Aug. 4, 1953 F. C. EASTMAN 2,647,478

SHOE SEWING MACHINE

Filed Jan. 21, 1949 8 Sheets-Sheet 1

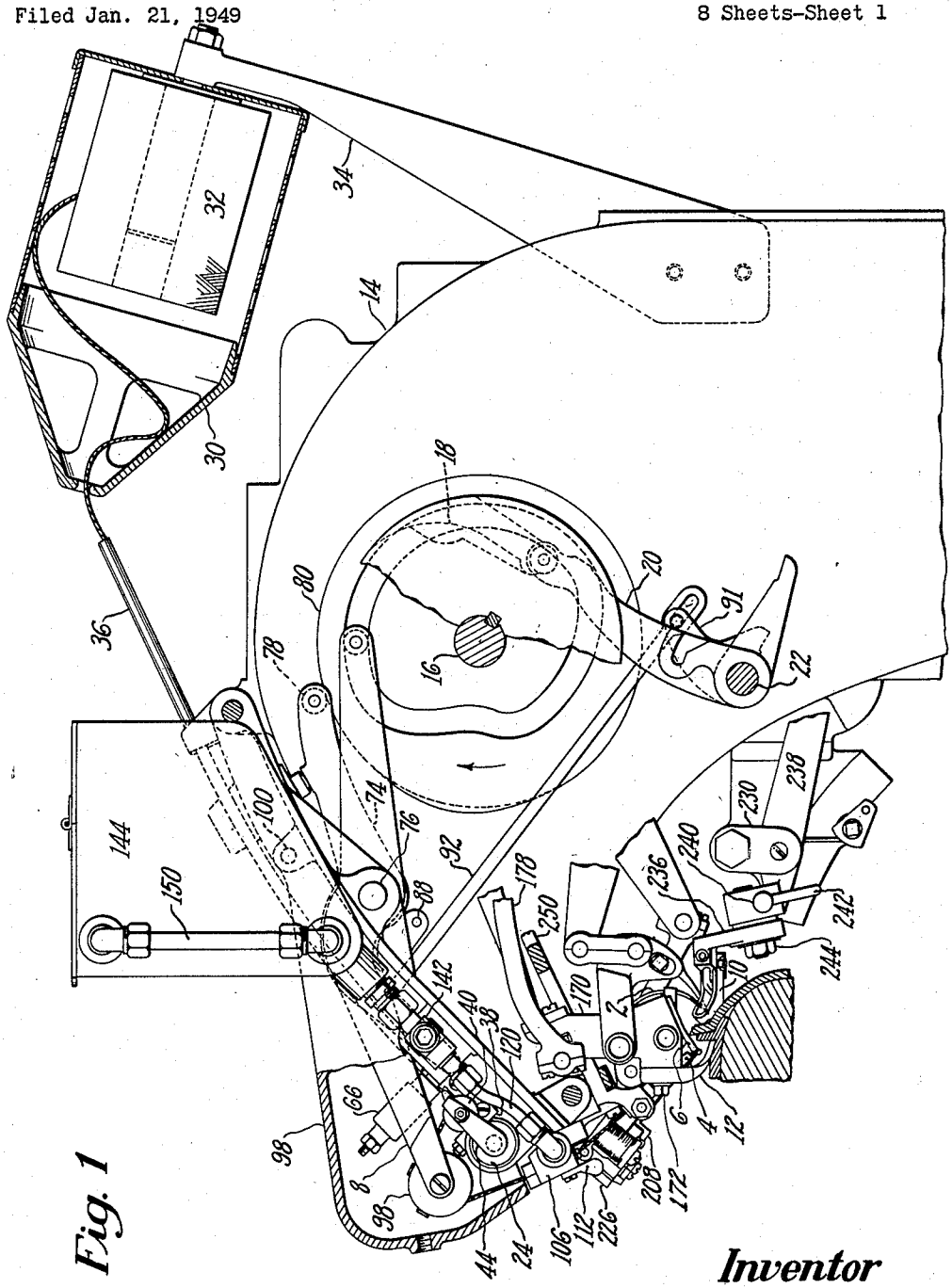


Fig. 1

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By his Attorney

Aug. 4, 1953 F. C. EASTMAN 2,647,478

SHOE SEWING MACHINE

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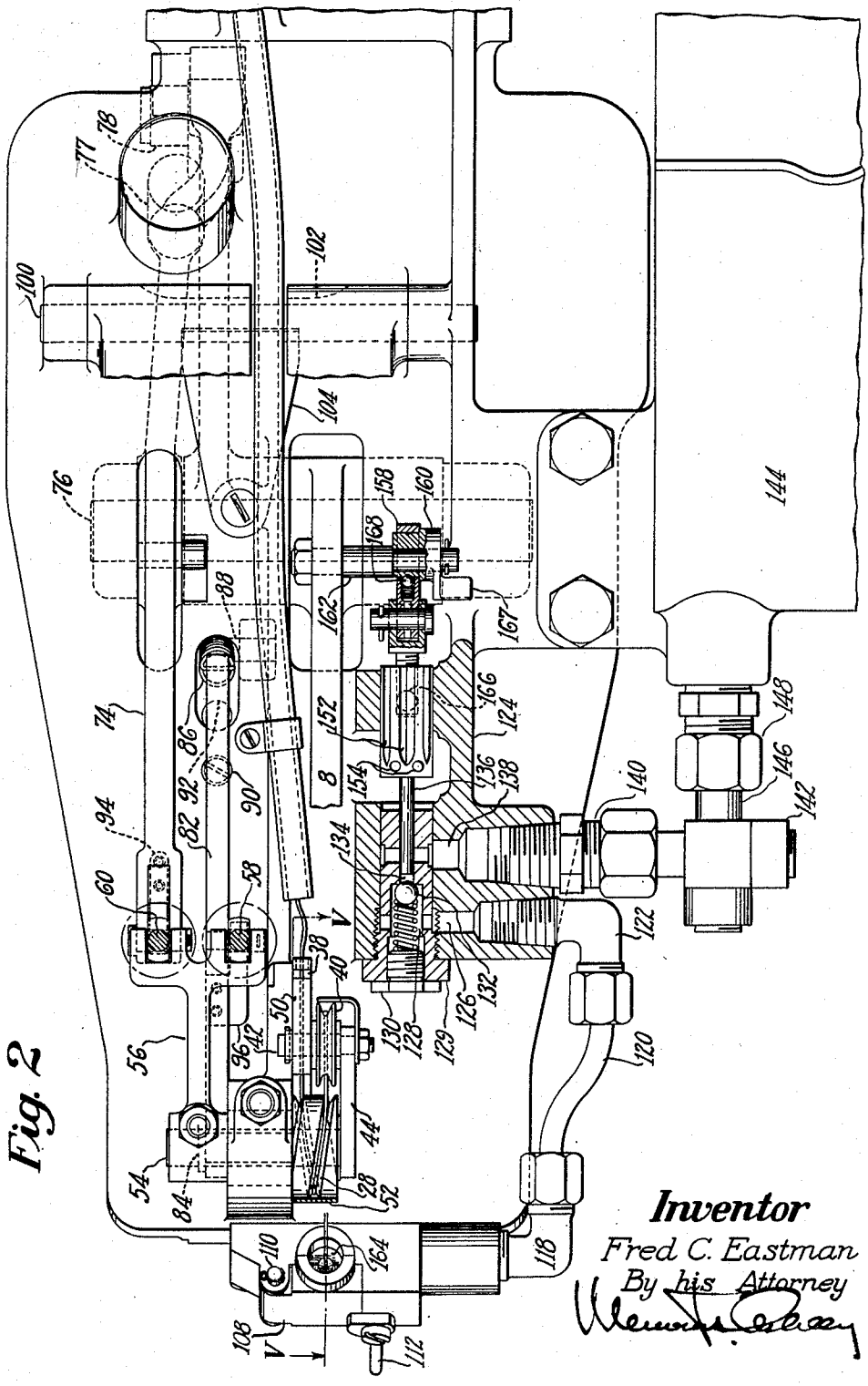


Fig. 2

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Herman Fraser

Aug. 4, 1953 F. C. EASTMAN 2,647,478

SHOE SEWING MACHINE

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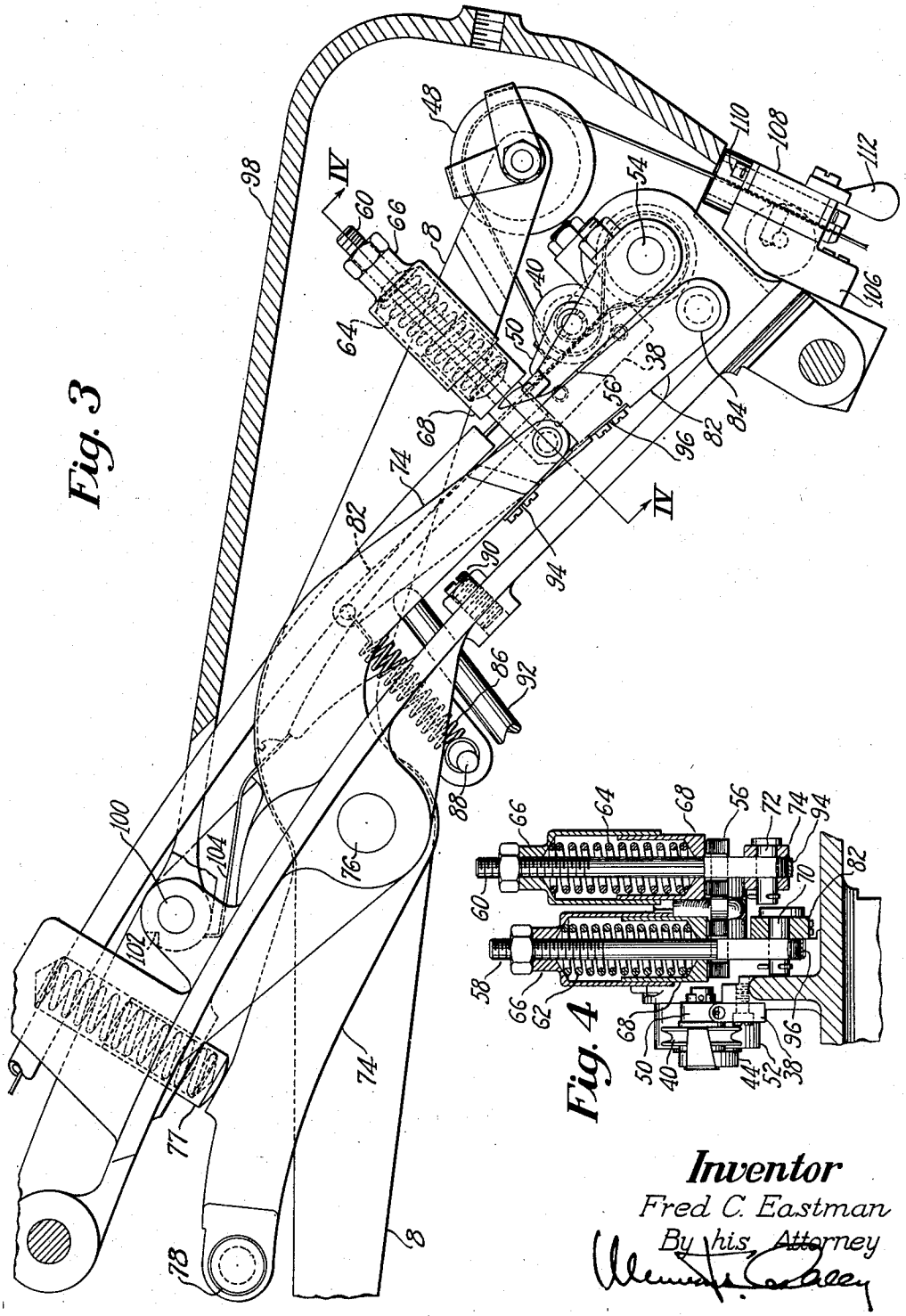


