machine not threaded properly.
3. Tension on the upper thread too tight.

4. Knots in thread.

5. Needle too fine for the thread used.

6. Needle bent or point broken. Change needle.

7. Edges of the stitch hole in the throat plate may be nicked and sharp. Either hone them smooth or get a new plate.

LOWER THREAD BREAKS: (See your operating manual).

1. Bobbin case is not inserted correctly.

2. Lower thread tension too tight.

3. Bobbin case not threaded correctly.

4. Bobbin wound unevenly.

5. Bobbin wound too fully.

6. Poor quality thread.

7. Damaged hole in the throat plate. Hone or replace plate.

8. Thread wound around center post of rotary hook.

LOWER THREAD DOES NOT COME UP:

Needle is inserted incorrectly.

MACHINE SEWING—POORLY:

1. Needle blunted or bent. Insert new needle.

2. Needle inserted incorrectly.

3. Machine threaded incorrectly.

4. Wrong size needle used.

5. Thread too heavy for the needle.

6. Insufficient pressure on the presser foot, especially when sewing thick fabrics. Turn the pressure regulating screw to the right.

7. Bobbin wound unevenly.

8. Upper thread tension not adjusted properly.

9. Lower thread too heavy. Should at least be of the same size as the upper thread, or a little finer.

10. Upper thread or needle not suited to the material.

STITCHING LOOSELY, *with loops at the underside of material:*

1. Machine not threaded correctly.

2. Presser foot not let down properly.

3. Upper thread tension too light.

4. Thread take-up spring bent or broken off. Adjust or replace.

5. Thread take-up not traveling enough.

THREAD TENSION UNEVEN:

Poor quality thread is a possible cause.

WRINKLING OF MATERIAL:

1. Needle thread tension too tight.

2. Needle and bobbin thread tensions too tight for material used.

3. Presser foot pressure too great. Turn regulator screw to left.

4. Thread take-up spring has too much strength.

STITCHES OF VARYING LENGTH:

1. Feed dog is clogged with lint. Clean it out.

2. Worn teeth in feed dog. Replace feed dog.

LOOSELY STITCHED SEAMS:

Upper (needle) and lower (bobbin) thread tensions too loose. (See your operating manual.)

CLOTH GETS CHEWED UP:

Too much pressure on the presser foot. Reduce by turning the pressure regulating screw to the left.

Needle And Thread Chart

	Needle Size	*Straight Stitch Length*	*Fabric*
Cotton 80-100 Nylon A Silk A Machine Embroidery	0	1-1½	Sheer Cottons, Silks, and Nylons. Fine Laces.
Cotton 60-80 Mercerized 50 Nylon A Silk A Machine Embroidery	1	1½-2	Light to Medium Weight Cottons. Light to Medium Weight Silks. Medium Weight Nylons. Light Weight Woolens.
Cotton 40-60 Mercerized 50 Mercerized Heavy Duty	2	2-3	Heavy Weight Cottons. Medium to Heavy Weight Woolens. Heavy Drapery Fabrics.
Cotton 30-50 Mercerized Heavy Duty	3	3-4	Heaviest Cottons as for Men's Work Clothes. Heaviest Woolen Coating.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