May 21, 1940. W. E. NICHOLS 2,201,449

SEWING MACHINE

Filed May 10, 1939 2 Sheets-Sheet 1

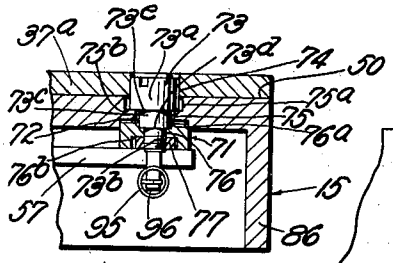

Fig. 2a

Fig. 1

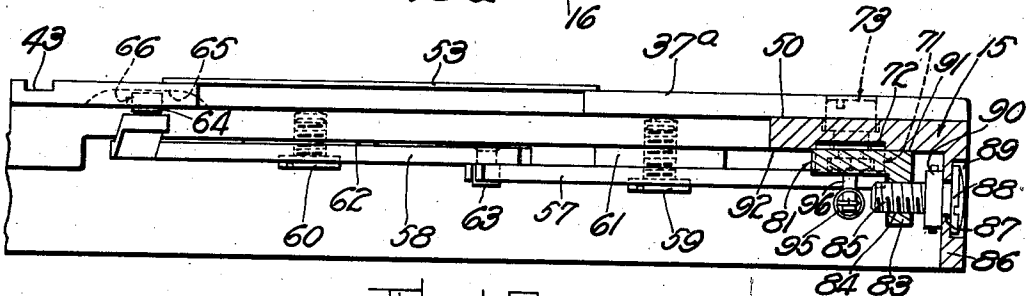

Fig. 2

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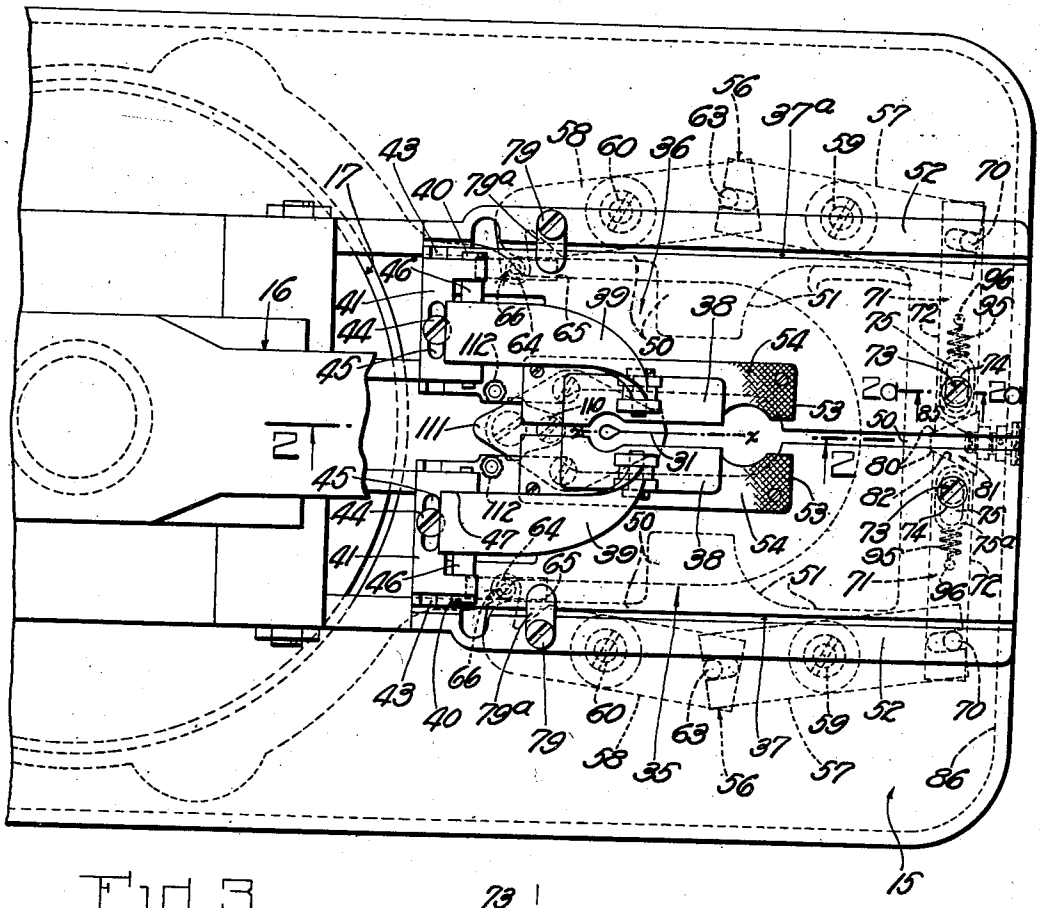