Fig. 3

Fig. 4

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SHOE SEWING MACHINE

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Fig. 5

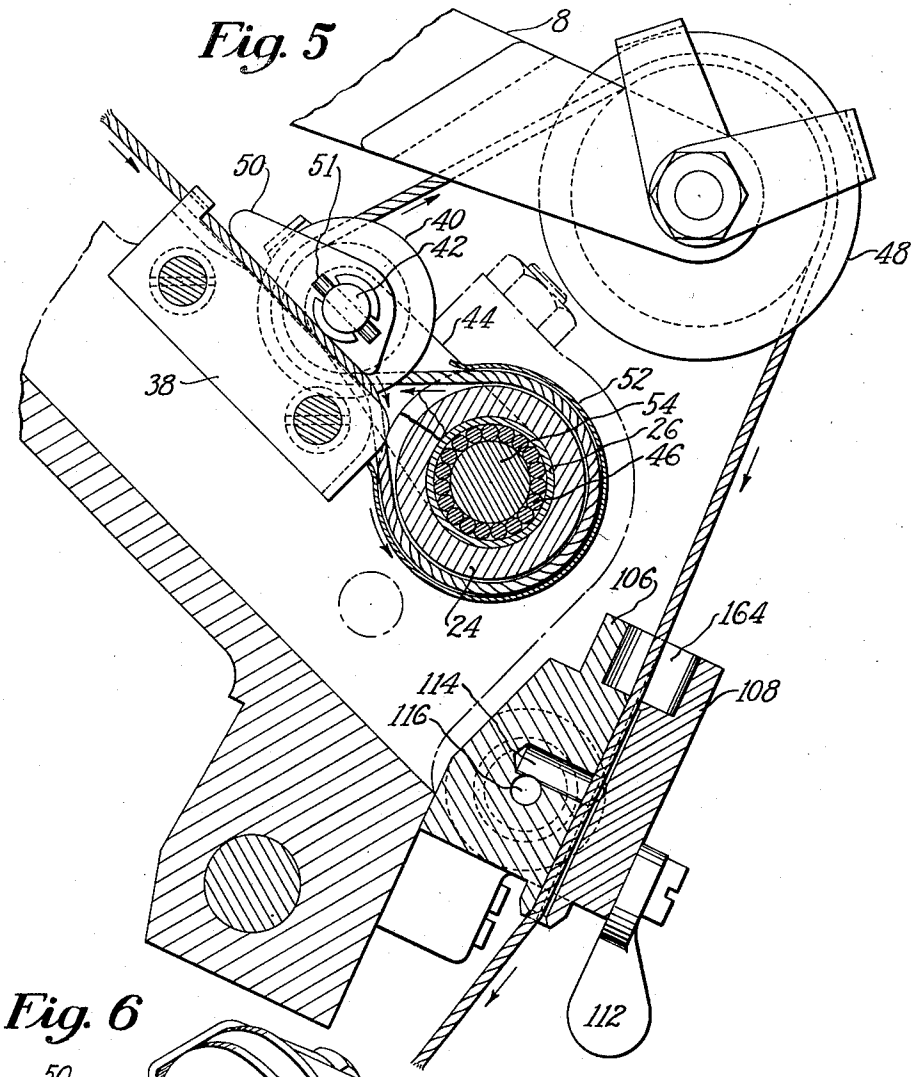


Fig. 6

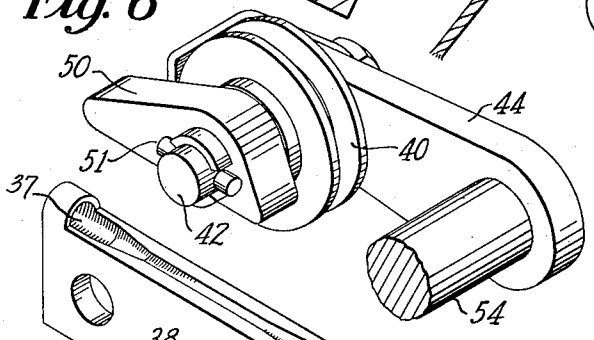


Fig. 7

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Aug. 4, 1953 F. C. EASTMAN 2,647,478

SHOE SEWING MACHINE

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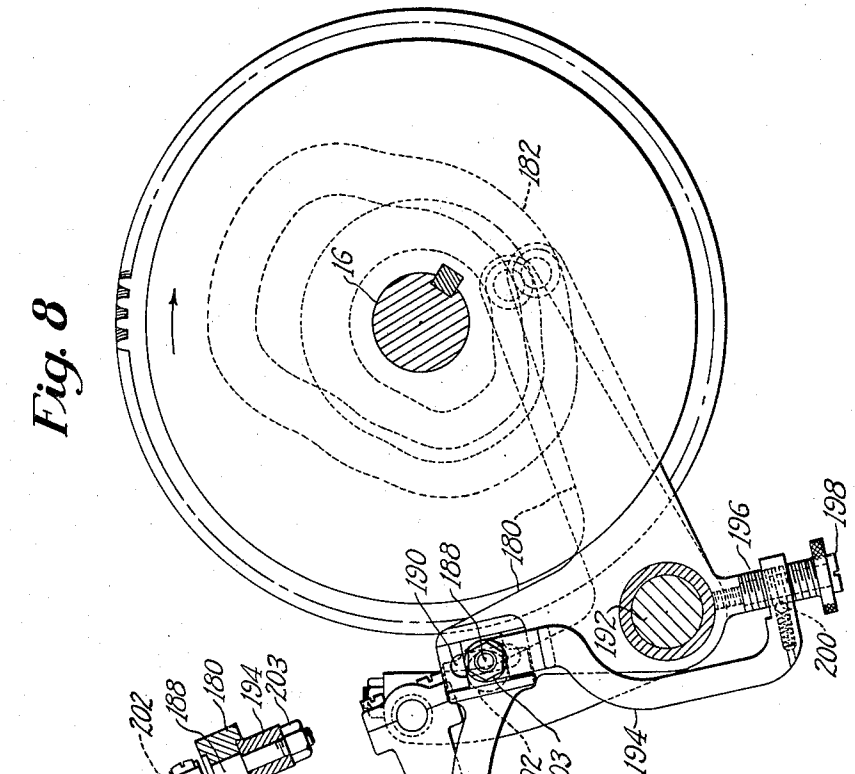


