Dec. 9, 1941. G. L. SUMMERS ET AL 2,265,678

SEWING MACHINE

Filed Jan. 12, 1939 5 Sheets-Sheet 1

Fig. 1

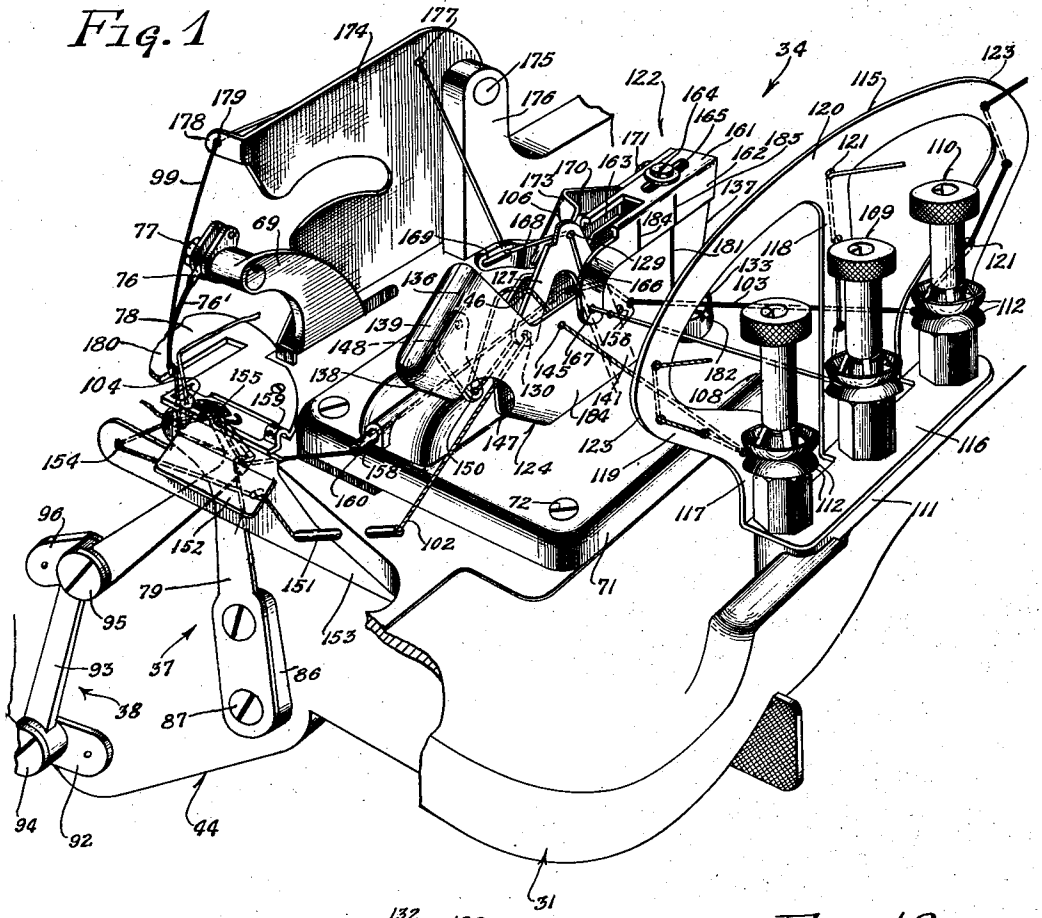


Fig. 11

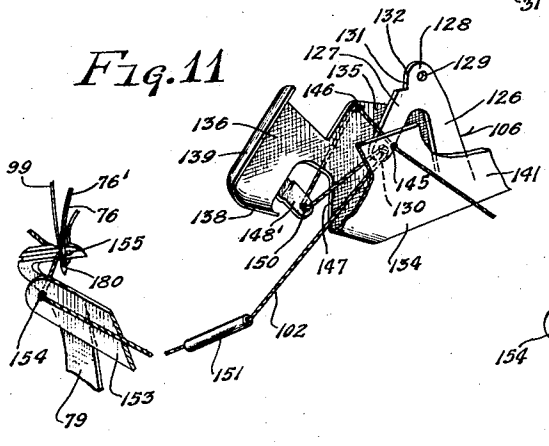
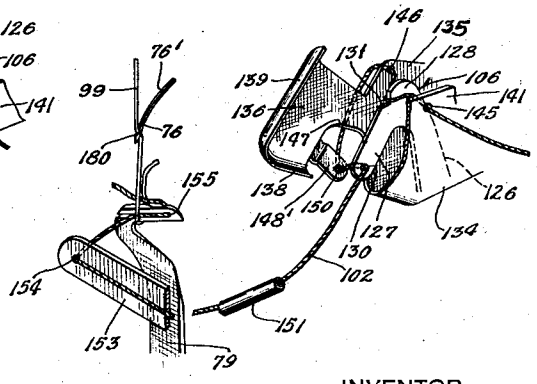


Fig. 12



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SEWING MACHINE

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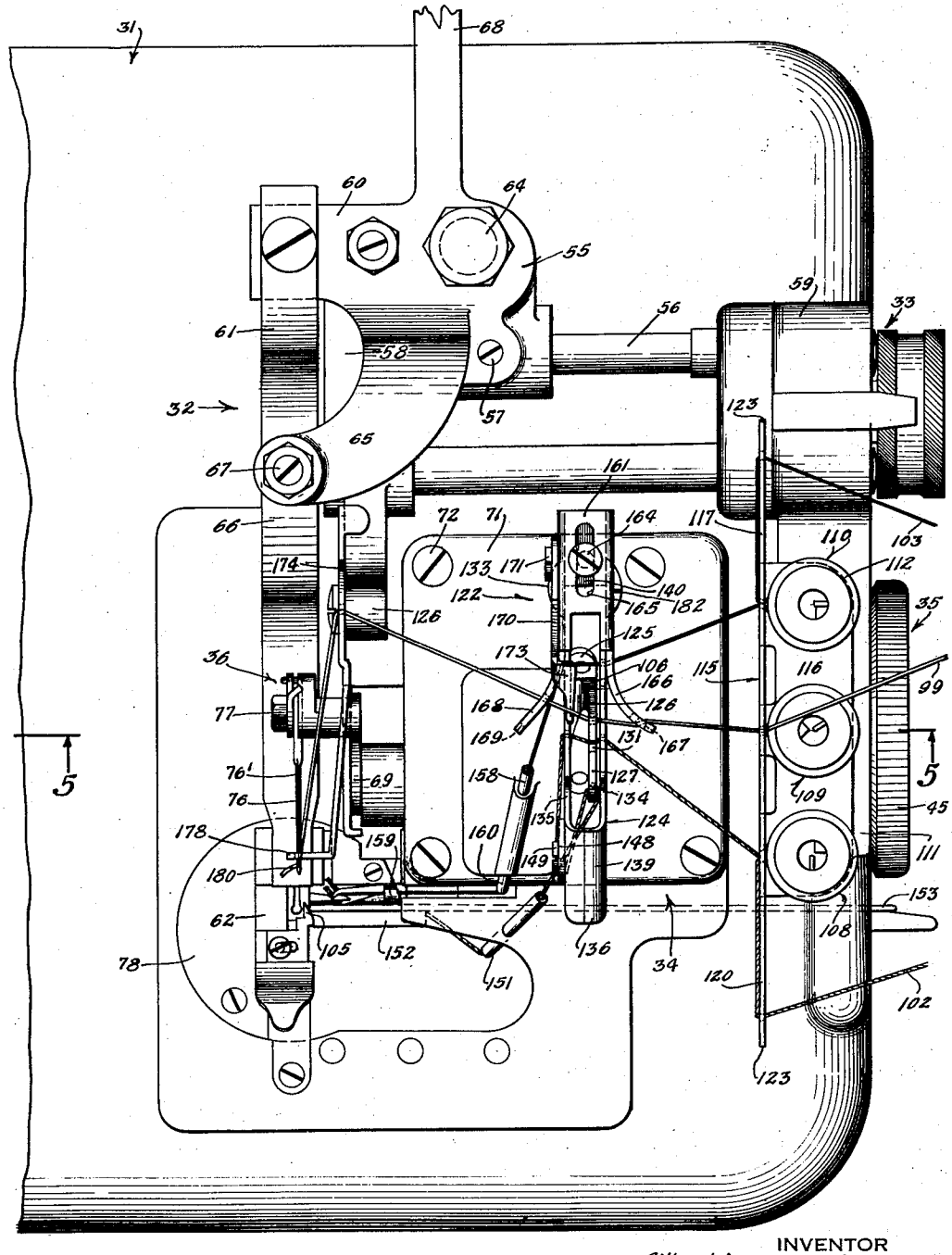


