Nov. 1, 1966 H. HERZ ET AL 3,282,234

SEWING MACHINE INCLUDING WORK FOLDING MEANS

Filed July 16, 1963

4 Sheets-Sheet 1

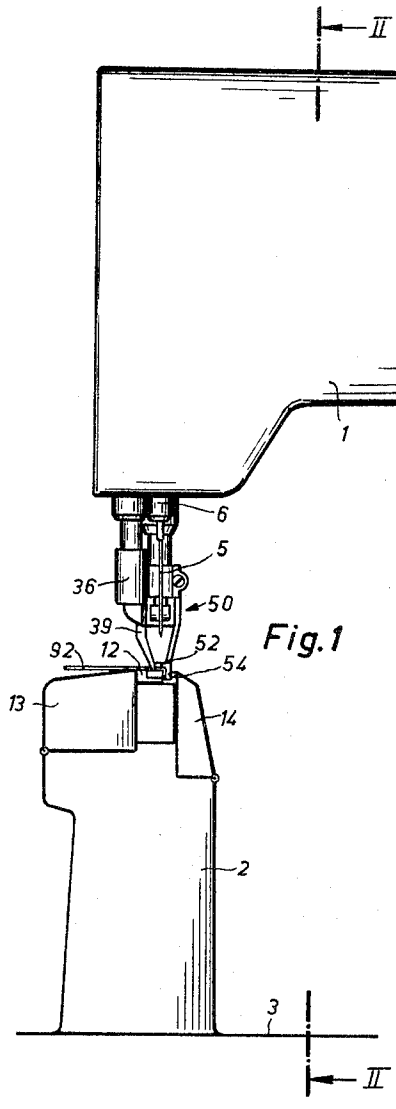


Fig. 1

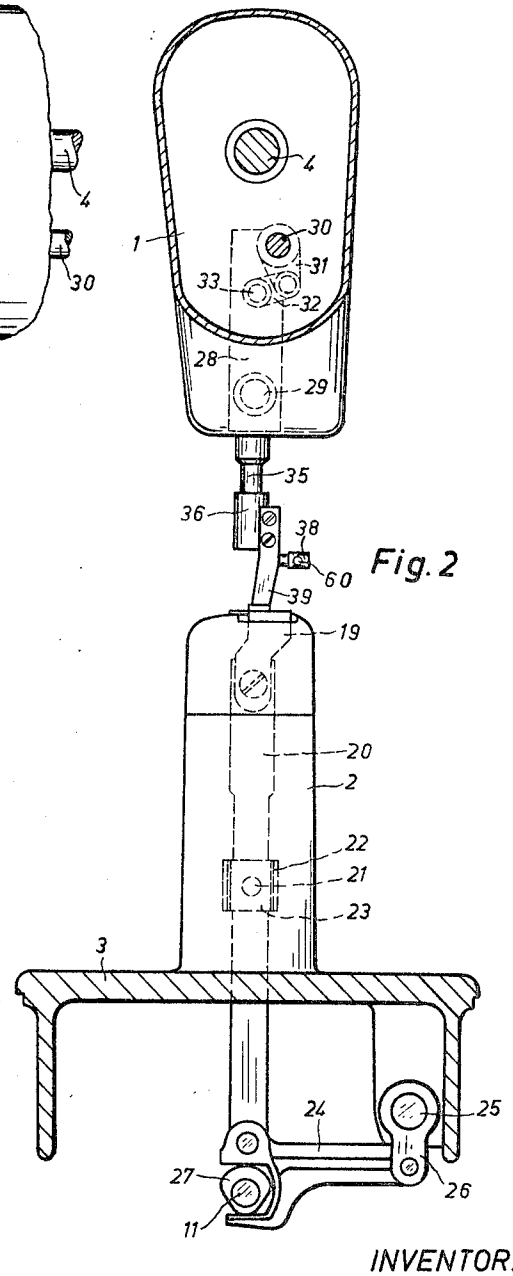