Fig. 8

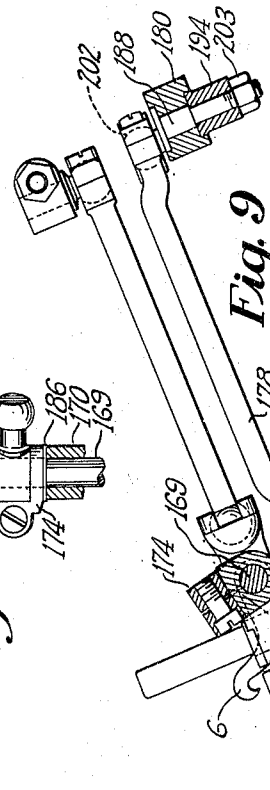


Fig. 9

Fig. 10

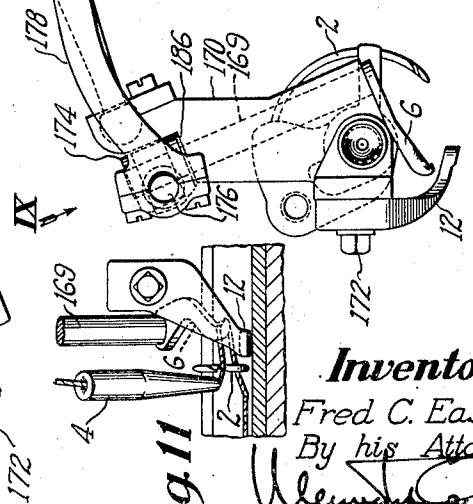


Fig. 11

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SHOE SEWING MACHINE

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Fig. 12

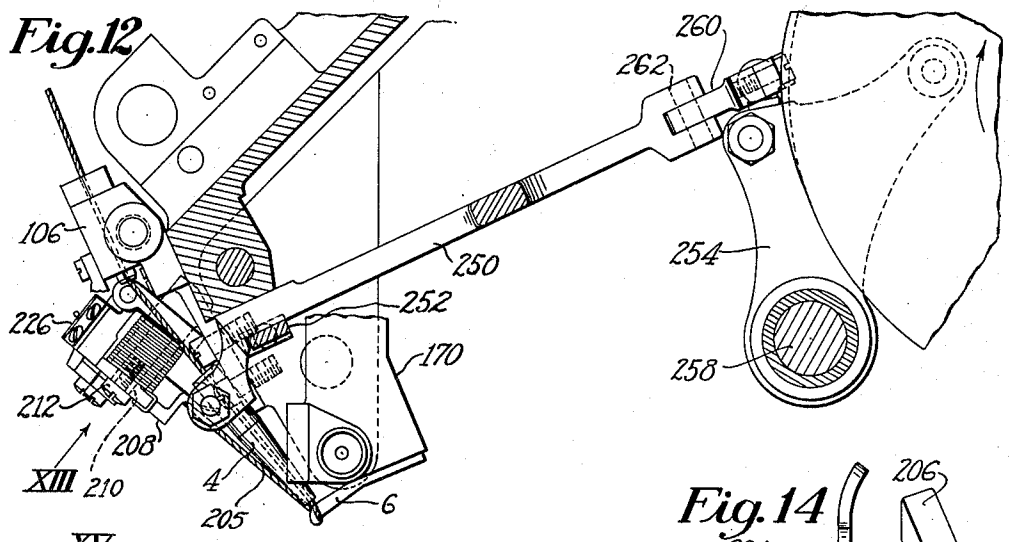


Fig. 13

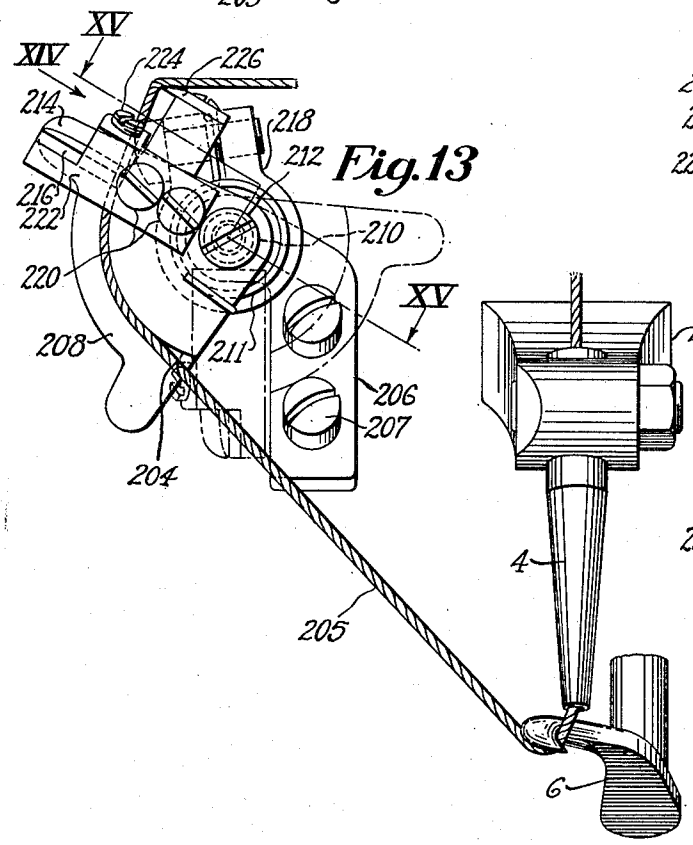


Fig. 14

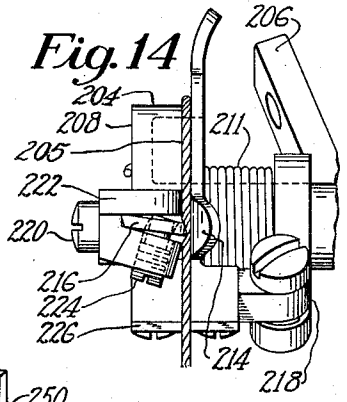
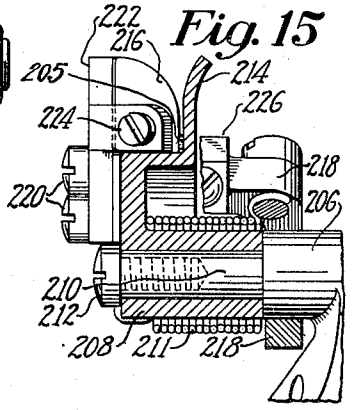


Fig. 15



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Aug. 4, 1953 F. C. EASTMAN 2,647,478

SHOE SEWING MACHINE

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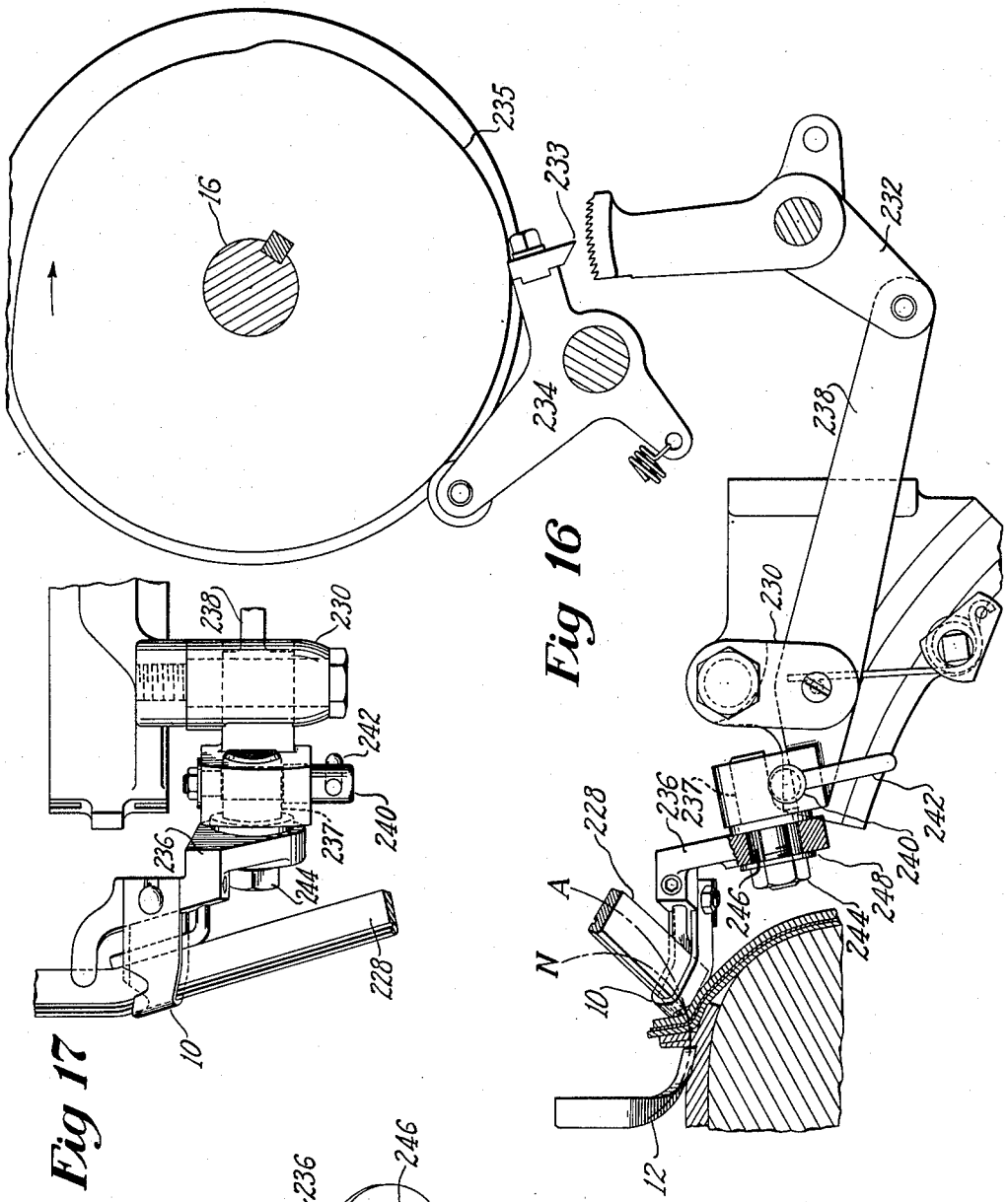


Fig 16

Fig 17

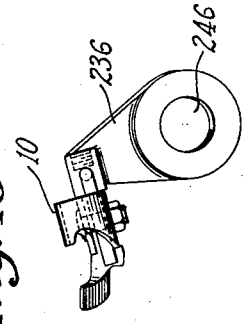


Fig. 18

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Aug. 4, 1953 F. C. EASTMAN 2,647,478

SHOE SEWING MACHINE

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Fig. 19

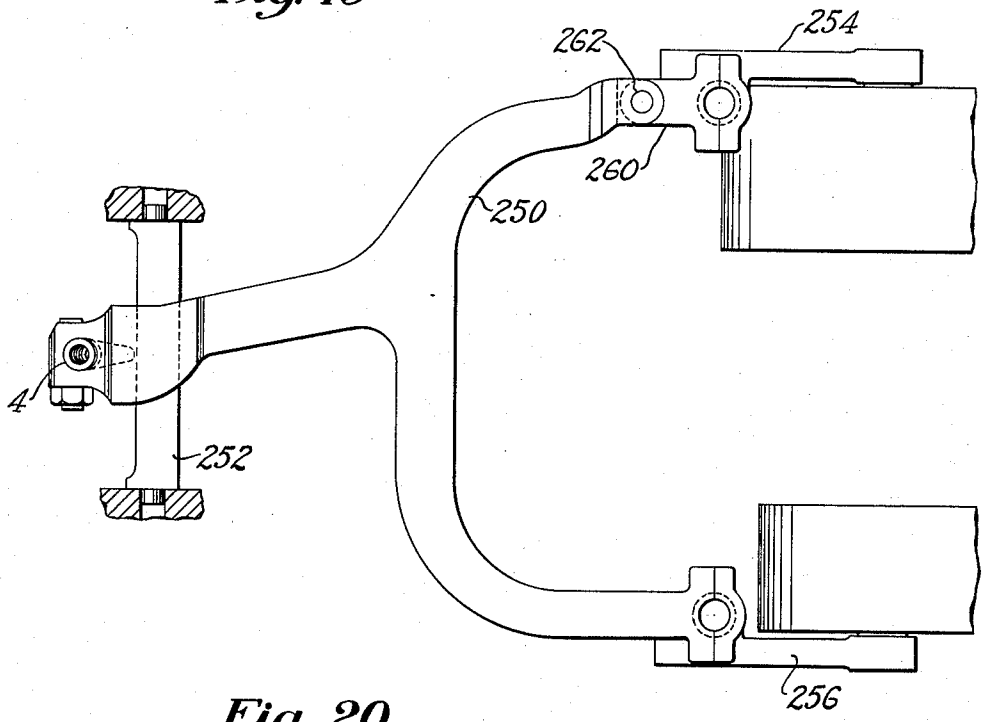
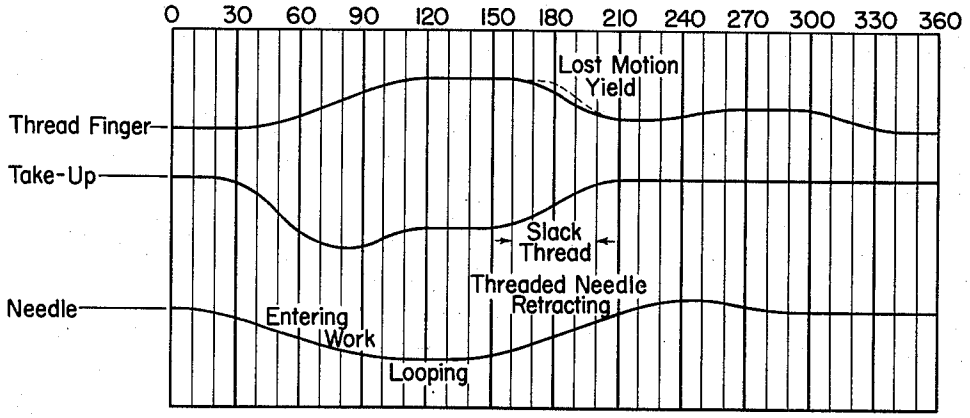