FIG. 2

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SEWING MACHINE

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Fig. 3

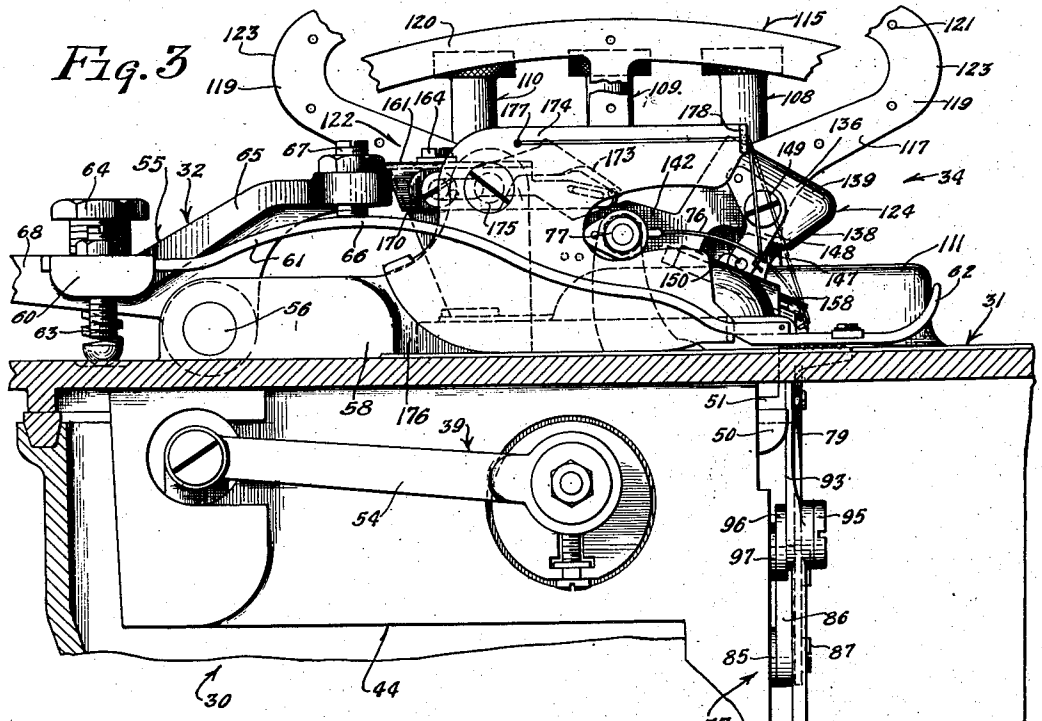
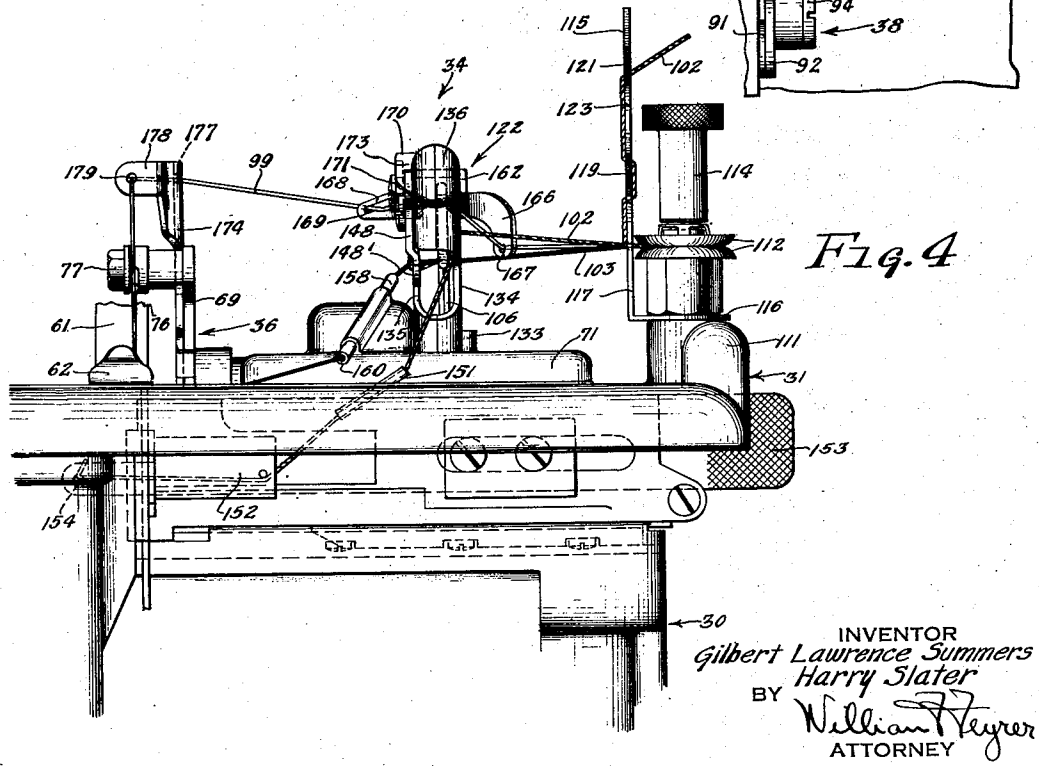