Fig. 2

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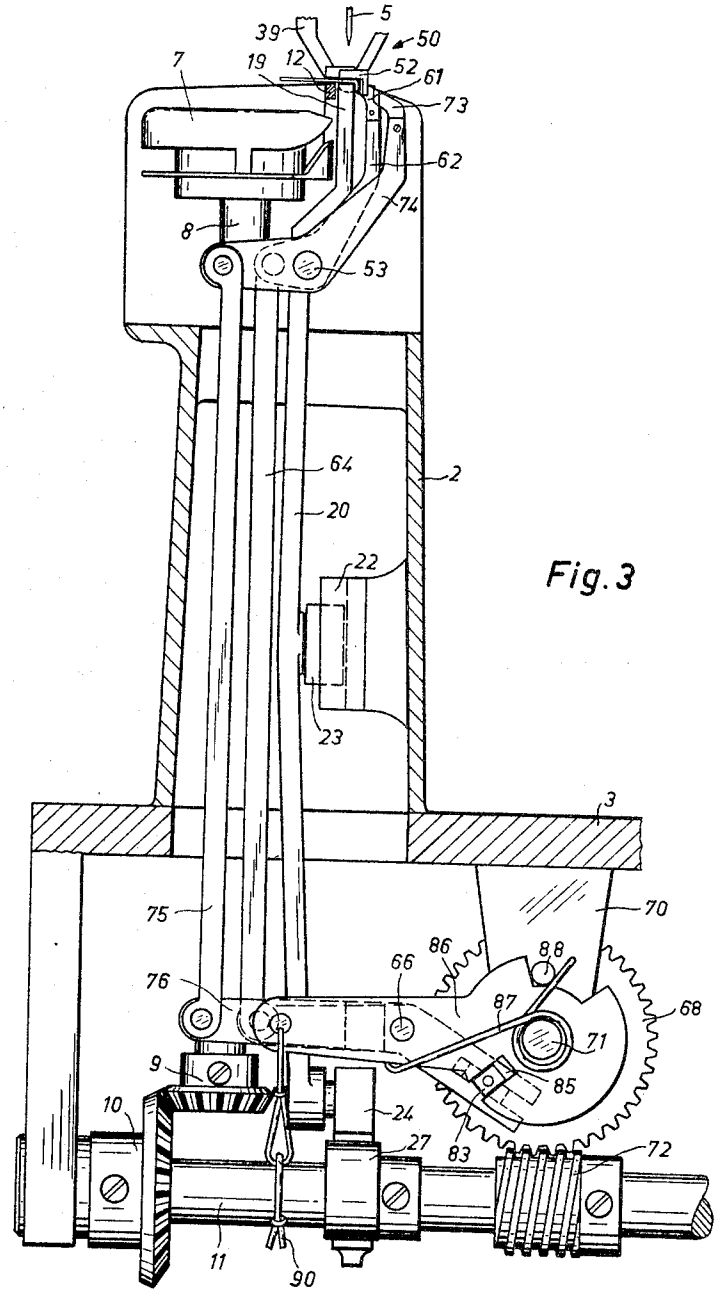


Fig. 3

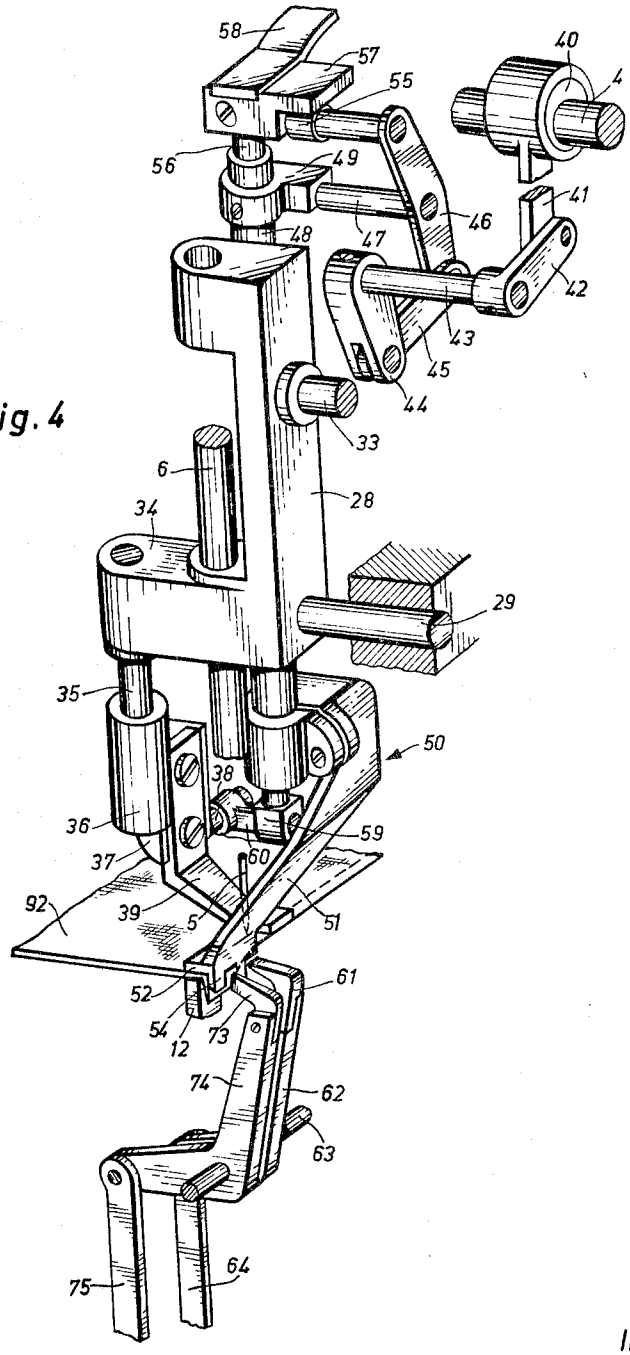
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Fig. 4