Fig. 20



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Patented Aug. 4, 1953 2,647,478

UNITED STATES PATENT OFFICE

2,647,478

SHOE SEWING MACHINE

Fred C. Eastman, Marblehead, Mass., assignor to United Shoe Machinery Corporation, Flemington, N. J., a corporation of New Jersey

Application January 21, 1949, Serial No. 71,990

27 Claims. (Cl. 112—37)

1

The present invention relates to improvements in shoe inseam sewing machines of the type disclosed in United States Letters Patent No. 1,108,560, granted August 25, 1914 upon application of Andrew Eppler and No. 1,971,575, granted August 28, 1934 upon application of Alfred R. Morrill, which machines are constructed and arranged to attach a welt and upper to the insole of a lasted shoe.

In machines of the type illustrated in the patents referred to, the stitch forming devices comprise a curved hook needle and an oscillating take-up acting successively during each sewing cycle to give up thread for the formation of each stitch, to tighten and set the stitch by exerting a suddenly applied predetermined tension on the thread and thereafter to draw from the supply sufficient thread for the formation of the succeeding stitch. To enable a predetermined tension to be exerted on the thread a tensioning device is provided comprising a grooved wheel over which the thread passes to the take-up and a friction brake drum is connected to the wheel, a brake shoe engaging the brake drum to resist rotation of the wheel. In the patented machines the friction of the brake shoe on the drum exerts only a minor part of the resistance to thread movement past the tensioning device. On account of the weight of the moving parts in the tensioning device including the grooved wheel and the brake drum connected thereto, the resistance offered to sudden thread movement is constituted in major part by inertia, particularly while each stitch is being set by the take-up. The inertia of the tensioning device, therefore, is greater with hard, inflexible work than with soft, pliable work, inasmuch as the snap of the thread is softened with work having more yielding qualities so that lower intensities of acceleration are imparted to the tensioning device. Furthermore, the degree of elasticity in the thread stretched between the tensioning device and the work also has a marked effect on that part of the thread tension produced by inertia of the tension wheel and brake drum for a like reason. Also, variation in speed of machine operation affects the tension in the thread, compensating devices frequently being employed to increase the tension caused by friction when the machine operations are slowed down.

An important object of the present invention is to provide a shoe inseam sewing machine in which the effects of inertia are substantially eliminated in the action of the thread tensioning device so that no variation in tension will be

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caused when sewing at different speeds with work having different physical qualities or when thread having different degrees of elasticity is employed.

A further object of the invention is to simplify and improve the construction of a sewing machine, particularly for operating upon heavy leather material such as shoes, in such a way that higher sewing speeds may be obtained with less wear on the operating parts of the machine and with more uniform results while at the same time requiring less skill and attention on the part of the operator to maintain the machine in properly adjusted operating condition.

To eliminate the effects of inertia in the embodiment of the present invention, a shoe inseam sewing machine is provided with the usual stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member having the thread wrapped about it, in which the tension of the thread is regulated between the friction member and the take-up by varying a preliminary snubbing tension on the thread as it first engages the friction member. In this way the moving parts engaging the thread are reduced in number to a minimum, particularly in the tensioning device with the result that the effects on the thread of inertia in the parts is avoided.

According to this feature of the invention the thread actuates a resilient arm located between the friction member and the take-up and causes a preliminary friction shoe connected to the arm to induce the snubbing tension in the thread as it engages the friction member, the pressure of the preliminary friction shoe on the thread being increased when the thread tension between the friction member and the take-up is decreased and the pressure being decreased when the tension on the thread between the friction member and the take-up is increased. Preferably, the friction member is of circular section and the arm actuated by the thread is pivoted concentrically to the friction member with a roll on the arm arranged to direct the thread from the friction member through approximately a right angle to the take-up. To assist in imparting the preliminary friction to the thread, the thread along that portion engaged by the friction shoe is backed by a grooved block along the groove of which the thread moves. Also, in the illustrated embodiment of this feature, the stationary friction member is grooved to receive the thread so that the thread will not be flattened or deformed as it moves about the surface of the friction member.

These and other features of the invention in-

cluding novel and improved means for changing the tension on the thread during each sewing cycle, novel and improved means for applying a lubricant, wax or other processing agent to the thread and other devices, combinations and arrangements of parts hereinafter described and claimed which, together with the advantages to be obtained thereby, will readily be understood from the following description, taken in connection with the accompanying drawings, in which

Fig. 1 is a view in right side elevation, partly broken away and in section of the head of a shoe inseam sewing machine embodying the features of the present invention;

Fig. 2 is a sectional plan view on a somewhat enlarged scale of the forward part of the machine head;

Fig. 3 is a sectional side view on a similar scale looking from the left of the take-up and thread-tensioning device of the machine with the take-up tension released;

Fig. 4 is a detail sectional view taken along the line IV—IV of Fig. 3;

Fig. 5 is a view in left side elevation and in section of the machine on a further enlarged scale taken along the line V—V of Fig. 2;

Fig. 6 is a perspective detail view of a portion of the preliminary thread tension controlling arm and shoe;

Fig. 7 is a similar view of the backing block for the preliminary thread tension shoe;

Fig. 8 is a detail view in right side elevation of the thread finger and channel guide and their operating mechanisms;

Fig. 9 is a sectional plan view looking in the direction of the arrow IX in Fig. 8 of the thread finger and channel guide actuating connections;

Fig. 10 is a sectional detail view of a universal joint in the mechanism illustrated in Fig. 8 looking from the front of the machine;

Fig. 11 is a view in front elevation of the needle, the looper, the thread finger and channel guide shown in operating relationship to a portion of a shoe indicated partly in section;

Fig. 12 is a sectional view in right side elevation of the looper and its actuating mechanism;

Fig. 13 is a detail view on an enlarged scale looking in the direction of the arrow XIII in Fig. 12 of the thread severing and holding device in the machine, showing its relation to the looper and thread finger;

Fig. 14 is a side view of the thread severing and holding device looking in the direction of the arrow XIV of Fig. 13;

Fig. 15 is a sectional view of the same device taken along the line XV—XV of Fig. 13;

Fig. 16 is a detail view of the welt guide and its actuating mechanism showing the manner of operation upon a shoe;

Fig. 17 is a plan view of the welt guide and its mounting in the machine;

Fig. 18 is a front detail view of the welt guide;

Fig. 19 is a plan view of the looper support and actuating mechanism for the looper; and

Fig. 20 is a time chart indicating the relative movements of the thread finger, take-up and needle in the machine.

The shoe machine illustrated in the drawings is arranged for sewing the upper and the welt to the insole of a welt shoe and is provided with the usual operating devices of a welt shoe sewing machine including a curved hook needle 2, a needle looper 4, a thread finger 6, a take-up 8, a welt guide 10, a channel guide 12 and other

stitch forming devices similar, except as hereinafter described, to those of the Eppler and Morrill patents above identified. The machine is driven through a driving and stopping mechanism having high speed forward and low speed reverse driving connections, a shift from one connection to the other being controlled by the operator. The shift from the high speed forward driving connections to the low speed reverse connections occurs just before the machine is brought to rest so that the needle is disengaged from its final loop of thread. When brought to rest the needle is retracted from the work and the other stitch forming devices are disengaged to enable the work to be removed readily from the machine.

The operating and stitch forming devices are mounted in an encasing frame 14 carried by a suitable column or pedestal (not shown). The stitch forming devices are driven from a main sewing shaft 16 mounted in the frame 14 and the stopping mechanism includes a cam 18 on the sewing shaft having a closed ended slot cooperating with a follower mounted on a lever 20 rotatable on a horizontal shaft 22 carried by the machine frame. The follower on the lever 20 enters the slot in the cam 18 during its reverse rotation and provides a definite limiting position to which the main sewing shaft may be rotated at low speed.

In a prior machine of the type employed for attaching a welt and upper to the insole of a lasted shoe, the take-up controls the movements of the thread toward and from the other stitch forming devices during formation of each stitch and tightens the thread to set each stitch after being formed. After tightening each stitch, the take-up draws a length of thread into the prior machine from the thread supply against a frictional tension device consisting of a grooved thread engaging tension wheel forming a traction member connected to a brake drum engaged by a friction brake shoe. The arrangement of the groove on the tension wheel causes the wheel to rotate as the thread is drawn therefrom. The inertia of the tension wheel and brake drum is so great that when a sudden jerk is applied to the thread, as in setting each stitch at high speed, the tension imparted to the thread may be excessive and breakage may occur if there is any irregularity in the amount of thread required. The tension also is affected by the rigidity of the work, the elasticity of the thread or any variation in sewing speed of the machine.

