

May 8, 1962

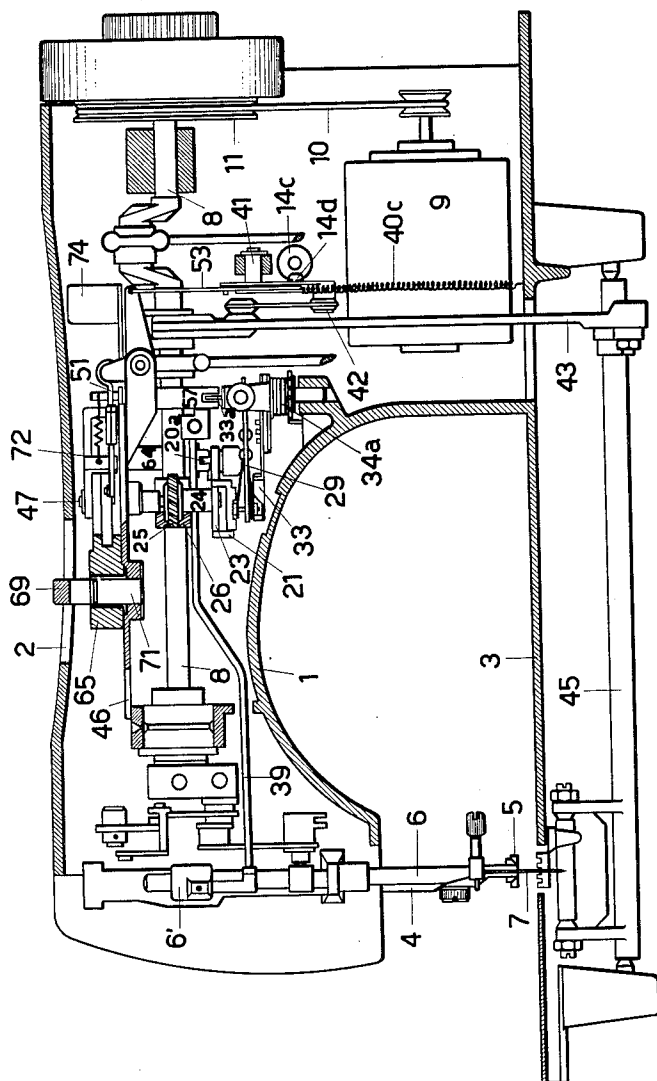
L. BONO

3,033,138

BUTTON-HOLE MAKING DEVICE APPLIED TO SEWING MACHINES

Filed Aug. 19, 1955

6 Sheets-Sheet 1



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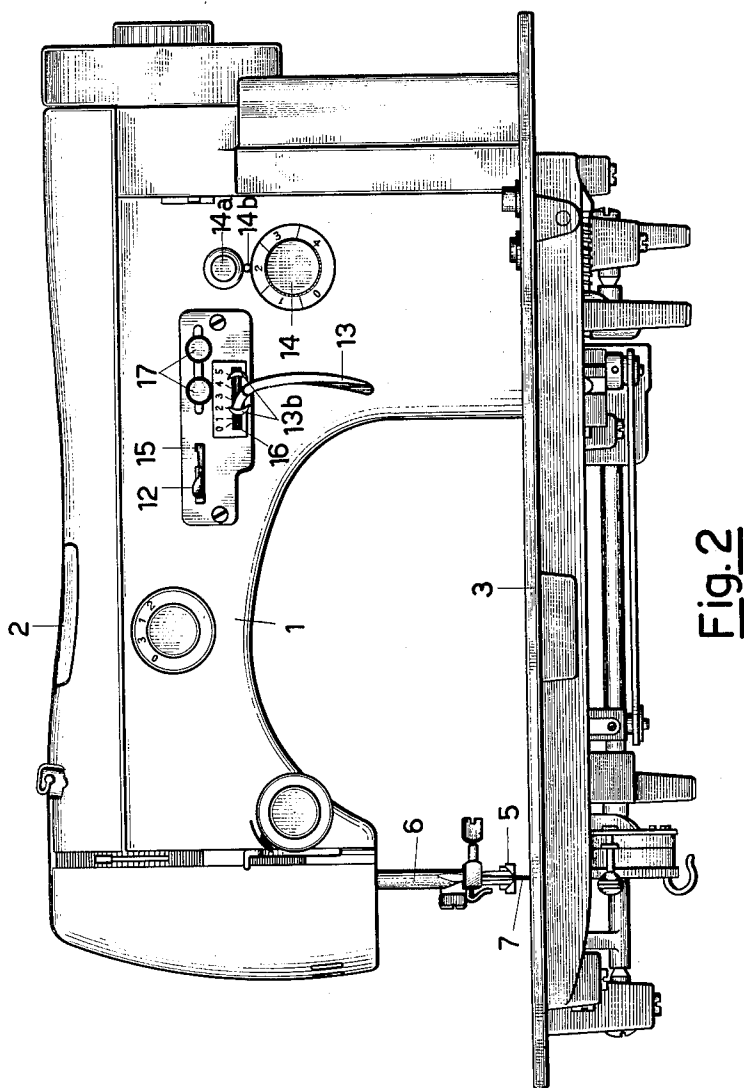