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Fig.5

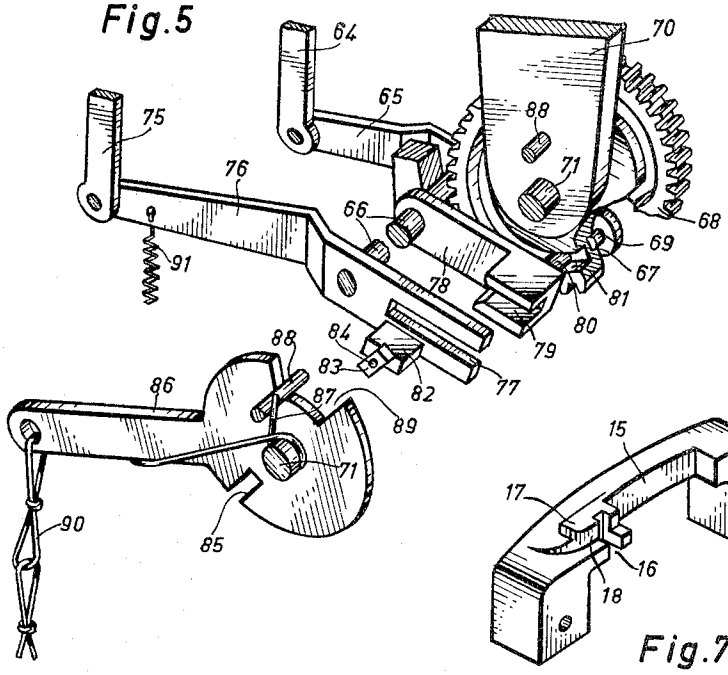
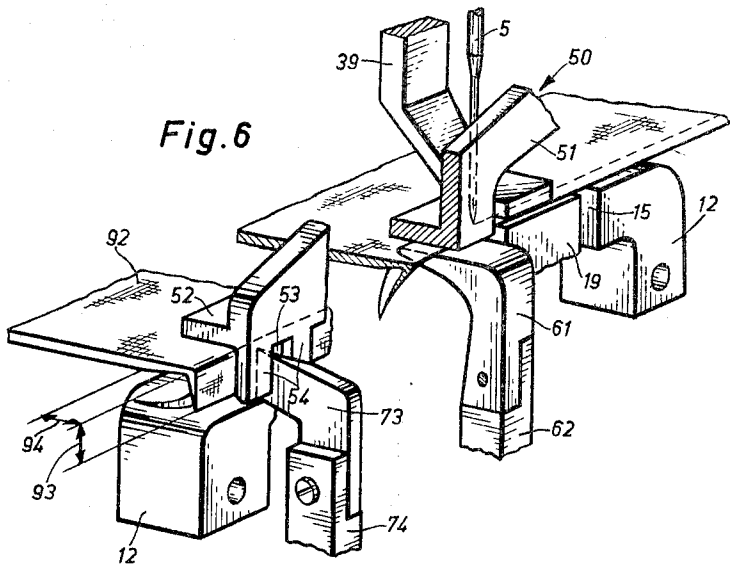


Fig.7

Fig.6



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SEWING MACHINE INCLUDING WORK FOLDING MEANS

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12 Claims. (Cl. 112—51)

The present invention relates to a combined work folding and sewing machine suitable especially, though not limitatively, for the finishing of the edges of shoe or bootleg parts or the like work pieces of leather or similar relatively stiff yet flexible material.