Fig. 3

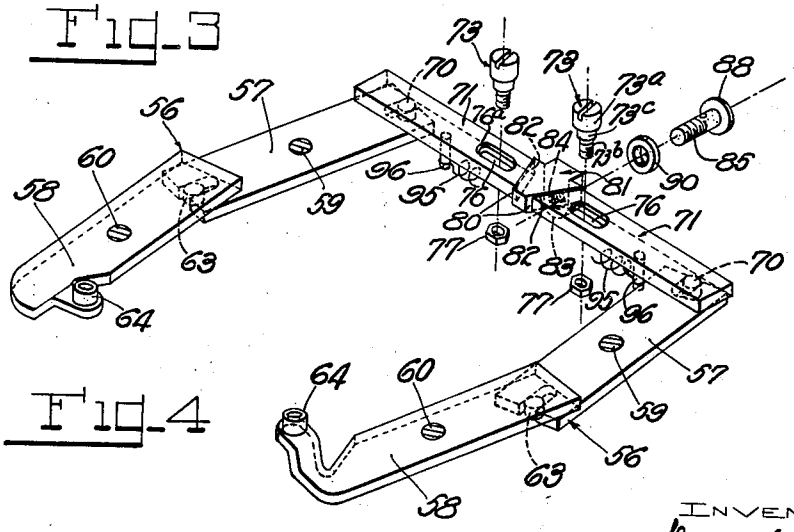

Fig. 4

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UNITED STATES PATENT OFFICE

2,201,449

SEWING MACHINE

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Application May 10, 1939, Serial No. 272,780

12 Claims. (Cl. 112—74)

This invention relates to sewing machines of the type designed to sew a suitably positioned line of stitches around an area or opening, such as a button hole, in the work, and more particularly to the work-clamping mechanism employed in such machines.

In button hole and similar sewing machines, the work-clamping mechanism usually comprises two clamps which are movable to and from each other and normally yieldingly urged toward each other. Each of these clamps consists of a work-supporting plate and a therewith cooperating clamping foot between which and the plate the work is clamped. After clamping the work, it is customary to spread the clamps, i. e., to move the plates with their respective clamping feet slightly away from each other in order to stretch or tension the work or to spread a button hole or other slit therein, as the case may be. Usually, the clamps are spread automatically in a conventional manner to a predetermined maximum separated position after the machine has been started and before the actual sewing begins. It is also customary to provide stops for the work clamps to limit the approach of the latter toward each other. These stops are adjustable to and from each other in the direction of movement of the clamps so that the latter, when moved from said stops outwardly into their maximum separated position, will traverse a distance which is just sufficient to effect any desired tension in, or spread of, any type of clamped material. Most commonly, these stops, hereafter called "inner limit stops," are made independently adjustable. This requires not only separate adjustment of each inner limit stop, but also considerable skill and frequently corrective adjustments in order to space said stops equal amounts from the invariable longitudinal axis of a button hole, for instance, which is formed by the stitch-forming instrumentalities of the machine.

It is, therefore, the primary aim and object of the present invention to provide for simultaneous and equal adjustment of the inner limit stops for both work clamps on manipulation of a single element.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention claimed herein beyond the requirements of the prior art.