Fig. 2

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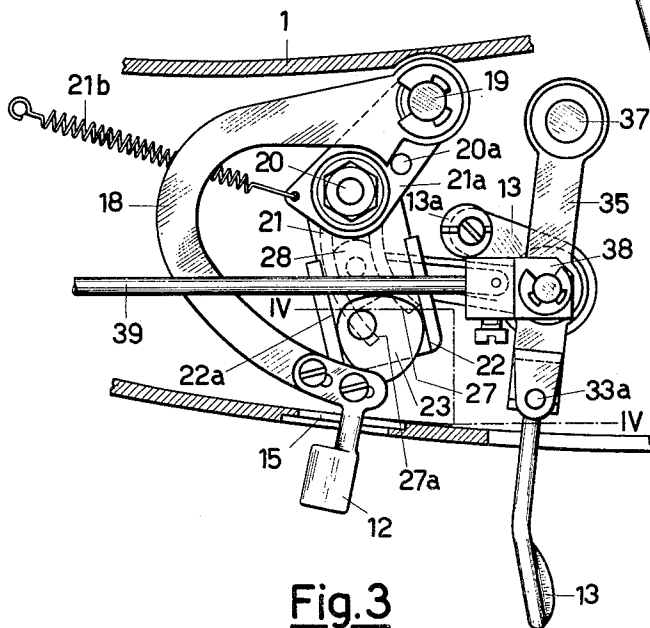
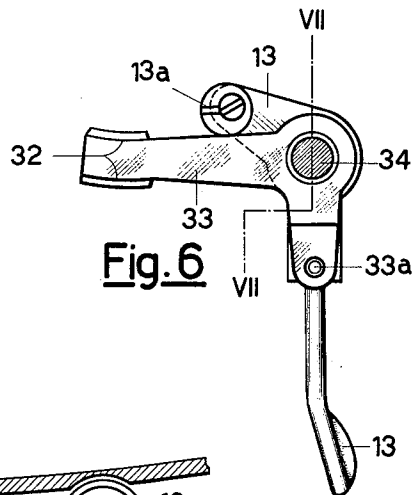
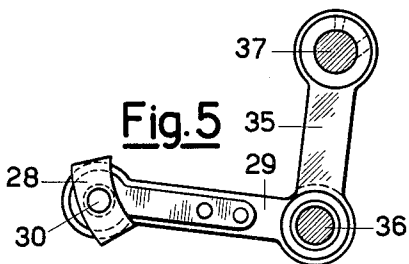
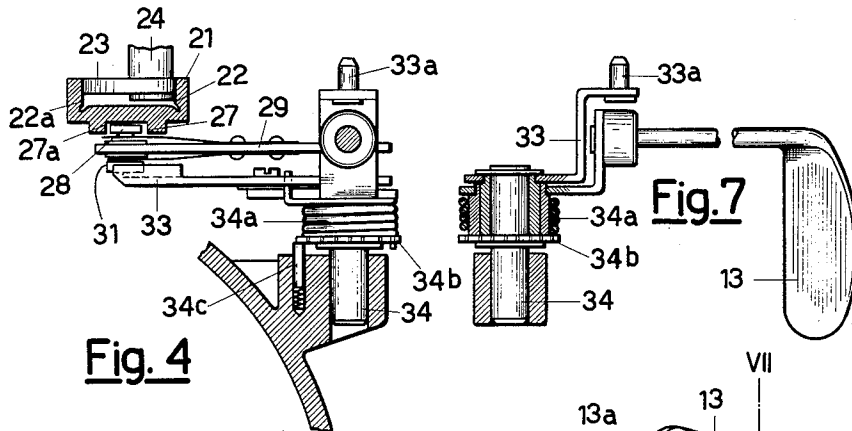