It has been customary heretofore to stitch or finish the edges of boot or shoe leg parts by means of separate steps of finishing operations, to prepare the parts for further use or processing. For this purpose, the work pieces having their edge zones pre-coated with a suitable glue or cement are introduced into a folding device, wherein the coated edge is bent upwardly by a folding levice about a presser plate acting as a guide during folding. Subsequently, the folded edge is seized and compressed by a hammer and anvil-like tool which, while still engaging the work piece is subjected a forward feed movement, in such a manner as to intermittently advance the work through the machine and to finish the same by fixing or securing the reversely bent edge by the glue or cement joint.

The work piece having been pre-finished is then fed to a separate sewing machine and the bent edge finally fixed or secured by a step stitch or the like seam produced in the ordinary manner by means of a conventional sewing operation. If desirable, this operation may be combined with the sewing of a lining or the like. The sewing of two cemented parts or pieces involves great difficulties in respect to assuring a smooth stitch formation and has the further drawback, among others, of the formation upon the underside of the seam of small loops by the upper thread known in the art as "little knots" according to shoe industry jargon. Despite extensive and costly experiments and attempts to overcome this defect, it has not been possible in the past to completely avoid "knot" formation positively and securely in practice.

Accordingly, among the objects of the present invention is the provision of improved sewing apparatus for the finishing of the edges of shoe leg parts or the like work pieces by which the prior and related difficulties are substantially overcome or minimized; by which the work pieces may be sewn or finished by means of a single operation or step in a most simple and expeditious manner; by which the appearance of the sewn pieces is greatly improved, especially as a result of the elimination of the "knots" of the upper thread resulting from previously known methods and techniques; and by means of which all the finishing operations including folding and stitching are performed by single integrated operation of a unitary processing device.

The invention, both as to the foregoing and ancillary objects as well as novel aspects thereof, will be better understood from the following detailed description of a preferred embodiment, taken in conjunction with the accompanying drawings forming part of this specification and in which:

FIG. 1 is a front elevation of a sewing machine embodying the improvements in accordance with the invention;

FIG. 2 is a sectional view taken on line II—II of FIG. 1 with the needle bar and work pressure foot being omitted from the drawing for clarity of illustration;

FIG. 3 is a sectional view of the work carrier and base of the machine shown by the preceding figures;

FIG. 4 is a prespective view of the upper stitch forming tools and work folding and feed means according to the invention with certain parts being shown broken away for better illustration;

FIG. 5 is a further and expanded perspective view of the drive means for the work folding and cutting devices;

FIG. 6 more clearly shows the operating parts of the folding and stitching mechanism in enlarged and expanded perspective view; and

FIG. 7 is a detailed perspective view of the special stitching plate forming part of the preceding figures.

Like reference numerals denote like parts or elements throughout the different views of the drawings.

With the foregoing objects in view, the invention involves generally the provision of a composite work folding and sewing machine embodying structurally and functionally combined work folding and stitch forming tools and comprising essentially a reciprocating needle and a loop taker cooperating therewith to produce stitches in a work piece being operated on. There is provided by the invention a special oblong or elongated stitching plate or work guiding bar disposed between said needle and loop taker and extending in the work feeding direction. Said plate or bar has lateral recess being traversed by the needle during operation and is engaged in a known manner by the base of the work presser foot or clamp, said base having a depending lateral extension forming a guide which overlies the lateral face of said plate or bar ahead of said recess in respect to the work feeding direction. As a consequence, a work piece having its edge partly folded may be fed or inserted in the angular passageway formed by said base bar or plate preparatory to final folding and stitching in the manner described presently. The work is fed in synchronism with the stitching operation preferably by the aid of upper and lower feed dogs or the like feed means being disposed behind the needle, as viewed in the work feeding direction, and intermittently engaging and advance the work within said recess, in the manner as will become more apparent from the following description. Disposed immediately ahead of the needle in respect to the work feeding direction and within said recess is an oscillating work folding lever or the like member also operated in synchronism with the needle or stitching operation and cooperating with the pressure foot base, to completely or finally fold or reversely bend the partly pre-folded edge of the work prior to the stitching thereof by said needle.