Fig. 4



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SEWING MACHINE

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Fig. 5

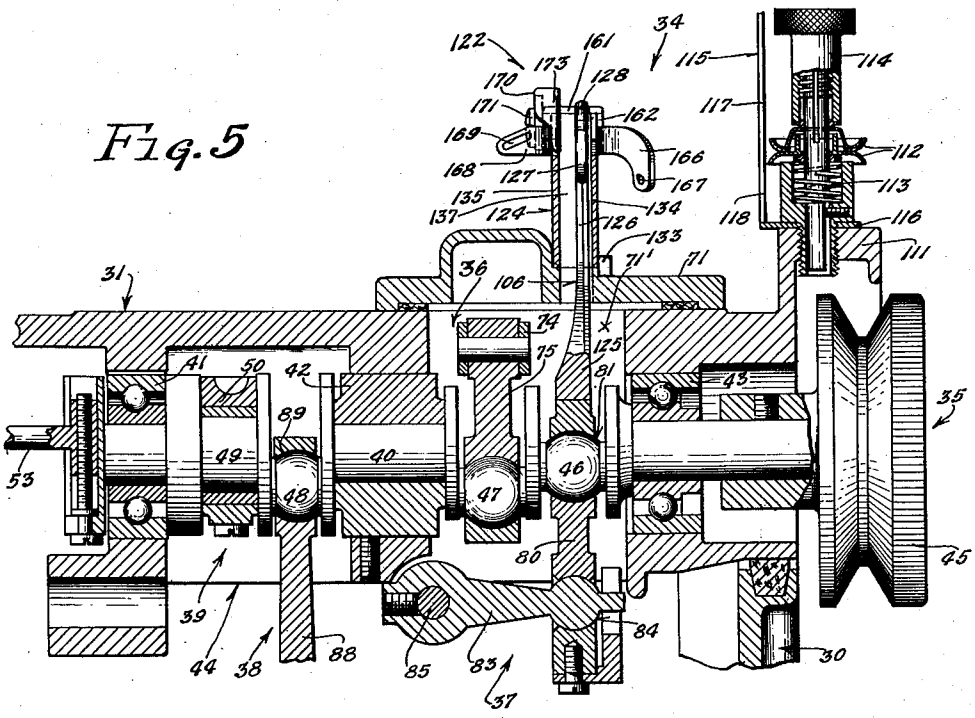


Fig. 7

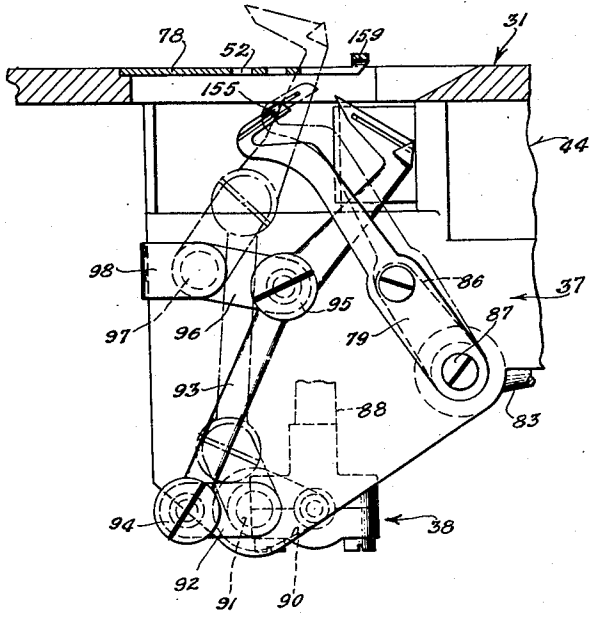
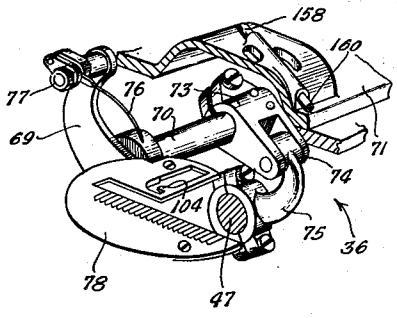


Fig. 6



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SEWING MACHINE

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Fig. 8

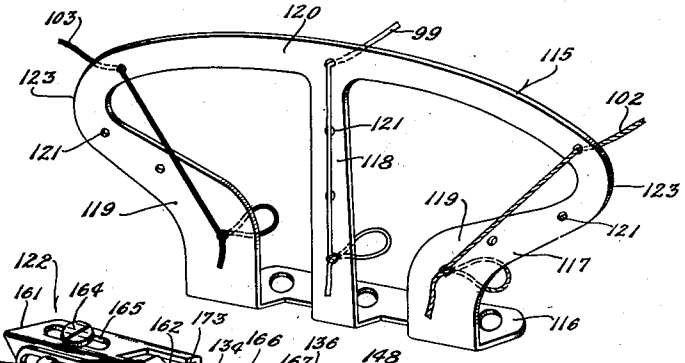


Fig. 10

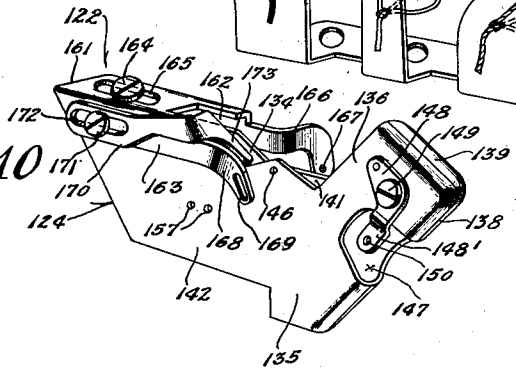


Fig. 13

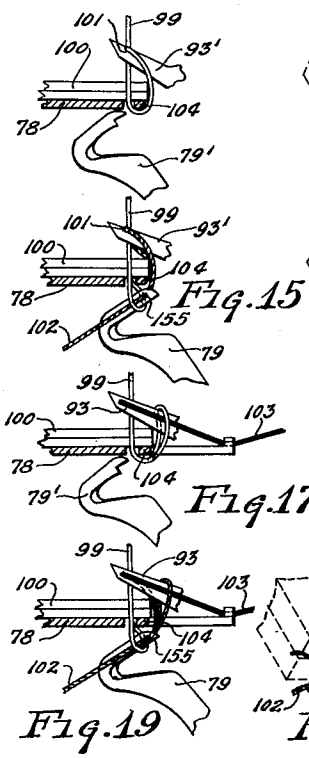


Fig. 14

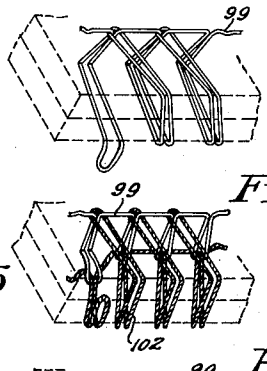


Fig. 9

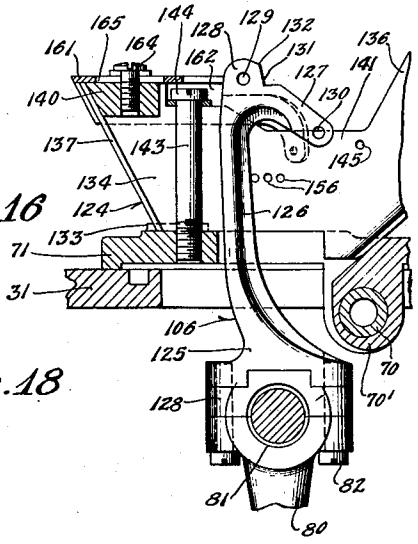


Fig. 15

Fig. 16

Fig. 17

Fig. 18

Fig. 19

Fig. 21

Fig. 20

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Patented Dec. 9, 1941 2,265,678

UNITED STATES PATENT OFFICE

2,265,678

SEWING MACHINE

Gilbert Lawrence Summers and Harry Slater, Nottingham, England, assignors to Willcox & Gibbs Sewing Machine Co., New York, N. Y., a company of New York

Application January 12, 1939, Serial No. 250,458
In Great Britain November 19, 1938

12 Claims. (Cl. 112—162)

The present invention relates to improvements in thread-handling devices for sewing machines, particularly over-edge sewing machines.