In the drawings:

Fig. 1 is a fragmentary side elevation, partly in section, of a sewing machine, including a work-clamping mechanism which embodies the present invention.

Fig. 2 is an enlarged, fragmentary section through the bed frame of the machine, taken substantially on the line 2—2 of Fig. 3.

Fig. 2*a* is an enlarged, fragmentary section taken on the line 2*a*—2*a* of Fig. 3.

Fig. 3 is a fragmentary plan view of the machine, with the sewing head thereof partly broken away for better illustration of the work-clamping mechanism underneath.

Fig. 4 is a perspective view of certain cooperating elements of the work-clamping mechanism, some of these elements being shown disassembled.

Referring to the drawings and particularly to Fig. 1 thereof, the present invention is shown as applied to a button hole sewing machine of a well-known type, comprising a stationary bed frame 15 which carries the work-clamping mechanism hereinafter described, a movable stitch frame or head 16 with the stitching mechanism, and mechanism on the stitch frame for cutting a button hole or the like. The stitch frame 16 is movable longitudinally over the bed frame 15 to bring the stitching and cutting mechanisms alternately into operative relationship with the work, and is also movable both longitudinally and laterally to position the stitches in accordance with the work to be performed, by means of feeding mechanism operated by a main cam 17 which is carried by the stitch frame 16 and rotated by any suitable power driven shaft (not shown). This feeding mechanism is well known in the art, being shown, for example, in the patents to Reece No. 240,546, April 26, 1881, and No. 655,637, August 7, 1900, and many others, and requires no detailed description herein.

The stitching mechanism comprises a needle 19 carried by a needle bar 20, and looper mechanism 14 which may be substantially as shown in the patent to Grip No. 1,905,854, April 25, 1933, said needle bar and said looper mechanism being carried by upper and lower turrets 21 and 22, respectively, which are rotated in unison at the proper time by gear segments (one being shown at 23 in Fig. 1) that are carried by a rock shaft 25, operated by the main cam 17 in a manner further described in the Reece patents above referred to. The lower turret 22 also carries a throat plate

26 through which the needle 19 passes in order to cooperate with the looper mechanism 14. The needle bar 20 is reciprocated vertically and vibrated laterally in its turret 21 in a manner substantially as shown and described in the patent to Reece No. 1,991,627, February 19, 1935. The looper mechanism 14 is operated in a manner substantially as shown and described in the patent to Grip above referred to and in the patent to Dunnell No. 1,935,083, November 14, 1933.

The cutting mechanism comprises upper and lower cooperating cutting elements 30 and 31, respectively, the former being carried by a lever or arm 32 which is operated at the proper time from the main cam 17 in a manner described more fully in the patent to Kiewicz No. 1,841,133, January 12, 1932.

It will be understood that in machines of this character suitable mechanism is provided whereby the machine, when started, will perform its operative cycle and then stop automatically, said cycle including first, the clamping of the work by the work-clamping mechanism, then a movement of the stitch frame from the cutting position shown in Fig. 1, in which the cutting elements 30, 31 are adjacent the stitching region or area of the work, into the stitching position in which the stitch-forming instrumentalities are adjacent said area, next, a stitching operation of a character determined by the design of the feed mechanism, then a return of the parts into cutting position, and finally the release of the work from the work-clamping mechanism, said cycle also including a cutting operation which may be performed either before or after the stitching operation according to the design or adjustment of the machine.

Except as hereinafter pointed out, or as they enter into combination with the parts hereinafter described, the mechanisms above referred to specifically form no part of the present invention and may be as shown and described in the patents referred to, or otherwise, as will be well understood by those skilled in the art.