There is thus provided by the invention a composite and fully integrated folding and sewing mechanism eliminating the previous separate folding, cementing and pressing operations and enabling the edge of the work to be sewn or finished by a single and fully integrated and automatic operation efficiently and securely and substantially without any of the prior defects and drawbacks, including the objectionable upper thread "knots" mentioned hereinabove.

According to an improved feature of the invention, the folding lever may be preceded by an oscillating cutting knife being operated in rhythm with the needle, feed dog and folding means, to successively cut or slit the partly folded edge portion of the work prior to final folding and stitching, in an effort to facilitate the edge seaming or finishing of pre-curved parts or work pieces, in particular shoe or boot leg parts, in a manner as will become further apparent from the following detailed description of the drawings.

Referring to FIG. 1, there is shown a conventional sewing machine having an overhanging upper arm 1 con-

nected through an upright (not shown) with a base plate 3 supporting a pillar-like work carrier or support 2 in the example illustrated. Mounted within the arm 1 is a main drive or arm shaft 4 which serves to operate in a known manner a vertically reciprocating needle bar 6 carrying a needle 5. Cooperating with the needle 5 is a rotary loop taker 7, FIG. 3, mounted within the work support 2, to produce stitches in a work piece operated on, said loop taker being rotated in a known manner by a loop taker shaft 8 being in driving connection, by way of a pair of bevel gears 9 and 10, with a loop taker drive shaft 11. The latter may in turn be driven by the armshaft 4 through a chain and pulley transmission or the like (not shown), in a manner customary in the design and operation of conventional sewing machines.

Secured to the upper end of the work carrier 2, FIG. 1, is a stitching plate or bar 12 adjoining at one end a first cover 13 overlying the loop taker 7 and adjoining at its opposite end a further cover 14 overlying the stitch forming and folding tools also mounted within the carrier 2. The stitching plate 12, FIG. 7, which advantageously has the shape of an upwardly curved or vaulted bar extending in the work feeding direction and overlying in part the loop taker 7, is provided with a longitudinal lateral recess 15 preceded by a transverse slot 16 as viewed in the work feeding direction, the needle passing through said recess during operation. The portion of the bar 12 ahead of the recess 15 is shaped to provide a horizontal pressure plate or surface 17 being interrupted by a vertical ledge or shoulder 18 which extends in the work feeding direction and merges along a curve into the surface of the bar or plate 12, in the manner shown in the drawing. The purpose of the slot 16 will become further apparent as the description proceeds.

In order to advance the work, there is provided, behind the needle 5 in respect to the work feeding direction, a first (lower) feed dog 19, FIGS. 2, 3 and 6, projecting into the recess 15 and being secured to the upper end of a vertical pull rod 20, the latter carrying a pin 21 at its center rotatively engaging a slide block 23 movable within a guide which is integral with or secured to the carrier or support 2. Pin 21 acts as a pivot for the rod 20 which has its lower end arranged to be oscillated in the horizontal direction by a forked link 24 having one end pivoted to said rod and having its opposite end operated, by way of a crank 26 and a rockshaft 25, from the main drive shaft 4 of the sewing machine through suitable and well known motion-transmitting means (not shown). The vertical movement of the feed dog 19 is effected by means of an eccentric 27 mounted upon the loop taker drive shaft 11 and engaging the mouth or forked-shaped end of the lever 24. As a consequence, the feed dog 19 is intermittently operated through a closed vertical and horizontal path, to feed or advance the work in synchronism with the stitching operation. In the example illustrated, the lower feed dog 19 is supplemented by a combined upper feed being comprised of a second (upper) feed dog 39 to be described presently and means to oscillate the needle in the work feeding direction in synchronism with the feeding operation. For the latter purpose, the needle for 6, FIG. 4, is mounted within an oscillating frame or support 28 rotatable about a pin or pivot 29 which is journalled in the housing 1. Frame 28 is actuated by a rockshaft 30, FIG. 2, operably connected in a known manner with the drive of the rockshaft 25 of the lower feed dog 19, on the one hand, and which carries a crank 31 cooperating, by way of a link 32, with a pin 33 secured to the frame 28, on the other hand.

As more clearly shown by FIG. 4, frame 28 has an extension 34 which carries a depending guide rod 35 slidable within a tubular carrier 36. The latter has an extension 37 to which is secured a pin 38, on the one

hand, and to which is further secured, by screws or the like, the upper feed dog 39 cooperating with the lower feed dog 19 and being displaced in the horizontal direction by the needle frame 28.