To avoid irregularities in tension of the sewing thread, according to the illustrated embodiment of the present invention, the inertia of the thread tensioning device is substantially eliminated and the tension in the thread is controlled entirely by frictional action applied directly to the thread in a manner complying with the requirements of acceptable sewing practices without the use of heavy parts upon which it is necessary for the thread to impose relatively large mechanical displacements for effective action. To this end, the illustrated thread tensioning device comprises a stationary circular friction member 24 about which the thread is wrapped to provide a direct action on the thread. The friction member 24 is secured in a stationary position on a sleeve 26, shown in Fig. 5. The cylindrical surface of the friction member is formed with a helical groove 28, best shown in Fig. 2, for guiding the thread and for imparting a greater frictional effort thereto than is possible with a plain cylindrical surface. The thread engaging sides of the groove

28 are disposed at an angle of 60° to each other and the sides form a sharp internal apex to insure that the thread will be frictioned by the sides rather than the bottom of the groove even with the smaller sizes of threads.

To control the tension of the thread uniformly as it passes about the friction member 24, the thread as it first engages the friction member is snubbed by resilient means with a preliminary friction varying with the tension on that part of the thread between the friction member and the stitch forming devices. The thread supply is indicated at 30 and consists of a retaining cage surrounding a centrally disposed spindle upon which is mounted a cop 32. The retaining cage is made fast to an arm 34 at the rear of the machine frame with the axis of the cop at a slight angle to the horizontal. From a central opening in the cage located in alinement with the axis of the cop the thread passes loosely through a guide tube 36 through an eye 37 in a stationary grooved block 38 (see Figs. 5 and 7) and about the friction member 24. As the thread engages the groove 28 in the friction member it is carried at a slight angle axially along the friction member to a position at one side of the block 38 where it engages a pulley 40 mounted for rotation on a shaft 42 secured to an arm 44. The thread in passing about the friction member engages the member within the groove through an angle of wrap of about 270°. The pulley 40 and the arm 44 swing about a fixed axis of a friction reducing needle bearing 46 (see Fig. 5) mounted within the sleeve 26 to which the friction member is secured, the rotary movement of the arm and pulley being concentric with the outer surface of the friction member. The thread passes upwardly from the pulley 40 to a guide roll 48 on the take-up 8. The arrangement is such that the pulley 40 is urged upwardly toward the take-up guide roll by the tension in the thread as it is being drawn toward the other stitch forming devices.

For snubbing the thread as it engages the friction member with a force varying with the tension on the thread between the friction member and the take-up to control the tension in accordance with acceptable sewing practices, the shaft 42 provides a rotatable mounting for a preliminary friction shoe 50 engaging the thread and gripping the thread as it moves along the groove in the grooved block 38. Unlimited rotation of the friction shoe on the shaft 42 is prevented by axial lugs on the shoe which engage a pin 51 passing diametrically through the end of the shaft. By providing a grooved block and a grooved circular friction member excessive deformation of the thread is avoided and the danger of flattening or otherwise changing the shape of the thread is substantially reduced.

The preliminary friction shoe is resiliently mounted and pressed yieldingly against the thread to resist the upward pull of the thread as it passes to the take-up from the friction member and if the tension in the thread as it passes to the take-up is increased the pressure of the friction shoe on the thread will be reduced correspondingly, thereby automatically regulating the tension uniformly on the thread between the friction member and the take-up. Thus, the preliminary snubbing force is varied inversely with the tension on the thread engaged by the other stitch forming devices without changing the positions of the parts by any substantial amount.

To prevent displacement of the thread from the groove in the friction member 24 the friction member is surrounded by a spring retaining clip 52. The retaining clip is removable to enable easy threading of the friction member and when slipped into place engages the friction member without imparting any drag on the thread.

Inasmuch as the surface of the thread engages the friction member to exert a frictional force directly on the thread, it is not desirable to modify the frictional coefficient between the thread with the friction member by application to the thread of a liquid lubricating wax or coating of other processing agent usual with hook needle type sewing machines before the thread engages the friction member. Accordingly, with the use of the illustrated tensioning device, the liquid wax, lubricant or other processing agent for the thread is applied beyond the tensioning device to the thread running between the take-up and the looper. For this purpose, the thread passes through a hollow guide, as will be more fully described, connected to a source of wax or other liquid processing agent, the processing agent being applied to the thread under pressure within the guide.

In the machine of the Eppler and Morrill patents, different degrees of tension are imparted to the thread during each sewing cycle. In the present machine the tension in the thread is increased and decreased during the take-up stroke of the take-up in a similar manner during each sewing cycle by varying the snubbing pressure of the preliminary friction shoe against the thread. To press the friction shoe against the thread as it moves along the block the arm 44 is secured to one end of a pivot shaft 54 passing through the bearing 46 and forming the axis of the arm. At the other end of the pivot shaft is a double forked arm 56, best shown in Fig. 2. The arm 56 is clamped to the shaft 54 and is pressed downwardly to bring the friction shoe against the thread. For this purpose, within the double forks of the arm 56 are disposed a pair of rods 58 and 60 (see Fig. 4) surrounded by a pair of coil springs 62 and 64 acting on the forks of the arm 56 with different intensities of pressure. The spring 62 is provided to apply a snubbing pressure of the shoe against the thread during the retracting stroke of the needle and the spring 64 acts together with spring 62 only during the take-up stroke of the take-up, the force of the spring 64 being added to that of the spring 62. At the end of a sewing operation, both springs are rendered inoperative to enable thread to be drawn freely past the thread tensioning device.

The springs 62 and 64 are each enclosed by a pair of hollow telescoping members, the upper ones of which are indicated in Fig. 4 at 66 and are threaded to receive a threaded portion of the rods 58 and 60. The lower telescoping spring enclosing members, indicated at 68, each loosely surrounds its rod between its spring and the arm 56 and prevents the entry of foreign materials between the coils of the spring.

When the machine is brought to rest the springs 62 and 64 are rendered inoperative, the members 68 being engaged by shoulders formed at the enlarged lower ends of the rods 58 and 60. The lower ends of the rods are perforated to receive pivot pins 70 and 72. The pivot pin 72 passes through the bifurcated arm of a cam actuated tension controlling lever 74 fulcrumed

on a shaft 76 which also serves as a fulcrum for the take-up 8. The rearward arm of the controlling lever 74 is acted upon by a spring-pressed plunger 77 and carries a roll 78 engaging the outer surface of a cam 80 (see Fig. 1) on the main sewing shaft 16. During operation of the machine the cam 80 intermittently brings the shoulder on the rod 60 against the member 68 surrounding it to render the take-up tension inoperative. The pivot pin 70 is mounted in the mid-portion of a tension throw-off lever 82 (Fig. 3) fulcrumed at 84 in the machine frame beneath the thread friction member. The upper end of the throw-off lever 82 is yieldingly depressed by a tension spring 86 connected between the lever and a pin 88 on the machine frame. Downward movement of the lever 82 is stopped by a set screw 90 threaded into the machine frame in a position to be engaged by the lever. The spring 86 pulls the rod 58 downwardly at all times during sewing operations to hold the shoulder on the rod away from its surrounding member 68.

At the end of a sewing operation when the reverse connections of the stopping mechanism are brought into operation and the follower on the lever 20 enters the slot in the cam 18 shown in Fig. 1, an arm 91 connected to the hub of the lever 20 moves with the lever and, through a pin and slot connection between the arm 91 and an inclined rod 92, forces the rod upwardly into engagement with the throw-off lever 82. The throw-off lever is moved upwardly bringing the shoulders on the rod 58 against the enclosing member 68 for the spring 62 thereby raising the member away from the forked arm 56 and rendering the spring 62 inoperative. In bringing the machine to rest the main sewing shaft stops in a position where the forward end of the cam lever 74 is raised so that the spring 62 also is held inoperative at this time and all pressure of the springs 62, 64 on the forked arm 56 is relieved.

To enable the preliminary friction shoe to be swung clear of the thread on the guide block 38 when the machine is being threaded or cleaned the rods 58 and 60 may be swung away from the forks in the arm 56, thus disconnecting the springs 62 and 64 from the friction shoe. For this purpose, the upper ends of the rods are pressed rearwardly until the lower spring enclosing members 68 clear the forks in the arm 56. To retain the rods in operative positions during sewing the lower ends of the rods are provided with squared surfaces engaging leaf springs 94 and 96. The spring 94 is secured to the forward end of the cam lever 74 and the spring 96 is secured to the throw-off lever 82. A beveled surface on each rod enables the rods to be restrained in disconnected positions when swung rearwardly with the beveled surfaces in engagement with the respective leaf springs.

The take-up 8 and the tensioning device are enclosed by a horizontally hinged cover 98 resting on the machine frame and rotatable about a pin 100 to expose the take-up and tensioning device. To hold the cover raised while threading the take-up and tensioning device the rearward portion of the cover surrounding the hinge pin is notched at 102 to receive the upwardly bent end of a leaf spring 104 secured at its other end to the machine frame. When the cover is raised the pressure of the spring 104 in the notch 102 resists downward closing movement.

The hollow thread waxing or processing guide is mounted at the front of the machine in such position that the thread passes in a substantially straight line between the take-up and the looper. The guide consists of a hollow block 106, shown in Figs. 1, 3 and 5, provided with a swinging front cap plate 108 formed with a thread guiding groove registering with a corresponding groove in the block 106 to form a split guide for the thread. The plate 108 swings toward and from the block 106 about a pin 110 passing substantially vertically through spaced lugs on the block 106 and through one end of the plate 108. To lock the plate in position against the block 106 the block has rotatably mounted upon it a downwardly projecting swinging finger piece 112 provided with a portion overlying the plate and a flattened portion to clear the plate when it is necessary to replace the thread or clean the guide.