Fig. 3

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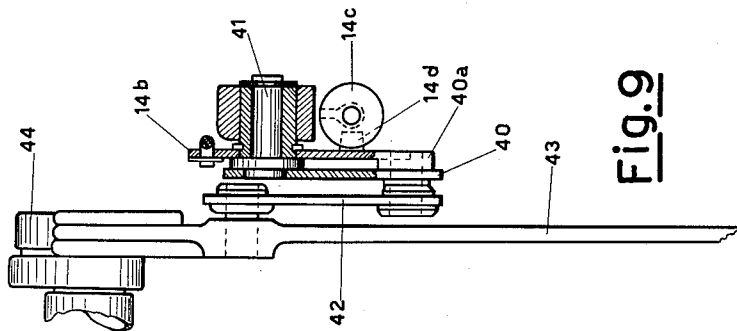


Fig. 9

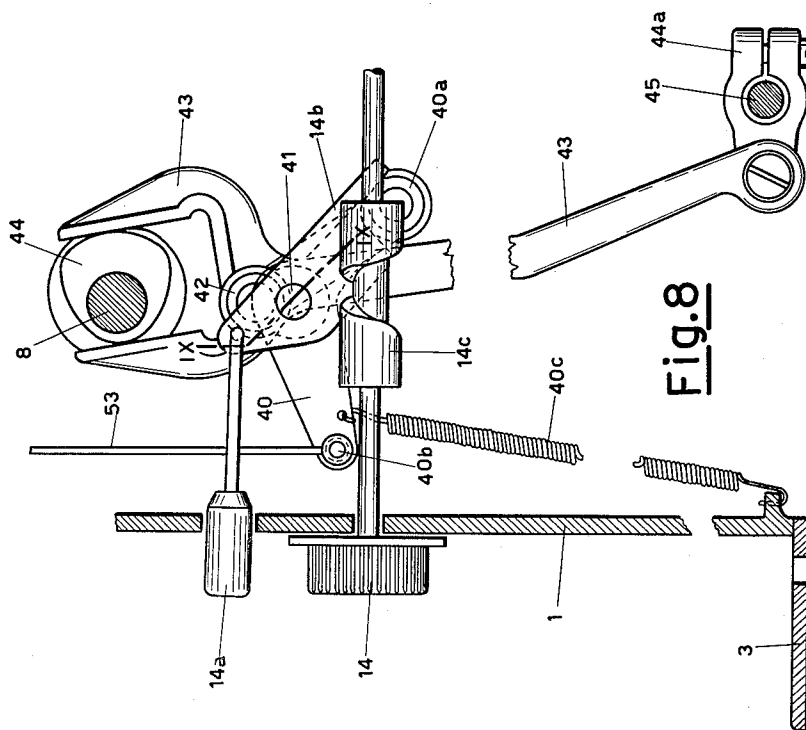


Fig. 8

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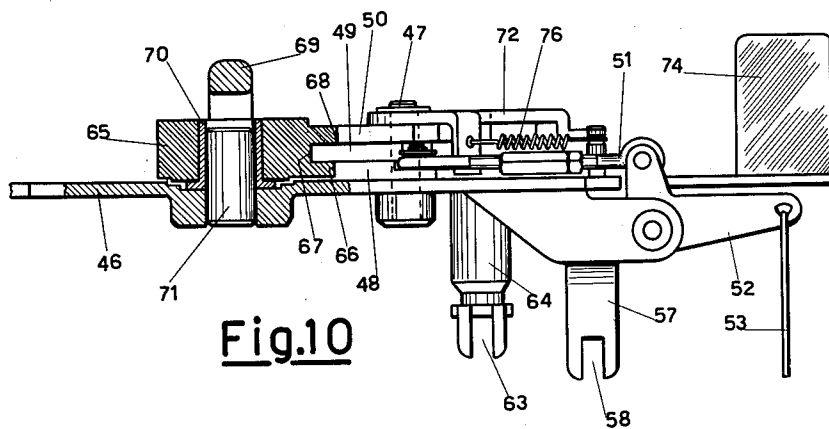