The work-clamping mechanism comprises two relatively movable clamps 35 and 36, each consisting of a work-receiving clamp plate 37 and a therewith cooperating clamping foot 38 which is carried by an arm 39, pivotally mounted at 40 on a block 41 which is supported on the plate 37 and guided thereon for linear adjustment by means of a rib 42 (Fig. 1) which projects into a guide groove 43 of said plate. Each block 41 is held in adjusted position by means of a screw 44, projecting through an elongated slot 45 in the block and being threadedly received by its respective clamp plate 37. A spacer 46 retains each pivoted arm 39 in engagement with a shoulder 47 of its respective supporting block 41 and thus prevents axial movement of said arm 39 on its pivot 40. The clamp plates 37 are slidably supported on the upper machined surface 50 of the bed frame 15 which is apertured as indicated in dotted lines at 51 in Fig. 3 to admit certain parts below the clamp plates 37 into close proximity to the latter. Provided on the upper surface of the bed frame 15 are two raised ledges 52 which are preferably flush with, and in close proximity to, the adjacent clamp plates 37. Each clamp plate 37 carries a matrix 53, having its work-engaging surface 54 knurled or otherwise roughened, the same as the sole of the therewith cooperating clamping foot 38, so that the clamped material therebetween may be more firmly gripped.

The clamp plates 37 are guided for linear movement at right angles to the longitudinal stitching axis x—x (Fig. 3). This is accomplished by providing a linkage 56 between each clamp plate 37 and the bed frame 15. As the construction and function of each linkage is the same, only one will be described in detail in connection with the clamp plate 37a.

Having particular reference to Figs. 3 and 4, it will be noted that each linkage 56 consists of two levers or links 57 and 58 which are pivotally mounted at 59 and 60, respectively, on machined bosses 61 and 62, respectively, (Fig. 2) on the underside of the bed frame 15. The adjacent ends of the links 57, 58 are floatingly pivotally connected with each other at 63 in the fashion best shown in Fig. 4. The other end of the rear link 58 is provided with a roller 64 which projects into a longitudinal groove 65 (Figs. 2 and 3) in the underside of the clamp plate 37a and thus forms a floating pivotal connection 66 between the latter and said rear link. The forward end of the front link 57 is floatingly pivotally connected at 70 with a slide 71, which is also included in the linkage and guided in a way 72 in the underside of the bed frame 15 for movement in the same direction as the clamping plate 37a, i. e., at right angles to the longitudinal stitching axis x—x.

As best shown in Figs. 2a and 3, the slide 71 is longitudinally adjustably connected with the clamping plate 37a by means of a bolt 73 whose head 73a is loosely received in a countersunk portion 75a of an elongated slot 75 in the bed frame 15 and fits accurately in a bore 74 in the clamp plate 37a, and whose shank 73b extends through said slot 75 and through an elongated slot 76 in the slide 71 and receives a nut 77. More particularly, the shank 73b has a blank portion 73c which fits accurately in a countersunk portion 76a of the elongated slot 76, and the nut 77 is received in another countersunk portion 76b of said slot 76. On tightening the nut 77, the bottom of the countersunk slot portion 76a in the slide 71 is firmly drawn against the annular shoulder 73d of the shank 73b without clamping the other annular shoulder 73e of the bolt against the bottom 75b of the countersunk slot portion 75a in the bed frame. Thus, tightening of the nut 77 does not interfere with the sliding support of the bolt head 73a on the bottom 75b of said countersunk slot portion 75a in the bed frame 15. It is also evident that by reason of the accurate fit of the head 73a and of the blank shank portion 73c of the bolt 73 in the bore 74 of the clamp plate 37a and in the countersunk slot portion 76a in the slide 71, respectively, relative movement between said clamp plate and slide in the direction of the longitudinal stitching axis x—x is effectively prevented.

Lateral movement of each clamp plate in either direction is under the guidance by its respective linkage 56 by reason of the bolt connection 73 and the floating pivotal connection 66 therebetween, as will be readily understood. Moreover, the links 57 and 58 of each linkage 56 and their floating pivotal connections 63, 66 and 70 with each other, with their respective clamp plate 37 and with their respective slide 71, are so coordinated that both ends of the clamp plate move for all intents and purposes equal amounts on actuation of the respective slide 71 or on transmitting a motive force to said clamp plates at any place thereof.