More especially, the present invention relates to improvements in machines of the type described and shown in United States Patent No. 2,157,369 and the divisions thereof.

It is one of the objects of the present invention to provide an improved overedge sewing machine which is capable of being used to form single-, double-, and triple-thread overedge seams, and also different types of double- and triple-thread seams.

It is a further important object of the invention to provide a simple mechanism for controlling the various threads supplied to the sewing mechanism of such a machine to permit operation thereof at very high speeds, and to prevent snarling, whipping and knotting of the threads during such operation.

Another object of the invention is the provision of an overedge sewing machine with highly efficient common thread-handling means for controlling all of the threads supplied to the sewing mechanism.

It is another object of the invention to provide simple means for setting the sewing mechanism to form either single-, double- or triple-thread overedge seams, and also means for adjusting the thread-handling and -guiding means relative to each other to vary the type of double- or triple-thread seams in a quick and easy manner.

Features of the invention are the provision of a single movable member of improved construction which: controls all of the threads supplied to the needle and loopers; is moved in at least two directions and operates upon at least one thread in both directions; operates at least upon the needle thread in two directions of movement and upon at least one looper thread in at least one direction; takes up or tensions at least one of the threads in both directions of movement; and pulls off new thread from the supply during a part of its movement in one direction.

Further objects, features and advantages will appear from the following detailed description of the invention and the drawings, in which:

Fig. 1 is a fragmentary perspective view of an overedge sewing machine according to the invention.

Fig. 2 is a plan view of the machine shown in Fig. 1.

Fig. 3 is a fragmentary side view, seen from the left of Fig. 2.

Fig. 4 is a fragmentary front view of the machine shown in Fig. 1.

Fig. 5 is a fragmentary cross-section along line 5—5 of Fig. 2.

Fig. 6 is a perspective detail view of the needle-operating mechanism.

Fig. 7 is a fragmentary front view of the lower and overedge loopers.

Fig. 8 is a perspective view of the guide for controlling the threads intermediate the supply and the tensions.

Fig. 9 is a detail view of the movable take-up finger according to the present invention.

Fig. 10 is a perspective view of the stationary thread-controlling and -guiding means which are associated with the movable take-up finger.

Fig. 11 is a diagrammatic view showing one stage of the operation of the take-up finger.

Fig. 12 is a view similar to Fig. 11 and showing another stage in the movement of the take-up finger.

Fig. 13 is a fragmentary detail view of the loopers used for forming a single-thread overedge seam.

Fig. 14 is an enlarged view of the single-thread overedge seam formed by the machine of the present invention.

Fig. 15 is a detail view of the loopers provided by the present invention to form a double-thread overedge seam.

Fig. 16 is an enlarged view of one form of double-thread overedge seam.

Fig. 17 is a view similar to Fig. 15 but shows a modified looper arrangement for forming a slightly different type of double-thread seam.

Fig. 18 is an enlarged view of the modified form of double-thread seam.

Fig. 19 is a fragmentary view of the main form of loopers used with the present invention for forming triple-thread overedge seams.

Fig. 20 is an enlarged view of one form of triple-thread overedge seam formed by the present invention.

Fig. 21 is a view similar to Fig. 20 and shows a modified form of triple-thread overedge seam formed by the present invention.

Before describing the present improvements and mode of operation thereof in detail it should be understood that the invention is not limited to the details of construction and arrangement of parts shown in the accompanying drawings, which are merely illustrative of the present preferred embodiments, since the invention is capable of other embodiments, and the phraseology

employed is for the purpose of description and not of limitation.

As previously indicated, the present invention relates to specific improvements in an overedge sewing machine of the type disclosed in United States Patent No. 2,157,369 and the divisions thereof, and various elements of such a machine, such as for example the trimming, presser, feeding and lubricating mechanisms and their driving connections with the main drive shaft are omitted wholly or in part from the following detail description and the drawings to clarify the thread-handling mechanism of the present invention.

The overedge sewing machine embodying the present invention comprises a main frame **30** of substantially boxlike structure having an open top. A work plate **31** is pivotally secured to the main frame **30** to close said open top and may be locked to the main frame by any suitable mechanism. The work plate **31** on its upper side supports a presser device **32** including a presser device shifter **33**, and thread-handling mechanism **34** including thread-tensioning, take-up control and -guiding means, and [illegible] supports a main [illegible]

upon the material may be regulated to various extents.

An arm **68** extending rearwardly of the carrier block **55** is provided to lift the presser foot into an inoperative position relative to the work plate **31**, and for this purpose arm **68** may be connected to any usual type of foot treadle mechanism.

A suitable mechanism **33** may also be provided for shifting the presser device **32** laterally relative to the line of stitching and feed, so that overedge seams of various widths may be obtained.

Although the present invention has been described with reference to the particular pressing and feeding mechanisms **32** and **39**, respectively, shown in the drawings, any other suitable pressing and feeding mechanisms may be used in place thereof.

Needle-operating mechanism

The needle-operating [illegible] particularly in [illegible]

Figs. 5 and 7 comprise a lower looper mechanism 37 and an overedge looper mechanism 38 the latter having a retracted position under the work plate 31, shown in full lines in Fig. 7, and an advanced operating position above the work plate and the materials being sewed, as shown in dot-and-dash lines in Fig. 7. These looper mechanisms, cooperating with the needle 76, are capable of forming a single-, double- and triple-thread seam, (United States "Federal Specification for Stitches, Seams, and Stitching", Type 501, 502, 503, 504 and 505), shown in Figs. 14, 16, 18, 20 and 21, respectively. However, as described hereinafter, the proper formation of these various stitches also depends in a large measure upon the operation and adjustment of the thread-handling mechanism 34, including thread-tensioning, take-up, control and guiding mechanisms according to the present invention. Since the accompanying drawings illustrate primarily the mechanisms for forming triple-thread stitches (Figs. 20 and 21), these mechanisms will be described first.