The vertical movement of the feed dog 39 being derived from an eccentric 40 upon the armshaft 4, FIG. 4, is transmitted, by way of an eccentric rod 41 and a crank 42, to a rockshaft 43 mounted in the upper arm 1. Rockshaft 43 at its front end carries a crank 44 which is connected with one end of a double-arm lever 46 through a link 45, said lever being pivoted upon a shaft or pin 47 forming part of or extending transversely from a connecting or intermediate member 49 which is secured to a first tubular lifting rod 48.

Secured to the lower end of the lifting rod 48 is a work clamp or presser foot 50 having an extension 51 of such configuration and terminating in a presser foot base 52, whereby to cause said base to engage the surface 17 of the stitching bar 12, that is, at a position ahead of the upper feed dog 39 as viewed in the work feeding direction. The base 52 has a flat surface and is provided at its front with a depending lateral extension 54 forming a guide and being interrupted by a slot 53, as shown more clearly in FIG. 6 of the drawings. The rear part of the base 52 in part extends over the recess 15.

Lever 46 carries at the end of its upper arm a roller 55 which upon deflection by said arm towards its upper dead center position engages an intermediate member 57 secured to a further lifting rod 56, whereby to raise the latter against the action of a flat spring 58 engaging the member 57. Lifting rod 56 slides within the rod 48 and at its lower end carries a guide piece 59 enclosing a ball joint at the end of a link 60 which has its opposite eye-shaped and engaging the pin 38.

The roller 55 of the lever 46 in its lower dead center position is disengaged from the member 57, whereby to release said lever and in turn the lifting rod 48 and presser foot 50 from the pressure of the spring 58. As a consequence, the presser foot 50 remains in its lowered position, while the full pressure of said spring is applied to the upper feed dog 39 via the rod 56 and link 60.

Cooperating with the base 52 of the presser foot 50 is a work folding device or lever 61 being secured to the upper end of a bellcrank lever 62 which is pivoted upon a pin or axis 63 secured to the carrier 2. The remaining end of the lever 62 has linked to it a vertical pull rod 64 to the lower end of which there is in turn rotatively connected one end of a double-arm lever 65, FIG. 5. The latter which is pivoted upon a shaft or axis 66 secured to the housing has its opposite end fitted with a roller 69 arranged to engage a cam groove 67 of a wormwheel 68. The groove 67 is so shaped as to cause the folding lever 61 within the recess to oscillate in synchronism with the needle operation and in a direction transverse to the work feeding direction. For the latter purpose, the worm wheel 68 is mounted upon a shaft 71, FIG. 3, secured to a bearing 70 which is supported by the base plate 3, said wheel meshing with a worm 72 mounted upon the loop taker drive shaft 11.

Disposed ahead of the folding lever, as viewed in the work feeding direction, is an oscillating cutting knife 73 being secured to the upper end of a further bellcrank lever 74 also mounted upon the axis or shaft 63. The remaining end of the lever 74 is connected to a further vertical pull rod 75 having its lower end linked to one arm of a further double-arm lever 76 also being mounted upon the axis 66, FIG. 5. The remaining end of the lever 76 forms a guideway 77 being parallel to the lever 65 and extending over the front face of the worm wheel 68.

Disposed between the lever 76 and the worm wheel 68 is a one-arm lever 78 also supported by the axis 66 and being provided at its free end with a guideway 79 parallel to and facing the guideway 77 and having a length less than the length of the latter, a roller at said

free end engaging a further cam groove 81 in the front face of the worm wheel 68.

Mounted within the guideway 77 is a sliding block 62 of such a size as to project beyond said guideway and adapted to temporarily enter or engage upon displacement in the direction of guideway 77, the guideway 79 of lever 78. Displacement of the guide block 82 being rotatably connected with a further guide block 83 through a pin 84 is effected by means of a rotatively supported lever 86 provided with a guide groove or slot 85 engaging the block 83.

The operating lever 86 pivoted upon an axis 71 is normally urged, by means of a torsion spring 81 engaging said lever on the one hand and engaging a pin 88 secured to the bearing 70 on the other hand, to a position as to cause the guide block 82 to be disengaged from the guideway 79. Pin 88 extends through a recess 89 in the lever 86, to limit the extent of movement or rotation of said lever. A chain 90 or the like being secured to the free end of the lever 86 may be connected of a foot pedal or the like operating member for the control of the cutting knife, as will become more apparent from the following description of the operation of the invention as shown by the drawings.