The wax or processing agent is directed to the guide under pressure of a pump acting periodically during that time in each sewing cycle when the take-up is giving up thread and the thread is moving with substantial velocity toward the looper. To apply the wax or processing agent to the thread the block 106 is provided with a bore 114 intersecting the thread guiding groove therein. Connecting with the bore 114 is a passage 116 which enters a tube fixture 118 (see Fig. 2) for clamping one end of a tube 120, the other end of which is secured in a fixture 122 threaded into the base 124 of the pump. From the fixture 122 a passage 126 in the base 124 enters a valve chamber 128 in a threaded sleeve 129, the outer end of which is closed by a screw plug 130. The sleeve 129 has a perforation in alinement with the passage 126 and is threadedly received in an opening in the base 124. The valve in the chamber is of the conventional spring pressed ball type, the ball of which is indicated at 132, closing one end of a cylinder 134 in the sleeve 129 within which is slidably mounted a reciprocating plunger 136. In reciprocating, the plunger moves across a supply passage 138 in the sleeve intersecting the cylinder so that the supply is cut off and a small quantity of the wax or processing agent from the supply is forced past the valve ball 132. During its return stroke the plunger uncovers the supply passage and an amount of wax or processing agent corresponding to the quantity expelled from the valve is drawn into the cylinder. The supply passage 138 is connected through a fixture 140 to a close coupled elbow 142. From the elbow 142 the connection runs to a gravity supply container 144 through a tube 146 and a fitting 148. The container 144 is for convenience provided with a sight level tube 150 (see Fig. 1).

To enable convenient adjustment in the displacement of the pump and in the amount of wax applied to the thread the pump plunger 136 is actuated by a variable mechanism and is formed with an enlarged head provided with a series of lengthwise grooves 152 and a number of radial spanner holes 154. The head of the plunger has a threaded opening engaged by a threaded rod 156 forked at one end to surround the shank of an eccentric strap 158 engaging an eccentric 160 rotatably mounted on a pin 162. The pin 162 has one end secured in the take-up 8, the arrangement being such that during the taking up stroke of the take-up the plunger 136 is retracted from the cylinder 134 and during the downward thread giving up stroke of the take-up as the thread is being drawn through the hollow guide, wax is conducted under pressure to the guide and is applied to the thread.

During the taking up stroke of the take-up the movement of the thread in the guide is reversed, the portion of thread to which the wax has

already been applied being drawn up into the guide. The shape and size of the thread guide grooves in the plate and cap, however, are proportioned to avoid wiping off wax to any appreciable extent. During the next downward stroke of the take-up the already waxed portion of thread is drawn again through the guide together with a further length of unwaxed thread so that there is no necessity for the use of a close fitting wiper to remove the excess of wax. If the proper quantity of wax is applied to the thread it will be carried off by the thread without loss through seepage from the guide. To avoid any possibility of excess accumulations of wax at the upper end of the guide, the upper surfaces of the guide block 106 and cap plate 108 are formed with cooperating collar lugs disposed to provide a recess 164 within which the excess may collect during the up stroke of the take-up. During the down stroke of the take-up the excess wax will be carried off with the thread.

In order to avoid loss by seepage of the wax from the thread guide or uncontrolled accumulations of excess wax which may drop onto the work during sewing operations, the quantity of wax applied to the thread during each period of pressure is carefully adjusted to that amount which will be carried off with certainty by the thread. For this purpose the plunger 136 is rotated on the threaded rod 156 until the stroke of the plunger beyond the supply passage 138 is changed to cause the correct amount of wax to be expelled. This is accomplished by inserting a spanner or regulating pin in the holes 154. For retaining the plunger in fixed adjusted relation to the threaded rod the depressions 152 are engaged selectively by a spring-pressed detent ball 166 mounted in the pump base 124. On account of the lengthwise direction of the grooves, reciprocation of the plunger does not affect the adjustment, the groove engaged by the ball sliding on the ball without changing the rotary position of the plunger.

Rotation of the plunger on the threaded rod 156 changes the effective stroke of the plunger in minute steps and affords an accurate adjustment of the quantity of wax expelled onto the thread. At certain times in the operation of the machine, particularly after the machine has lain idle for a substantial period of time or when the supply of wax or processing agent has become exhausted the pump may become filled with air or gas consisting of vaporized solvent, resulting in a loss of pressure in the wax guide. An accumulation of gas in the form of air or vaporized solvent may effectively block the operation of the pump entirely. To overcome this difficulty the stroke of the pump is increased temporarily in a relatively large step as compared with the minute steps employed to obtain the correct plunger stroke under normal operating conditions.

To enable the stroke of the wax pump plunger to be increased temporarily in a relatively large step so that gas may be expelled from the pump, the eccentric 160 is arranged to be quickly shiftable to either of two 180° opposite positions relatively to the strap 158. These two positions are easily located by rotation of a handle lug 167 projecting axially from the eccentric and rotating the eccentric until a second spring-pressed detent ball 168 enters arranged to be engaged with either of two oppositely disposed depressions in the eccentric. For instance, the position of the eccentric shown in Fig. 2 is that assumed during normal running conditions. If the eccentric is rotated 180° from this position the effective stroke of the plunger 136 will be substantially increased. If the machine is run idle without having work presented to it with the increased plunger stroke, accumulations of gas in the pump will quickly be expelled and a fresh supply of wax will be drawn into the system. The eccentric may then be rotated to return it to its normal running position when sewing operations are to be resumed.

The illustrated machine is equipped with a main positively actuated take-up but has no yielding auxiliary take-up as in the machine of the Eppler patent. Accordingly, slight variations in the thickness of the materials operated upon may influence the sewing operations to some extent. Frequently in the machine of the Eppler and Morrill patents the requirements for slack thread as the threaded needle is withdrawing from the work are greater than the supply of thread available from the action of the thread finger. Accordingly, it is inevitable in those machines that the thread will slide in the needle hook while the hook moves through the work. Such sliding of the thread in the needle hook imposes a destructive action on the thread tending towards breakage or excessive abrasion of the thread.

In the illustrated machine the stitch forming and thread handling devices are carefully timed and the thread finger is moved to measure thread between the looper and the needle a sufficient distance while in engagement with the thread to avoid any possibility of the thread sliding in the threaded needle hook while being withdrawn from the work. After moving with the thread the thread finger is actuated yieldingly in giving up thread to the needle to enable proper control of the thread to be maintained according to the requirements of each stitch. To these ends, the active stroke of the thread finger is increased beyond that employed in prior machines and the channel guide is bowed outwardly to clear the thread finger during its increased stroke as more clearly illustrated in Figs. 9 and 11, the thread finger moving directly behind the channel guide at the end of its thread measuring stroke. Also the main take-up is so timed and actuated that it maintains an accurate control of the thread by causing a large number of small increments of thread to be drawn past the thread tensioning device at different times, distributed more or less evenly throughout each sewing cycle except for that time when the threaded needle hook is being withdrawn through the work when no thread is drawn past the tensioning device.

The time that the threaded needle hook is being retracted through the work is indicated in the time chart of Fig. 20 as taking place between a 160° and 200° of main sewing shaft rotation. At this time the "Take-up" curve indicates a giving up movement greater than required by the other stitch forming devices so as to provide "Slack Thread" at this time but without releasing all control of the tension. At the same time, the "Thread Finger" curve indicates giving up thread to the needle so that both sides of the loop of thread carried by the needle hook through the work have little tension applied to them. As a precaution against excessive tension in the needle loop at this time, according to a further feature of the invention, the thread finger during the time of giving up thread to the threaded needle is subject to an indefinite yielding con-

trol within the range enclosed by the solid and broken line as required by the pull on the thread.

To enable the thread finger 6 to yield upon the pull of the thread so as to give up thread where required during the time in each sewing cycle when the threaded needle hook is passing through the work, the mechanism for actuating the thread finger comprises a lost motion connection and a yielding frictional joint in the lost motion connection (see Figs. 9 to 11, inclusive). The thread finger actuating mechanism is generally similar to that of the Morrill patent, noted above, and comprises an arm forming the thread finger 6 and a thread finger actuating rock shaft 169 to which the thread finger is fixed, rotatably mounted in a thread finger carrier 170. The channel guide 12 also is rigidly clamped by a bolt 172 to the carrier. The thread finger and channel guide carrier are oscillated during each cycle of operations and are moved laterally in the line of feed with the needle to maintain the proper position of the thread finger with relation to the needle during the lateral movements of the needle to and fro in the line of feed.

The thread finger is actuated with a swinging movement in the line of feed across the plane of the needle to measure thread in opposition to the feed of the work by means of a slotted clamp block 174 secured on the upper end of the rock shaft 169, an arm 176 rotatable within the slot of the clamp block between two shaft engaging portions of the block, a link 178 pivotally connected between the arm 176 and a cam lever 180, and a cam on the main sewing shaft 16 having a slot 182 into which a roll on the lever 180 fits.

The lost motion connection is best shown in Fig. 9 and is arranged between the hub of the arm 176 and the slotted clamp block 174, the limits of the lost motion being determined by a slight angle formed on a relatively straight face 184 within the slot of the block 174 cooperating with a slightly beveled surface on the arm 176. The lost motion connection is ineffective during the thread drawing stroke of the thread finger 6 and becomes effective only after the operating mechanism begins to move in the opposite direction. If the requirements of the needle loop as the threaded needle hook is moving through the work are sufficiently great, the thread finger will be moved simultaneously with the actuating connections. If, however, the thickness of the work is extremely small the maximum thread drawing position of the thread finger will be retained and the thread finger will not be returned to its starting position until the return limit of lost motion in the actuating connections is reached. Beween these two extreme positions the thread finger is moved yieldingly against the action of a frictional joint by the thread to give up thread to the needle without loss of control in the thread while, at the same time, imparting a minimum tension to the thread engaging the thread finger.

The frictional joint in the actuating connections for maintaining the thread finger yieldingly in its maximum thread drawing position comprises a spring washer 186 acting between the clamp block 174 and an upper surface on the thread finger carrier 170 to produce a further frictional engagement between the lower surface of the carrier and the thread finger 6.

To regulate the thread drawing stroke of the thread finger accurately to the requirements of the machine and to the type of work operated upon, readily adjustable means is provided in the actuating connections for the thread finger. Regulation of the thread finger stroke assists in tightening each previously formed stitch during the needle retracting stroke, the loop of thread carried by the needle being tightened sufficiently to cause the previously formed loop of thread through which the loop carried by the needle passes to be tightened securely about the needle engaging loop. Thus, with thin work and short stitches the thread drawing stroke of the thread finger may be reduced while with thicker work and longer stitches the thread drawing stroke of the thread finger may be increased without affecting the tightness of the previously formed stitches adversely.