The lower looper mechanism 37 comprises a crank arm 80 pivotally mounted at its upper end on crank 46 of the main drive shaft 45 by means of a ball and socket joint 81 secured together by screws 82 (Fig. 9). A laterally extending arm 83 is connected to the lower end of crank arm 80 by a ball and socket joint 84, and secured to a shaft 85 which, in turn, is pivotally mounted in a suitable bearing on the depending housing 44. A looper carrier arm 86 is likewise secured to shaft 85, thus with arm 83 forming a bell crank lever which is adapted to pivot about the axis of shaft 85. The lower looper 79 is secured to the carrier arm 86 by screws 87 and may thus be easily exchanged for another or differently shaped looper if the size of the thread, the type of materials being operated upon, the type of stitch desired, or other factors make such change desirable.

The overedge looper mechanism 38 comprises a crank arm 88 which is mounted at its upper end by means of a ball and socket joint 89 on the crank 48 of the main drive shaft 40, and is pivotally connected at its lower end to a lateral arm 90 mounted on a shaft 91 which is pivotally mounted in a suitable bearing on the depending housing 44. A looper carrier 92 is likewise secured to shaft 91 and is pivotally connected to the lower end of overedge looper 93 by a screw 94. Intermediate its length, looper 93 is further pivotally connected by a screw 95 to a crank arm 96 which, in turn, is adapted to pivot about a shaft 97 secured to the depending housing 44 by a strap 98. This mechanism imparts to the overedge looper 93 both a vertical and oscillatory movement so that when the crank 48 is in the uppermost position, the looper carrier 92 is moved into its lowest position whereby the looper 93 is placed entirely below the work support 31 and the materials being sewed, as shown in full lines in Fig. 7.

If, on the other hand, the crank 48 is rotated to the lowermost position, the looper is lifted to a point above the work plate 31 and then counterclockwise movement is imparted to the looper 93 about shaft 97 to move the thread-carrying point of the looper 93 over the upper surface of the material to co-operate with the needle 76 in a well-known manner.

In general, and depending upon the type of seam desired, the lower looper mechanism 37 may carry a hook-type looper 79', as shown in Figs. 13 and 17, or carry an eye-type looper 79, as shown particularly in Figs. 7, 15 and 19. Similarly, the overedge looper mechanism 38 may carry a hook-type overedge looper 93', as shown in Figs. 13 and 15, or an eye-type overedge looper 93, as shown particularly in Figs. 7, 17 and 19. The main body section of all the loopers and structure for supporting and driving the same is alike, the only difference being in the shape at the top end as illustrated. A change-over from one type of looper to another may be easily accomplished in the case of the lower looper by removing the screws 87, and in the case of the overedge looper by removing the pivot screws 94 and 95.

When the loopers 79' and 93' of a hook-type (Fig. 13) are used, and a thread 99 is carried through the work 100 by the needle 76, the lower hook-type looper 79' catches the needle loop, carries it to the edge of the material where the overedge hook-type looper 93' catches it in the notch 101 during its upward movement and during retraction of the lower looper 79' to carry it into the path of the needle to form the stitch type 501, as shown in Fig. 14.

When the eye-type lower looper 79 and a hook-type overedge looper 93' (Fig. 15) are used, the lower looper 79 and a lower looper thread 102 are passed through the loop of the needle thread 99, whereupon the notch 101 of the overedge looper 93' catches the lower looper thread to carry it upwardly over the edge of the work and into the path of the needle to form the double thread seam, type 502, clearly illustrated in Fig. 16.

When a lower hooked looper 79' and an overedge eye-type looper 93 (Fig. 17) are used, the lower looper 79' catches the loop of the needle thread 99 and carries it to the outer edge of the work 100 where the overedge looper 93 carrying an upper looper thread 103 passes through the needle loop upwardly over the work and into the path of the needle which, as it passes into the work, catches and holds the looper thread 102 to form the overedge seam, type 503, shown in Fig. 18.

Three-thread seams are formed by the lower eye-type looper 79 and the overedge eye-type looper 93 (Fig. 19). The lower looper 79 catches the loop of the needle thread 99, carries its own lower looper thread 102 to the edge of the work 100 where the overedge looper, while carrying its own upper looper thread 103 over the work to be engaged by the needle, passes through the lower looper thread 102. By suitable adjustment of the thread-handling mechanism 34 the three-thread seams, type 504 or 505 of Figs. 20 and 21 respectively, may be formed.

If desired, a horn 104 on the plate 78 may also be provided to assist in forming the stitches, as shown in Figs. 6, 13, 15, 17 and 19. Furthermore, a second horn 105 may be provided on the presser foot 62 (Fig. 2) to overlie and complement the lower horn 104. One or both of these horns 104 and 105 may, however, be omitted, or modified in size and shape, if the material to be sewed possesses sufficient body or stiffness to hold the loop, or if any other reasons make such omission or modification desirable.

Thread-handling mechanism

Ordinarily, the threading of an overedge sewing machine and especially one in which three threads are used, is a difficult operation. The operating parts of many of these machines

known prior to this invention are at such inaccessible and awkward places that the various threads must be passed through divers paths changing their general direction frequently and increasing the difficulty of properly threading the needle and loopers.

Furthermore, in overedge sewing machines operating at extremely high speeds, there is considerable danger that the threads in passing from the supply through the thread take-up and guiding means and to the needle and loopers are either easily strained to an impermissible extent, or that excessive slack is formed in the threads which may result in whipping, tangling, kinking, or knotting thereof. Both such excessive tension and slack in the threads usually cause improper feeding of the thread to the needle and loopers, inaccurate and irregular formation of the stitches, and frequent breakage of the threads and of the needle.

The thread-handling mechanism **34** of the present invention includes various new features differing both in principle and structure from thread-handling mechanisms of somewhat similar outward appearance as suggested prior to this invention. The new mechanism is unusually efficient in operation and overcomes all of the above-mentioned disadvantages very effectively. Particularly, the various elements of this mechanism **34** are so positioned and constructed that the machine may be easily threaded, the paths and the movement of all the threads may be easily observed and adjusted for proper tensioning and slack control, so that tangling and breaking of the threads may be practically avoided.

For obtaining these advantageous results, it is of particular importance, according to the present invention, that a single movable, take-up finger **106** be provided for controlling all of the threads, which acts upon both the needle and looper threads in both directions of its movement. It is further of importance for the proper control of the lower looper thread **102** that the movable take-up finger **106** is provided with a plurality of thread-engaging portions, that one portion engages the looper thread at all times and that the take-up finger cooperates with a stationary element in such a manner that another portion of the take-up finger **106** engages the looper thread only during a part of its movements.

Considering the thread-handling mechanism **34** more in detail, it will be seen from the drawings that a battery of thread-tension devices **108**, **109** and **110** for the lower looper, needle and overedge looper threads **102**, **99** and **103** respectively, are secured to an upstanding flange **111** of the work plate **31** at the right side end thereof. These tension devices may be of customary construction and each includes a pair of discs **112** which are yieldingly urged toward each other by suitable spring means **113** the tension of which may be adjusted by an adjusting screw **114**.