Mounted on the ledges 52 of the bed frame 15 by means of screws 79 are two latch plates 79a

for holding the clamp plates 37 down on their supporting surface 50.

The work-clamping mechanism so far described is in many respects like the one shown and described in the patent to Kiewicz, No. 1,481,514, January 22, 1924. This latter patent also discloses independently adjustable inner-limit stops for the clamp plates in order to limit the approach of the latter toward each other to a variable extent so that said clamp plates, when automatically moved from said stops outwardly into an invariable maximum separated position, will traverse a distance which is just sufficient to effect any desired tension in, or spread of, any type of clamped material. The present work-clamping mechanism also provides inner-limit stops which differ, however, fundamentally from those of Kiewicz in that they are simultaneously adjustable on manipulation of a single element and, hence, overcome the previously mentioned disadvantages of the independently adjustable inner-limit stops. More particularly, the inner-limit stops of the present work-clamping mechanism are constituted by the converging surfaces 80 of a wedge member 81 which is located between the opposed slides 71. These converging surfaces 80 of the wedge member 81 cooperate with the correspondingly inclined ends 82 of said slides 71. As best shown in Figs. 2 and 4, the wedge member 81 is provided with a depending lug 83, threadedly receiving at 84 a screw 85 which is rotatably but axially immovably mounted in the depending skirt 86 of the bed frame 15. More particularly, the screw 85 and its head 88 are freely rotatable in a hole 87 and a counter-bore 89, respectively, in said skirt 86, while an adjustable collar 90 prevents, in conjunction with the screw head 88, axial movement of said screw 85. By placing the screw head 88 in the counter-bore 89, the former is readily accessible to the operator for manipulation from the outside of the bed skirt 86 and forms no obstruction on which material hanging from the bed 15 may be caught and eventually damaged. The wedge member 81 is, by means of the screw 85, held with its machined surface 91 in engagement with the machined surface 92 on the underside of the bed frame 15, thus being prevented to rotate and instead forced to move in the direction of the longitudinal stitching axis x—x (Fig. 3) on manipulation of the screw 85. Such movement of the wedge member 81 in either direction varies the extent to which the slides 71, and thereby the clamp plates 37, may approach each other, as will be readily understood. Furthermore, if the opposite stopping surfaces 80 of the wedge member 81 are symmetrical to the longitudinal sewing axis x—x as viewed and shown in Fig. 3, the clamp plates 37 will be equally spaced from said axis x—x when their slides 71 engage said stopping surfaces 80 in any adjusted position of the wedge member 81. The slides 71 are normally yieldingly urged into engagement with their respective stopping surfaces 80 by a tension spring 95, the opposite ends of which are anchored on depending pins 96 on said slides. By the same token and through intermediation of the bolt connections 73 and the links 57 and 58, the clamp plates 37 are also normally yieldingly urged into their inner limit positions which are determined by the adjusted wedge member 81, as will be readily understood.

While the clamp plates 37 are in their inner limit positions and after the machine has been started for one cycle of operation, the clamping feet 38 are automatically lowered into clamping engagement with the work W on the plates 37 in a manner not fully shown in the drawings as this does not form any part of the present invention. It is deemed sufficient to show in Fig. 1 a rocker 105 which is pivotally mounted at 106 on the underside of the bed frame 15 and provided with two arms (one being shown at 107) that terminate in fingers 108, each projecting into a fork 109 of a clamp arm 39. This rocker 105 is automatically rocked counter-clockwise as viewed in Fig. 1 into the position shown therein by mechanism fully shown and described in the patent to Hill No. 713,764, November 18, 1902, with the result that the clamping feet 38 are lowered into clamping engagement with the work W on the plates 37.