The adjustable means for changing the thread drawing stroke of the thread finger is carried by the cam lever 180 and consists of a pivot 188 slidable in a slot 190 disposed radially of a fulcrum shaft 192 for the lever 180. The pivot 188 is secured in the rearward end of the link 178 and is moved upwardly along the slot 190 to increase the stroke of the thread finger and downwardly in the slot to reduce the stroke. To move the pivot 188 along the slot 190 the pivot also passes through a rectangular upper end of a C-shaped link 194, the lower end of which is enlarged and provided with a threaded opening within which is engaged the threaded portion of a hollow thumb screw 196 rotatably mounted on a pin 198 secured to the cam lever 180 in a position radially of the fulcrum shaft 192. Rotation of the thumb screw 196 imparts the desired adjusting movement to the pivot 188, the position of the thumb screw being retained by a spring-pressed ball 200 disposed within a passage in the link 194 to bear on the thumb screw.

As a further means of convenient adjustment of the thread finger stroke, the pivot 188 is provided at one end with a spherical head 202 engaged by a socket in the link 178 and arranged eccentrically to that portion of the pivot which passes through the slot 190 and the upper end of the link 194. Rotation of the pivot causes the relative positions of the link 178 and lever 180 to be changed and the pivot thereafter is clamped in adjusted position by a check nut 203 on the threaded end of the pivot opposite the ball, engaging the C-shaped link 194.

The present machine is provided with a thread cutting and holding device of an improved form. In the machine disclosed in United States Letters Patent No. 2,200,402, granted May 14, 1940 upon application of V. J. Tetrault, a thread cutting off and holding device is disclosed in which a thread holder is mounted on a movable support to enable the pull of the thread in starting a new seam to move the thread holder yieldingly until the first stitch is formed, thus maintaining the thread under accurate control and tension during the formation of the first stitch under the yielding movement of the jaws with the thread. The thread holder support of that patent moves about a center formed by a pivotal mounting of the support, the angle formed between the thread and the holder changing progressively as the support is rotated. For this reason the thread may become released from the holder sooner than desired inasmuch as the changing angle formed by the thread with the holder tends to disengage the thread from the grip of the holder in an irregular manner.

To avoid irregular release of the thread from the holder of the present machine, the thread

holder support has mounted upon it a member having an arcuate thread engaging surface 204 located concentrically with the pivotal axis about which the support rotates. Not only does the use of such arcuate thread engaging surface 204 prevent irregular release of the thread, indicated at 205, from the thread holder but it produces a uniform pull on the thread as the support is rotated about its pivotal mounting, thus contributing to the uniformity and accuracy of the insertion of the first stitches in a seam.

The illustrated thread holding device is mounted on the frame of the machine in the same position to the left of the sewing point as in the Tetrault machine and includes a bracket 206 (see Figs. 12 to 15, inclusive) secured to the machine frame by screws 207 and a thread holder support 208 rotatably mounted on a spindle 210 extending from the bracket 206, forming the pivotal axis for the support. A screw 212 is provided at the end of the spindle to prevent lengthwise displacement of the support. The thread holder includes a pair of gripping jaws 214 and 216. The jaw 214 is formed integrally with the support 208 and consists of a radially disposed finger projecting from the support. The jaw 216 consists of a nipping block mounted for pivotal movement about its end remote from the point of engagement with the thread to swing the end engaging the thread toward and from the other gripping jaw 214. The arrangement is such that when the thread is engaged between the gripping jaws a pull on the thread in a downward direction swings the nipping block jaw 216 toward the gripping jaw 214 to increase the pressure and grip on the thread, thus avoiding possibility of displacement of the thread from the gripping jaws and insuring that the gripping jaws will swing the support about the spindle 210 to the desired position.

The support 208 is yieldingly actuated by a coil spring 211 surrounding the hub of the support with one end hooked about a flanged portion of the support and the other end clamped between lugs on a split collar 218 fixed to an enlarged boss on the bracket 206 from which the spindle 210 projects. The arcuate thread engaging surface member is connected to move with the gripping jaws and is disposed in such relation to the gripping jaws that the thread is carried in a direct line from the gripping jaws about the arcuate surface. The member having the arcuate surface in the illustrated form of this feature is a circular portion of the support 208 and is connected with the hub of the support by a radial flange. Clamped to the outer surface of the flanged portion of the support by screws 220 is a plate 222 provided with a right angle slotted ear (see Fig. 14) within the slot of which the nipping block 216 is mounted. To prevent displacement of the nipping block it is perforated to receive the reduced end of a screw stud 224 threaded into a portion of the ear at one side of the slot therein.

The thread cutter is mounted in a stationary position upon the split block 218 in close proximity to the gripping jaws on the thread holder support 208 when the thread holder support is at the limit of its yieldingly actuated movement. When a pull is exerted on the thread after being grasped by the gripping jaws the thread holder support moves away from the thread cutter. When the thread is moved away from the arcuate surface 204 it is released from the nipping block jaw 216. After the thread is released from the jaws the jaws 214, 216 are returned again to their position of proximity to the thread cutter.

The thread cutter consists of a knife blade 226 clamped to a projecting lug (see Figs. 13 and 14) on the collar 218 with the cutting edge of the blade disposed toward the left, looking from the front of the machine. After a shoe is withdrawn from the sewing position in the machine it is moved upwardly and to the left to carry the thread about the surface of the arcuate member on the support and between the gripping jaws 214 and 216. Thereafter the shoe is moved somewhat toward the right to carry the thread across the cutting edge of the knife blade 226 as illustrated in Fig. 13, severing the thread against the knife. In starting a new seam the thread holder rotates with the support, maintaining a uniform pull on the thread and yielding thread as required by the stitch forming devices. When a position of the thread holder support is reached, as indicated in the dot-dash lines of Fig. 13 where the thread begins to be drawn radially away from the gripping jaws the thread is released. Until the dot-dash position is reached where the thread draws away from the gripping jaws, the arcuate surface prevents angular displacement of the thread and release from the jaws.

In the machine of the Eppler and Morrill patents, as above noted, the welt attached to a shoe is led toward the sewing point through a welt guide arranged for easy adjustment to provide the most effective application of welt to the shoe. It is essential in adjusting the position of the welt guide to so locate the guide that the needle in entering the welt will engage a stitch receiving groove in the welt, indicated in Figs. 16 and 17 at 228. The mounting for the welt guide comprises movable pivot points on a pair of arms 230 and 232 so arranged that the welt engaging end of the guide moves in a circular path corresponding to that of the needle. Accordingly, the welt engaging end of the guide must be connected in one relation only to the pivot points of support offered by the arms 230 and 232. For this purpose the welt guide of the patented machine consists of a bar having a reversely bent strip of metal forming a guiding shield for the welt. Such an arrangement, however, provides little opportunity for adjustment of the guiding shield on the bar, particularly when different sizes and shapes of welt are being sewn. For convenience in locking the welt guide in the prior machine the rear arm 232 forms a part of a lever, the upper arm of which has a ratchet engaged by a pawl 233. The pawl is mounted on a lever 234 actuated by a cam 235 on the sewing shaft 16.

The welt guide 10 of the present machine consists of a shield similar to that disclosed in the patent but instead of being secured directly to a movable bar connecting the pivot points on the arms 230 and 232, the welt shield is secured to a separate mounting block 236 adjustably clamped to a stud 237. The stud 237 has an enlarged flattened end clamped in turn within a lug at the forward end of a pivot connecting bar, indicated at 238, joining the pivots on the arms 230 and 232. To clamp the stud 237 in the bar 238 the flattened surface of the stud is engaged by an eccentric shaft 240 rotatably mounted in the movable bar 238 and having a downwardly extending handle 242 for rotating it.

With each particular size and shape of welt

a separate close fitting frame or shield is required, necessitating separate adjustment of the shield on the movable bar 238. Such adjustment is readily obtained in the present machine by loosening a nut 244 on the stud 237 and shifting the position of the block 236 on the stud throughout the range of an enlarged opening 246 within which the stud is movable in the block, a washer 248 being provided to cover the opening. After tightening the nut 244 the parts are held clamped in a desired relationship. When it is necessary to change the shield for a different size or shape of welt, instead of removing the shield from the block 236 and losing the adjustment previously obtained, the eccentric shaft 240 is rotated to release the stud 237 only. A new shield, block and stud are then substituted and, if necessary, adjusted in the proper fashion. When it is necessary to return the first adjusted shield to the machine no further adjustments are required inasmuch as the adjusted relationship of the stud 237 and the block 236 insure a correct location of any shield after having once been adjusted on its mounting stud.

As in the machine of the Morrill patent, the present machine is provided with a mounting for the looper 4 consisting of a Y-shaped three-cornered support 250 shown in Figs. 12 and 19. At the front end of the support it is confined vertically between a surface on the machine frame and a bearing member 252 secured to the machine frame and the support carries the thread guiding member of the looper. The remaining divergent arms of the support are each operatively connected to one of two actuating arms 254 and 256 fulcrumed on a fixed shaft 253. To connect the support with the actuating arms in the machine of the patent, the arms are provided with socket portions engaging directly with ball members mounted on the actuating arms, the actuating arms being operated by followers engaging cams on the sewing shaft 16. In the machine of the patent, there is a tendency for the operating arms to be subject to undue frictional effect and transverse torsion in their rocking movements about the shaft 253, particularly if the bearing surfaces are constructed with a close fit. This undue frictional effect is the result of the foreshortening movement of the support 250 which is connected between the two arms.

In the present illustrated machine the frictional effect on the actuating arms 254 and 256 as a result of the foreshortening movement of the looper support 250 is avoided by the use of a separate link 260 connecting one arm of the support 250 with the actuating arm 254. The link 260 is in turn formed with a socket portion engaging with the ball member on the arm 254 and is perforated to receive a pin 262 passing through the forked end of the support 250. The forked end of the support is disposed with lateral bearing surfaces for the link 260 extending in planes parallel with the general plane of the support so that displacement of the support from its plane will be avoided while movement of the link on the arm 254 within the general plane of the support is not restrained. With the use of the link 260 any foreshortening movement of the support between its points of connection with the arms 254 and 256 merely imparts a swinging movement to the link 260 about the pin 262 without exerting any undue torsional force on the support such as will cause undesirable frictional reaction on the arms 254 and 256.