While the sliding block 82 is disengaged from the guideway 79, the lever 76 is rotated in counterclockwise direction by the action of the spring 91, having one end engaging said lever and having its opposite end engaging the housing of the machine, until the sliding block 82 engages the inner end of the guideway 77, thus normally urging the cutting knife operated by the lever 76 and pull rod 75 to its disengaged position as shown in FIG. 4.

FIG. 6 more clearly illustrates the folding and stitching of the edge of a work piece 92, such as a boot leg or the like part, the edge zones of which have been advantageously sharpened or chamfered on the inside, in a manner well known. In operation, the work piece 92 is inserted with its outside surface pointed upwardly underneath the base 52 of the presser foot 50 in such a manner as to cause the outer partial edge zone 93 to be folded in the downward direction or through a substantial 90° angle, as shown in the drawing, by the depending guide or extension 54.

After the sewing machine has been set into motion in a known manner, the partial edge zone 93 of the work piece 92 is finally folded or reversely bent against the inner edge zone 94 by the folding lever 61 operated in synchronism with the needle 5 and feed dogs 19 and 39 to intermittently enter the recess 15 of the stitching plate or bar 12. As a consequence, the needle 5 and upper feed dog 39 engage the folded edge of the work from above while the lower feed dog 19 engages the work from below, to thereby advance the same by a stitching length, while at the same time the needle effects a stitch in the folded edge zone in cooperation with the loop taker 7. In other words, the edge zone 93, 94 of the work piece 91 is folded, compressed and stitched by a single and integrated operation, thus enabling the folding and stitching parts or tools to be mounted within a minimum of space and to facilitate the sewing of pre-bent or curved pieces or parts in a most simple and effective manner. To this aim, it is advantageous to effect transverse cuts or incisions in the partial edge zone 93 by means of the cutting knife 73, whereby the cut portions may be readily expanded or contracted during the ensuing folding and sewing operations.

For the latter purpose, a foot pedal (not shown) connected to the chain 90 may be depressed to rotate the lever 86 and with it the slide block 83 engaging the slot 85 in counterclockwise direction against the action of the spring 87. Slide block 83 in turn displaces the slide block 82 within the guideway 77 and in a direction radially outwardly of the lever 76, in such a manner as to cause the block 82 to engage the guideway 79 of the lever 78 being continuously oscillated by the cam 81 of the worm wheel 68 or, in other words, to couple the lever 76, operating the cutting knife 73 through the pull rod 75 and bellcrank lever 74, with its actuating lever 78. By the proper design of the groove 81, the operating rhythm of the knife 73 may be related with the sewing and feeding operations, in any desired manner such for instance by effecting a single cut or incision for each three stitches being sewn, or to achieve any other number or relationship to suit varying operating conditions or requirements.

At the transition from a curved edge to a straight edge of the work piece 91 the knife 73 may be simply disconnected by release of the pedal or equivalent control member, whereby the spring 87 causes the lever 86 to rotate in the clockwise direction and the slot 85 entraining the block 83 causes the disengagement of the block 82 from the guideway 79, thereby resulting in the interruption of the driving connection of the knife 73. At the same time, the spring 91 by rotating the lever 76 acts to retract the knife to its normal or inoperative position by way of the pull rod 75.

In the foregoing the invention has been described in reference to a specific illustrative device. It will be evident, however, that variations and modifications, as well as the substitution of equivalent parts or elements for those shown herein for illustration, may be made without departing from the broader scope and spirit of the invention as set forth in the appended claims. The specification and drawings are accordingly to be regarded in a illustrative rather than in a restrictive sense.

We claim:

1. The combination with a sewing machine having a reciprocating needle and a loop taker cooperating therewith to form stitches in a work piece being operated on, of a stitching plate between said needle and loop taker having a lateral recess in the direction of the work feeding movement, said needle passing through said recess during operation, a work presser foot having a base overlying said plate and a depending lateral extension forming a guide overlying the lateral face of said plate ahead of said recess as viewed in the work feeding direction, for introducing a work piece with its partly folded edge through the angular passageway formed by said plate and base, work feeding means synchronized with and disposed behind said needle in respect to the work feeding direction and adapted for operation into feeding engagement with the work within said recess, and oscillating work folding means also synchronized with and disposed ahead of and close to said needle, to intermittently engage and completely reversely bend, in cooperation with said plate, the partly folded edge of the work within said recess immediately prior to the stitching thereof by said needle.