For guiding the threads **102**, **99** and **103** from a suitable source of supply to the tension discs **112** and for exerting a snubbing action upon the threads to prevent yanking thereof through the tensions, there is provided a stationary thread guide **115** having a base **116** which is secured by means of tensions **108**, **109**, **110** to the flange **111**. A vertical, substantially oval or loop-shaped upright **117** on base **116** is closely spaced from tensions **108**, **109** and **110** and comprises a central arm **118**, a pair of side arms **119** which are curved outwardly relative to arm **118**, and a curved top arm **120** connecting the side arms **119** with the upper end of central arm **118**. Series of thread eyes **121** are provided in each of the central and side arms **118** and **119** through which the looper and needle threads **102**, **99** and **103** may be passed. By threading the respective threads either only through the upper and lower eyes **121**, as shown in Fig. 8, or through all of the eyes as shown in Fig. 1, different degrees of friction or snubbing action may be exerted upon the threads. After passing through the lower eyes **121**, the threads are looped around the tensions **108**, **109** and **110**, respectively, in the usual manner and are then returned through the same lower eyes **121** and directed toward the take-up and tensioning unit **122**.

By forming the thread guide **115** for the various threads as a single element and by making the same of substantially oval or loop shape, as shown in the drawings, the danger of entanglement of the threads with the guide is avoided. Even if during feeding, the threads should whip considerably and consequently loop about the outer ends **123** of the guide **115**, such loops will immediately slide off the guide and disappear because of the curved shape of the guide.

The take-up and tensioning unit **122** comprises a movable take-up and control finger **106**, and a normally stationary guide member forming a casing **124** surrounding the take-up finger **106**, as shown particularly in Figs. 1, 2, 4, 9 and 10. The take-up finger **106** which comprises a base **125** and a substantially vertical upright **126**, which terminates into an angular forwardly extending arm **127**, is fixedly mounted by the screws **82** on the top bearing cap **128** of the ball and socket joint **81** which connects the crank arm **80** of the lower looper mechanism **37** to the crank **46** of the main drive shaft. Consequently, the reciprocating movement of the take-up finger **106** is identical with the movement of crank arm **80** and in direct timed relation with the lower looper **79**.

Take-up finger **106** is provided substantially at its upper end or apex **128** with a thread eye **129** for operating upon the needle thread **99**. Furthermore, for operating upon the lower looper thread **102**, take-up finger **106** is provided with a second thread eye **130** at the free end of the arm **127**, and a thread-engaging notch **131** in the rounded upper edge **132** of the arm **127** near the apex **128**.

The stationary guide casing **124** which surrounds the reciprocating take-up finger **106** is mounted on the top housing **71** intermediate upwardly projecting portions **133** thereof which forms a guide-way for preventing lateral movement of casing **124**. As shown in Figs. 1, 2, 4, 9 and 10, the latter comprises right and left side walls **134** and **135** respectively, having a diagonally upwardly projecting forward portion **136** and an upwardly projecting rear portion **137**, front and top walls **138** and **139** on said forward portion, and a solid top portion **140** connecting the upper ends of the rear portion **137** of side walls **134** and **135**.

As shown particularly in Figs. 9 and 10, the central portions **141** and **142** of side walls **134** and **135** are recessed at their upper edges relative to the forward and rear portions **136** and **140**. A screw **143**, the head **144** of which rests on the upper edges of the recessed portions **141** and **142** of side walls **134** and **135**, is inserted between

these side walls and threaded into the top housing 71. Thus, the entire guide casing 124 may be adjustably secured in various positions forwardly or rearwardly of top housing 71 by the single screw 143. Thread eyes 145 and 146 for the lower-looper thread 102 are provided in central portions 141 and 142 near their upper edges for accommodating and guiding the lower looper thread 102 from its tension 108 through the eye 145 in the right side wall 134, then over the rounded upper edge of arm 127 of the take-up finger 106, and then through the eye 146 in the left side wall 135. As indicated in Fig. 11, the relative position of eyes 145 and 146 is such that the lower looper thread extends in a substantially straight line from its tension 108 through these eyes when the take-up finger 106 is substantially at the end of its rearward movement.

An aperture 147 is provided in the forward end of the casing 124 substantially midway of the height of front wall 138, and a guide member 148 is adjustably secured by means of a screw 149 to the left side wall 135 above the aperture 147. This adjustable guide member 148 includes a downwardly extending arm 148' which is crooked so that its lower end which is likewise provided with a thread eye 150 for guiding the looper thread 102, is substantially in the same vertical plane as the left side wall 135. The position of the adjustable thread eye 150 relative to the eye 130 in the take-up finger 106 is such that these two eyes are substantially coaxial when the take-up finger 106 is in its most forward position, as shown in Fig. 12.

After passing through the eyes 145 and 146 in the side walls 134 and 135 of the casing, the lower looper thread 102 passes along the left side wall 135 and through the adjustable eye 150 and then through the eye 130 in the take-up finger 106. Thereafter, the looper thread 102 is directed through a guide tube 151 which is mounted on work plate 31 and extends therethrough; then in back of a guide plate 152 on a slide member 153 below the work plate 31; then through an eye 154 at the left end of slide member 153 and finally through the looper eye 155.

When in the operation of the machine the lower looper 79 starts forwardly, the take-up finger 106 moves backwardly, thereby positively drawing up the slack in the lower looper thread 102, as indicated in Fig. 1. After completing its backward stroke, the take-up finger proceeds forwardly, thereby releasing the looper thread 102, while the lower looper 79 continues its forward stroke. During this forward movement of the take-up finger 106, the upper edge 132 thereof contacts the lower looper thread 102 which is finally caught by the notch 131, as indicated in Fig. 12. Thereupon, while the lower looper 79 moves backwardly and the take-up finger completes its forward stroke and proceeds to move backwardly, the notch 131, the stationary eyes 145, 146 and 150, and the eye 130 in the take-up finger cooperate to take up and tighten the lower looper thread, to draw the latter about the overedge looper 93, and to draw off further thread from the supply through the tension 108.

After the take-up finger 106 has reached an intermediate position during its backward stroke in which the notch 131 is rearwardly of the eyes 145 and 146, the looper thread 102 is disengaged from and slips out of notch 131, as indicated in Fig. 1, after the lower looper 79 arrives at the end of its backward stroke and starts its forward movement.

A plurality of laterally spaced thread eyes 156 and 157 for the overedge looper thread 103 are further provided in side walls 134 and 135 in the rear of and slightly below the lower looper-thread eyes 145 and 146, respectively. By passing the thread 103 through one or another of these eyes 156 and 157 in each wall 134 and 135, the direction of the thread through the guide casing 124 as well as the position thereof relative to the movable take-up finger 106 may be adjusted to vary the amount of slack as well as the amount of feeding of the overedge looper thread 103 from its tension 110.

After passing through eyes 156 and 157, the overedge looper thread 103 passes forwardly and downwardly through a guide tube 158 mounted in the top housing 71. A further guide member 159 which is open toward the bottom is provided on the needle plate 78 and is located within a vertical plane passing through the forward end 160 of the guide tube and the overedge looper 93 as shown most clearly in Figs. 1 and 2. The purpose of guide member 159 is to guide thread 103 to the overedge looper when the same moves above the work plate 31 and the material to be sewed, to prevent the thread 103 from whipping, and to assist in taking up and drawing the overedge looper thread from its tension 110.