Certain features of the invention, herein disclosed form the subject-matter of divisional applications as follows:

Serial No. 285,405, filed May 1, 1952, relating to thread cutting and holding devices;

Serial No. 287,891, filed May 15, 1952, relating to a thread finger actuating mechanism;

Serial No. 289,732, filed May 24, 1952, relating to a welt guide shield mounting; and

Serial No. 292,672, filed June 10, 1952, relating to a looper actuating mechanism.

The nature and scope of the invention having been indicated and a particular embodiment having been described, what is claimed is:

1. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with resiliently mounted means controlled by the tension of the thread between the friction member and the other stitch forming devices to snub the thread as it first engages said friction member.

2. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with a resiliently mounted arm actuated by the thread between the friction member and the take-up and a preliminary snubbing friction shoe connected to the arm for imparting a controlling tension to the thread as it engages the friction member.

3. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a circular stationary friction member about which the thread is wrapped, in combination with a resiliently mounted arm pivoted concentrically to the circular friction member, and a roll carried by said arm for directing the thread from said friction member to the take-up to impart a controlling tension to the thread as it engages the friction member.

4. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with a resiliently mounted arm actuated by the thread between the friction member and the take-up, a preliminary snubbing friction shoe connected to the arm for imparting a controlling tension to the thread as it engages the friction member, and a grooved block along the groove of which the thread is engaged by the friction shoe.

5. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, and a take-up, in combination with a thread tensioning device comprising a circular friction member having a helical groove within its circular surface for engaging the thread to impart a tension to the thread without substantially deforming the section of the thread.

6. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, and a take-up, in combination with a thread tensioning device comprising a circular friction member having a helical groove within its circular surface for engaging the thread to

impart a tension to the thread without substantially deforming the section of the thread, and a retaining clip surrounding the friction member to prevent displacement of the thread from the groove.

7. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with an arm actuated by the thread between the friction member and the take-up, a preliminary snubbing friction shoe connected to the arm for imparting a controlling tension to the thread as it engages the friction member, and means for applying wax to the thread between the take-up and the looper, comprising a guide through which the thread passes in a substantially straight line between the take-up and the looper and a source of wax connected to the guide.

8. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, and a take-up, in combination with a thread tensioning device comprising a circular friction member about which the thread is wrapped having around its circular surface a guiding groove formed with thread engaging side walls disposed at an angle of approximately 60° to each other.

9. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with resiliently mounted means actuated by the tension on the thread between the friction member and the take-up to vary the tension in the thread as it first engages said member, comprising an arm actuated by the thread and a preliminary friction shoe connected to the arm to grip the thread with a yielding pressure varying with the tension on the thread between the friction member and the take-up.

10. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with an arm actuated by the thread between the friction member and the take-up, a preliminary snubbing friction shoe connected to the arm for imparting a controlling tension to the thread as it engages the friction member, yielding means for actuating the preliminary friction shoe against the thread, and mechanism acting during each sewing cycle to vary the force of the yielding means.

11. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with an arm actuated by the thread between the friction member and the take-up, a preliminary snubbing friction shoe connected to the arm for imparting a controlling tension to the thread as it engages the friction member, springs for actuating the preliminary friction shoe against the thread, and mechanism acting during each sewing cycle on one of the springs to increase or decrease the force applied to the friction shoe.

12. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with an arm actuated by the thread as it leaves the friction member, a preliminary friction shoe on the arm for imparting a controlling tension to the thread as it engages the friction member, a pivot shaft to which said arm is secured, a bearing for said shaft, a second arm fixed to said shaft actuated yieldingly to press the friction shoe against the thread, and a lever actuated in bringing the machine to rest to raise the friction shoe from the thread.

13. A shoe inseam sewing machine having a main sewing shaft and stitch forming devices actuated by the sewing shaft including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with means actuated by the thread as it leaves the friction member to vary the tension in the thread as it first engages the friction member including a preliminary friction shoe, an arm for actuating the shoe, a pair of springs acting on the arm to press the shoe against the thread, one of said springs acting with a uniform pressure on the arm, and a lever actuated by the main sewing shaft to which the other spring is connected to cause said other spring to apply an increased pressure to the arm during the take-up stroke of the take-up.

14. A shoe inseam sewing machine having a main sewing shaft and stitch forming devices actuated by the sewing shaft including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with means actuated by the thread as it leaves the friction member to vary the tension in the thread as it first engages the friction member including a preliminary friction shoe, an arm for actuating the shoe, a pair of springs acting on the arm to press the shoe against the thread, one of said springs acting with a uniform pressure on the arm, a lever actuated by the main sewing shaft to which the other spring is connected to cause said other spring to apply an increased pressure to the arm during the take-up stroke of the take-up, and an arm connected to the uniform pressure spring actuated in bringing the machine to rest to release the thread from any pressure by the friction member.

15. A shoe inseam sewing machine having a main sewing shaft, stopping mechanism for bringing the sewing shaft to rest in a predetermined stopped position and stitch forming devices including a curved hook needle, a needle looper and a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with means actuated by the thread between the friction member and the take-up to vary the tension in the thread as it first engages said friction member, and means for applying two degrees of tension in the thread during each sewing cycle and for releasing the tension in the thread at the end of a sewing operation including a pair of springs for resisting movement of the thread actuated means.

16. A shoe inseam sewing machine having a main sewing shaft, stopping mechanism for bringing the sewing shaft to rest in a predetermined stopped position and stitch forming devices including a curved hook needle, a needle looper and a take-up and a thread tensioning device comprising a stationary friction member about

which the thread is wrapped, in combination with means actuated by the thread between the friction member and the take-up to vary the tension in the thread as it first engages said friction member, means including two springs for applying two degrees of tension in the thread during each sewing cycle, a cam on the sewing shaft for releasing the force of one spring at the stopping position of the sewing shaft, and an arm connected to the other spring and actuated by the stopping mechanism to release the force of the other spring.

17. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a needle looper, a take-up and a thread tensioning device, in combination with means for applying tension to the thread as it passes over the tensioning device, comprising a forked arm connected to the tensioning device, a spring acting on the arm, a rod surrounded by the spring and the fork of the arm, a pivot for the rod about which the rod may be swung to enable the arm to be freed from the spring.

18. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a needle looper, a take-up and a thread tensioning device, in combination with means for applying two degrees of tension to the thread, comprising a double forked arm, a pair of springs acting on the arm, rods surrounded by the springs and the forks of the arm, and pivots for the rods about which the rods may be swung toward and from the forks to enable the forked arm to be freed from the springs.

19. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a needle looper, a take-up and a thread tensioning device, in combination with means for applying two degrees of tension to the thread, comprising a double forked arm, a pair of springs acting on the arm, rods surrounded by the springs and the forks of the arm, and pivots for the rods about which the rods may be swung toward and from the forks to enable the forked arm to be freed from the springs, one of the pivots for the spring surrounded rods being mounted on an actuated part of the machine to render that spring active and inactive during each sewing cycle.

20. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a looper, a take-up and a thread tensioning device comprising a stationary friction member about which the thread is wrapped, in combination with a forked arm actuated by the tension on the thread between the friction member and the take-up, a block along which the thread moves before engaging the friction member, a friction shoe connected to the arm and arranged to engage the thread along the block, a spring acting on the arm to press the friction shoe against the thread on the block, a rod within the fork of the arm to provide a mounting for the spring, and a pivot for the rod about which the rod may be swung away from the fork in the arm to enable the friction shoe to be shifted away from the block.

21. A shoe inseam sewing machine having stitch forming devices including a curved hook needle, a needle looper, a take-up and a thread tensioning device, in combination with means for applying tension to the thread as it passes over the tensioning device, comprising a forked arm connected to the tensioning device, a spring acting on the arm, a rod surrounded by the spring and the fork of the arm, a pivot for the rod about which the rod may be swung to enable the arm to be freed from the spring, and yielding means for retaining the rod within the fork of the arm.

22. A shoe sewing machine having stitch forming devices including a hook needle, a needle looper and a take-up, in combination with means acting between the take-up and the looper to process the thread comprising a hollow guide to which a liquid processing agent is conducted under periodic pressure applied during the movement of the thread from the take-up to the looper.

23. A shoe sewing machine having stitch forming devices, a hook needle, a needle looper and a take-up, in combination with means acting between the take-up and the looper to process the thread comprising a split thread guide to which a liquid processing agent is conducted, one part of said guide being movable to release the thread, and means for locking the movable guide part in a position engaging the thread.

24. A shoe sewing machine having stitch forming devices including a hook needle, a needle looper and a take-up, and a main sewing shaft for operating said devices, in combination with means acting between the take-up and the looper to process the thread comprising a hollow thread guide, a reciprocating plunger pump actuated by the sewing shaft for directing a liquid processing agent to the guide under pressure, and a rotatable connection between the pump and the sewing shaft for changing the stroke of the pump.

25. A shoe sewing machine having stitch forming devices including a hook needle, a needle looper and a take-up, and a main sewing shaft for operating said devices, in combination with means acting between the take-up and the looper to process the thread comprising a pump having a plunger, a threaded rod actuated by the sewing shaft engaging the pump plunger, means for rotating the plunger relatively to the threaded rod to change the stroke of the plunger, and detent means engaged by the plunger for retaining the plunger in fixed relation to the threaded rod.

26. A shoe sewing machine having stitch forming devices including a hook needle, a needle looper and a take-up, and a main sewing shaft for operating said devices, in combination with means acting between the take-up and the looper to process the thread comprising a pump having a plunger grooved in a lengthwise direction, a threaded rod actuated by the sewing shaft engaging the pump plunger, means for rotating the plunger relatively to the rod to change the stroke of the plunger, and a detent engaging one of the grooves in the plunger to prevent rotation relatively to the threaded rod of the plunger during its reciprocation.

27. A shoe sewing machine having stitch forming devices including a hook needle, a needle looper and a take-up, and a main sewing shaft for operating said devices, in combination with means acting between the take-up and the looper to process the thread comprising a hollow thread guide, a pump having a plunger actuated by the sewing shaft for directing a liquid processing agent to the guide, a sewing shaft actuated pin, an eccentric on the pin, an eccentric strap connected to the pump plunger and a detent engaged with the eccentric for retaining it in either of two 180° opposite positions relatively to the strap to enable the stroke of the plunger

to be increased temporarily upon the presence of gas in the pump after the machine has lain idle for a substantial period of time.

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