Suitably mounted at 110 on the stitch frame 16 is a spreader block or cam 111 (Figs. 1 and 3) which is adapted to engage followers 112 on the underside of the clamp plates 37 and force the latter outwardly away from each other into a maximum separated position against the tendency of the spring-urged linkages 56 to force said clamp plates toward each other. This is accomplished after the material or work W is clamped and when the stitch frame 16, and with it the spreader block 111, is moved by the feed mechanism from the cutting position shown in Figs. 1 and 3 into the stitching position, i. e., to the left as viewed in Figs. 1 and 3. The result is a tensioning or spreading of the clamped material the extent of which is determined by the adjustment of the wedge member 81 as will be readily understood.

Inasmuch as the spreader block 111 moves beyond the followers 112 when the stitch frame 16 moves into stitching position and as the material W has to remain tensioned or spread during the stitching operation which takes place after the stitch frame has arrived in the stitching position, mechanism other than the spreader block 111 has to be provided for holding the clamp plates 37 in their maximum separated position against the tendency of the spring-urged linkages 56 to return them to their innermost position as determined by the wedge member 81. This mechanism, which is not shown or described herein, as it forms no part of the present invention, is fully shown and described in the co-pending application of Ralph A. Collins, Serial No. 281,548 filed June 28, 1939.

I claim:

1. In a sewing machine, the combination of two work clamps guided for movement to and from each other; stops limiting movement of the clamps toward each other only; and means including a single member immovable in the direction of the clamp movement for simultaneously adjusting said stops on manipulation of said member.

2. The combination in a sewing machine as set forth in claim 1, wherein said member is rotatable about its own axis and otherwise immovable for causing adjustment of said stops.

3. The combination in a sewing machine as set forth in claim 1, wherein said member is a screw.

4. In a sewing machine, the combination of two work clamps guided for movement to and from each other; and a single cam member engageable by said clamps to limit their approach to each other, said cam member being immovable in the direction of the clamp movement and

manipulatable to vary the approach limit of the clamps.

5. The combination in a sewing machine as set forth in claim 4, wherein said cam member is a wedge movable transversely to the direction of the clamp movement only.

6. In a sewing machine, the combination of two work clamps guided for movement to and from each other; a manually rotatable and axially immovable screw extending transversely to the direction of the clamp movement; and a non-rotatable cam engageable by said clamps to limit their approach to each other, said screw being threadedly received by said cam wherefore the approach limit of the clamps may be varied by causing movement of the cam on rotating said screw.

7. In a sewing machine, the combination of a bed; two work clamps guided for movement to and from each other on top of said bed and having projections depending below said bed; a manually rotatable and axially immovable screw below the top of the bed and extending transversely to the direction of the clamp movement; and a non-rotatable cam below the bed between and engageable by said projections, said screw being threadedly received by said cam wherefore the limit of the approach of the clamps toward each other may be varied by causing movement of the cam on rotating said screw.

8. The combination in a sewing machine as set forth in claim 7, wherein said bed has a depending skirt with a hole in which said screw is journalled, said hole being countersunk to receive the head of said screw therein.

9. In a sewing machine, the combination of a bed; two work clamps movable on said bed; a linkage so connecting each clamp with the bed as to guide its respective clamp for movement to and from the other clamp; a stop for and engageable by each linkage to prevent movement of the clamps only beyond a predetermined limit of approach to each other; and means including a manually operable single member immovable in the direction of the clamp movement for adjusting said stops simultaneously on manipulation of said member to vary the approach limit of the clamps.

10. The combination in a sewing machine as set forth in claim 9, wherein said stops are constituted by opposite cam surfaces of an element moved transversely to the direction of the clamp movement by said adjusting means on manipulation of said member.

11. The combination in a sewing machine as set forth in claim 9, wherein said stops are constituted by the opposite, inclined surfaces of a non-rotatable wedge and said member is a manually rotatable and axially immovable screw extending transversely to the direction of the clamp movement and being threadedly received by said wedge.

12. The combination in a sewing machine as set forth in claim 9, further comprising spring means urging said linkages into engagement with their respective stops.

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