In the operation of the machine, the upright 126 of the take-up finger 106 acts at the end of its backward movement upon the overedge looper thread to take up its slack and draw the same from its tension 110, as indicated particularly in Fig. 1.

For guiding the needle thread 99 from its tension 109, relative to the take-up finger 106, and toward the needle 76, there is provided a guide element 161 of substantially inverted U-shaped cross-section which is mounted on the rear top portion 140 of the casing 124, so that its side arms 162 and 163 enclose the upper ends of the side walls 134 and 135 to prevent lateral shifting of member 161. The latter may be secured in various positions of adjustment longitudinally of casing 124 by means of a screw 164 passing through an elongated slot 165 in the central portion of the U-shaped member 161 and threaded into the top portion 140 of the casing 124. An outwardly curved and downwardly extending guide finger 166 projects forwardly from the right side arm 162 of the U-shaped member, and is provided with a thread eye 167 which is located within a vertical plane intermediate the eyes 145 and 156 for the lower and overedge looper threads 102 and 103, respectively. A second, likewise outwardly curved guide finger 168 projects forwardly from the left side arm 163 of the U-shaped member 161, and is provided with an elongated thread eye 169.

A further guide member or thread controller 170 for the needle thread 99 is adjustably mounted on the left side arm 163 of the U-shaped member 161 by a screw 171 passing through an elongated slot 172 in thread controller 170, and carries at its forward end a diagonally downwardly extending control finger 173 which is located in substantially the same vertical plane as the left side wall 135, and intermediate the take-up finger 106 and the left guide finger 168.

For guiding the needle thread 99 from the elongated eye 169 in guide finger 168 toward the needle 76, a guide plate 174 is mounted by means of a screw 175 on an upstanding projection 176 of the work plate 31 at the left side of

the top housing 71. A thread eye 177 is provided in the guide plate 174 near its upper edge and the rear end thereof. Guide plate 174 terminates at its forward end into an angular finger 178 likewise provided with a thread eye 179 which is located in a straight line with the groove 76' in the needle 76 so that when the needle is in a downward position the needle thread 99 is always located within the groove 76'.

After passing from its tension 109 through the eye 167 in the guide finger 166, then through the eye 129 in the take-up finger 106, and then through the elongated eye 169 in the left guide finger 168, the needle thread 99 passes through the eyes 177 and 179 in the guide plate 174 and toward the needle eye 180.

The relative position of eyes 167, 129, 169 and 177 is such that when the take-up finger 106 is in an intermediate position during its forward movement, the needle thread 99 is directed in a substantially straight path from its tension 109 to the eye 177.

For indicating the proper position of guide casing 124 relative to the tensions 108, 109 and 110, and particularly relative to the take-up finger 106, indicating lines or marks 181 and 182 are provided on the side wall 134 of guide casing 124 and on the upper surface of the corresponding projection 133 of the top housing 71. For adjusting the guide casing 124 to its proper position, after screw 143 has been loosened, the guide casing is moved forwardly or rearwardly intermediate the projections 133 to bring lines 181 and 182 into coincidence.

Furthermore, by adjusting the position of the needle thread eyes 167 and 169, and the thread controller 170 relative to the take-up finger 106, different types of stitches may be formed. For facilitating such adjustment, indicating lines 183 and 184 are provided on the side wall 162 of the U-shaped guide element 161. If the element 161 is adjusted, as shown in Fig. 1, so that the rear line 183 is in line with lines 181 and 182 on the guide casing 124 and on the projection 133, respectively, a regular overedge stitch is formed, while when the front line 184 coincides with lines 181 and 182, a box-edge stitch is formed.

The operation of the various elements of the sewing and thread-handling mechanisms of the present invention relative to each other is broadly as follows:

(1) As the needle 76 begins its downward movement, the take-up finger 106 concurrently moves from an intermediate position forwardly and pulls just enough needle thread 99 from the supply through the tension 109 to permit the needle eye 180 to reach its lowest position. This pulling of the needle thread 99 from the supply is completed when the take-up finger 106 reaches the end of its forward movement, just as the needle point 180 passes the overedge looper 93, and before the needle reaches the material.

Also, as the take-up finger 106 moves forwardly, the lower looper thread 102 is caught by the notch 131 (approximately at, or just prior to, the beginning of the downward movement of the needle), and as the take-up finger 106 continues its forward movement, and after the lower looper thread 102 has been engaged by the overedge looper 93, it takes up the slack in the thread of the receding lower looper 79, draws said thread tautly about the overedge looper, and pulls off new lower looper thread 102 from the supply through the tension 108.

(2) As the needle 76 approaches the bottom of its stroke while passing through the material, and begins its upward movement, the lower looper 79 moves forwardly, or in a clockwise direction, as viewed in Fig. 7, and passes through the needle loop. Concurrently, the lower looper thread slides out of notch 131 of the rearwardly moving take-up finger 106; however, since the lower looper thread is still engaged by the eye 130 of the take-up finger 106, the latter takes up the slack in the lower looper thread 102 during its continued rearward movement. Also, during such rearward movement, take-up finger 106 controls the slack in the needle thread 99, and as it approaches its rearmost position, it works against the overedge looper thread 103 to pull off a new supply of overedge looper thread for the next stitch. During the latter part of the rearward movement of the take-up finger 106, it lays the needle thread 99 over the thread controller 173 to pull up the needle thread 99 and thereby causes the needle thread to rise with the eye 180 of the needle; thus, overcoming kinking and twisting of the needle thread, and effectively preventing adversely drawing of the thread back and forth through the eye 180 of the needle. This close and effective control of the needle thread 99 occurs at a critical time in the formation of the stitch, and thereby insures a proper and uniform seam formation.

(3) As the needle 76 proceeds in its upward motion, leaving the material, lower looper 79 continues to move forwardly, the overedge looper 93 starts its forward or upward motion, and the take-up finger 106 likewise moves forwardly, thereby disengaging from the overedge looper thread 103 and releasing the lower looper thread, and the needle thread 99 which slides off the thread controller 173.

(4) Next, as the needle 76 continues to move backwardly and approaches the end of its upward movement, the lower looper 79 reaches the end of its forward stroke, the overedge looper 93 picks up the lower loop from the lower looper 79, while the take-up finger 106 continues to move forwardly still releasing the needle thread 99. Thereupon the cycle of movements of the various elements is repeated in the same manner as stated above.

By providing the novel thread-handling mechanism according to the present invention, the following advantages are obtained:

(A) During the descent of the needle:

(1) No strain is placed on the needle thread 99 until the needle eye 180 in its downward movement passes through a line drawn between the eye 179 at the forward end of the guide plate 174, and the point of the previous penetration of the needle 76 through the material.

(2) The needle thread 99 is pulled through the tension 109 before the loop is shed from the lower looper 79.

(3) No strain is placed on the needle thread 99 as the needle eye 180 passes the eye of the overedge looper 93 and engages the overedge looper thread 103.