2. The combination with a sewing machine having a reciprocating needle and a loop taker cooperating therewith to produce stitches in a work piece being operated on, of an elongated stitching plate between said needle and loop taker extending in the work feeding direction and having a lateral recess, said needle passing through said recess during operation, a work presser foot having a base overlying said plate and a depending lateral extension forming a guide overlying the lateral face of said plate ahead of said recess as viewed in the work feeding direction, for introducing a work piece with its partly pre-folded edge through the angular passageway formed by said plate and base, upper and lower work feeding means synchronized with and disposed behind said needle in respect to the work feeding direction and adapted for operation into engagement with and disengagement from the work within said recess, and an oscillating work folding lever also synchronized with and disposed ahead of and close to said needle in respect to the work feeding direction, to intermittently engage and to completely reversely bend, in cooperation with said plate, and the partly folded edge of the work within said recess immediately prior to the stitching thereof by said needle.

3. In a composite work folding and sewing machine as claimed in claim 2, including means to oscillate said needle in the work feeding direction in synchronism with said feeding means.

4. In a composite work folding and sewing machine as claimed in claim 2, said stitching plate having an upper surface being vaulted in the work feeding direction and including a flat horizontal portion at its work inlet end adjacent and parallel to said presser foot base.

5. In a composite work folding and sewing machine as claimed in claim 2, at least one inlet edge of the vertical portion of said angular passageway being provided with an outwardly curved extension.

6. In a composite work folding and sewing machine as claimed in claim 2, including an oscillating cutting knife having operating means to actuate the same synchronism with said needle, said feed means and said folding lever, to cause said knife to intermittently enter said recess at a point ahead of said folding lever in respect to the work feeding direction and to successively transversely slit the pre-folded edge of the work piece prior to its final folding by said lever, and control means to connect and disconnect said knife operating means.

7. In a composite work folding and sewing machine as claimed in claim 6, said knife having an operating rhythm being a fraction of the stitching rhythm of said needle, said feed means and folding lever.

8. The combination with a sewing machine having a reciprocating needle, a drive shaft therefor, a loop taker also driven by said shaft for cooperation with said needle to produce stitches in a work piece being operated on, of an elongated work-supporting stitching bar between said needle and loop taker, said bar extending in the work feeding direction and having a lateral recess and said needle passing through said recess during operation, a work presser clamp having a base overlying said bar and a depending lateral extension forming a guide overlying a lateral shoulder of said bar ahead of said recess in respect to the work feeding direction, for introducing a work piece with its partly folded edge through the angular passageway formed by said bar and base, upper and lower work feed dogs disposed within said recess behind said needle in respect to the work feeding direction, actuating means for said feed dogs operably connected to said drive shaft, to operate the same in synchronism to intermittently advance the work, and an oscillating work folding lever operably connected to said drive shaft for operation in synchronism with said needle and disposed ahead and close to said needle in respect to the work feeding direction, to intermittently engage and completely reversely bend, in cooperation with said presser clamp base, the partly folded edge of the work within said recess immediately prior to the stitching thereof by said needle.

9. In a composite work folding and sewing machine as claimed in claim 8, including further means to oscillate said needle in the work feeding direction whereby said needle acts as an additional work feed in synchronism with said feed dogs.

10. In a composite work folding and sewing machine as claimed in claim 8, including an oscillating cutting knife having operating means to actuate the same in synchronism with said needle, said feed dogs, and said folding lever, to intermittently enter said recess at a point ahead of said folding lever in respect to the work feeding direction, to successively transversely slit the prefold edge of the work piece prior to its final folding by said lever, and control means to connect and disconnect said knife operating means.

11. In a composite work folding and sewing machine as claimed in claim 10, said knife having an operating rhythm being a fraction of the operating rhythm of said needle, feed dogs, and folding lever.

12. In a composite work folding and sewing machine as claimed in claim 10, including common operating means for said folding lever and said cutting knife to derive separate oscillating motions for said lever and said knife, respectively, from said drive shaft, said last control means adapted to impart to and remove one of said motions from said knife operating means.

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