(4) The needle 76 descends into the material with only sufficient thread to allow the needle eye 180 to reach its lowest position and without drawing further needle thread than necessary through the tension 109. In the meantime, the last loop which has been shed from the lower looper 79, is drawn up to the under-surface of the material, however, without tightening upon the

lower looper thread 102 to such an extent as to prevent a correct setting of the latter.

(B) During the ascent of the needle:

(1) As the needle 76 moves upwardly, the take-up finger 106 exerts just sufficient pull upon the needle thread 99 by moving the same along the thread controller 170 so as to cause the needle thread 99 in front of the needle 76 to travel at the same speed as the needle so as to keep the needle thread 99 within the groove 76' of the needle and to prevent the formation of a kink. This also causes the needle loop to be thrown out directly behind the needle 76, and the thread intermediate the needle eye 180 and the last stitch is sufficient to form an adequate needle loop by the time the point of the lower looper 79 has arrived at its loop-taking position.

(2) During the movement of the needle 76 towards the end of its backward stroke and movement of the needle eye 180 toward the rear of the line passing from the eye 179 in the guide plate 174 to the last point of penetration of the needle, the take-up finger 106 moves forwardly again so that all strains are fully removed from the needle thread.

(C) In the movement of the lower looper:

(1) A continuous supply of thread is provided for the lower looper 79 both before and during its advance through the loop in the needle thread 99, and no strain whatever is placed upon the lower looper thread 102 until after the same is engaged by the overedge looper 93.

(2) New lower looper thread is drawn by the take-up finger 106 from the supply through its tension 108 after the lower looper thread 102 has been engaged by the overedge looper 93 and before the latter starts to retreat.

(3) The strain in the lower looper thread 102 is relaxed sufficiently to allow the same to shed its loop from the overedge looper 93 without danger of its breaking thereby.

(4) The loop in the lower looper thread 102 sets very quickly between the moment of shedding of this loop from the overedge looper 93 and the descent of the needle 76 to its lowest position.

(D) In the movement of the overedge looper 93, sufficient thread is drawn through the tension 110 to provide that when the overedge looper 93 reaches the end of its upward stroke, the overedge looper thread 103, which is about to be engaged by the descending needle 76 is released from any strain.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

What we claim is:

1. In an overedge sewing machine having a sewing mechanism including a movable needle and at least one movable looper, and a feeding mechanism, the combination of only one movable take-up and control member for operating on threads to said needle and looper respectively; driving means for concurrently operating said sewing and feeding mechanisms and said take-up member; means associated with said take-up member for separately guiding said threads from a supply to said needle and said looper, said guiding means having first guide portions for said looper thread disposed at opposite sides of said take-up member and also having a second guide portion for said looper thread; a first means on said take-up member for operating on said looper thread, having a motion transverse relative to a line connecting said first guide portions, said motion and said first guide portions being so related and said first means being so formed that said first means engages said looper thread during only one phase of the movement of the take-up member to draw the looper thread from a thread supply and disengages from said looper thread during a second phase of the movement; and a second means on said take-up member having a motion relative to said second guide portion, for engaging said looper thread and tightening the same intermediate the sewing mechanism and the take-up member during the second phase of the movement of the latter.

2. An overedge sewing machine according to claim 1, comprising means on the one take-up member for acting on the needle thread in two directions of movement of the take-up member and on at least one looper thread in at least one direction.

3. An overedge sewing machine according to claim 1, including normally stationary means associated with the take-up member for taking up slack in the needle thread and being in engagement with the needle thread only during one phase of the movement of the take-up member.

4. An overedge sewing machine according to claim 1, in which the guiding means includes normally stationary guide portions at opposite sides of and adjacent the take-up and control member for guiding the needle thread relative to the take-up member; and normally stationary means intermediate the movable take-up member and normally stationary guide portion at one side of the take-up member for taking up slack in the needle thread.

5. An overedge sewing machine according to claim 1, including adjustable thread tensions intermediate the thread supply and the movable take-up member adapted with the take-up member to alter the form of stitch; and stationary means for controlling and guiding the threads intermediate the supply and the tensions.

6. An overedge sewing machine according to claim 1, including adjustable thread tensions intermediate the thread supply and the movable take-up member adapted with the take-up member to alter the form of stitch; stationary means for controlling and guiding the threads intermediate the supply and the tensions; and means for varying the friction exerted by the last-mentioned controlling means upon the threads.

7. An overedge sewing machine according to claim 1, including adjustable thread tensions intermediate the thread supply and the movable take-up member adapted with the take-up member to alter the form of stitch; stationary means for controlling and guiding the threads intermediate the supply and the tensions; and means on said stationary control means for preventing entangling of said threads about said control means.

8. An overedge sewing machine according to claim 1, including means on the take-up member for taking up slack in the needle thread during both movements of the take-up member and for positively drawing needle thread from the supply during only a part of said movements.

9. An overedge sewing machine according to claim 1, in which the first and second means on the take-up and control member are respectively a notch portion and an eyelet portion.

10. An overedge sewing machine according to claim 1, including a driving means for operating the sewing and feeding mechanism and the take-

up member and in which the driving means include a single drive shaft and in which the at least one looper is a lower looper; means on said shaft for producing a relatively slow short ascending stroke of the needle; and means on said shaft for producing a relatively long, quick needle-loop-taking stroke of the lower looper so that the latter slides freely and quickly through the needle-loop during the ascending stroke of the needle.

11. In an overedge sewing machine having a sewing mechanism including a movable needle and at least one movable looper, a feeding mechanism and driving means for operating said sewing and feeding mechanisms; only one movable take-up and control member of angular extent operated by said driving means so as to act upon threads supplied to said looper and needle, said take-up member having a notch in its upper edge near the apex thereof, and a thread-guiding aperture substantially at the free end thereof; a pair of stationary guide members adjacent and at both sides of said take-up member, having a pair of thread-guiding apertures substantially in line with each other and associated with the notch in said take-up member; and an adjustable normally stationary guiding element on one of said guide members spaced from the apertures in said guide members and associated with the aperture in said take-up member, one of the threads passing through said apertures in said guide members and being engaged by the notch in said take-up member during one phase of the movement thereof and being disengaged during the second phase of movement, said thread further passing through said adjustable guiding element and through the aperture in the take-up member and then to said sewing mechanism.

12. In an overedge sewing machine having a sewing mechanism including a movable needle and at least one movable looper, and a feeding mechanism, the combination of only one movable take-up and control member for operating on threads to said needle and looper respectively; driving means for concurrently operating said sewing and feeding mechanisms and said take-up member; means associated with said take-up member for separately guiding said threads from a supply to said needle and said looper, said guiding means having first guide portions for said looper thread disposed at opposite sides of said take-up member and also having a second guide portion for said looper thread; a notch portion on said take-up member for operating on said looper thread, having a motion transverse from one side to the other side of a line connecting said first guide portions for engaging said looper thread during only one phase of the movement of the take-up member to draw the looper thread from a thread supply and for disengaging from said looper thread during a second phase of the movement; and an eyelet portion on said take-up member having a motion relative to said second guide portion, for engaging said looper thread and tightening the same intermediate the sewing mechanism and the take-up member during the second phase of the movement of the latter.

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