Fig. 10

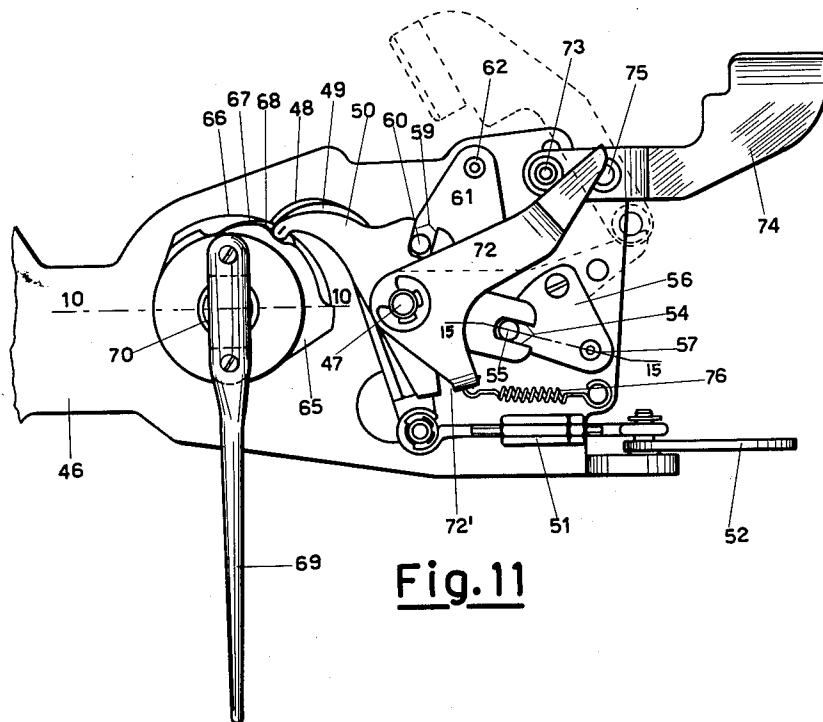


Fig. 11

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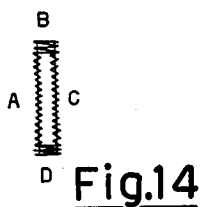
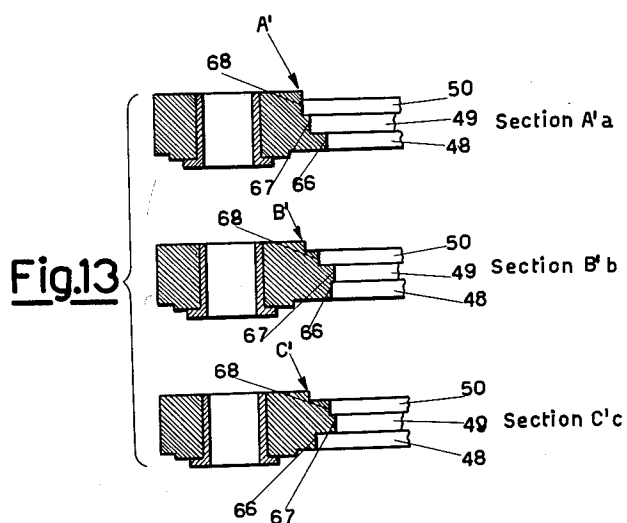
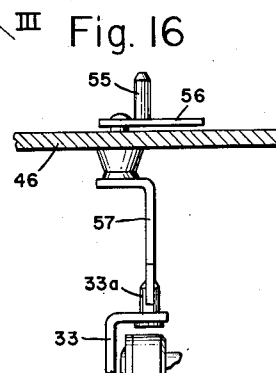
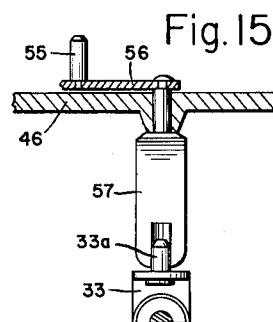
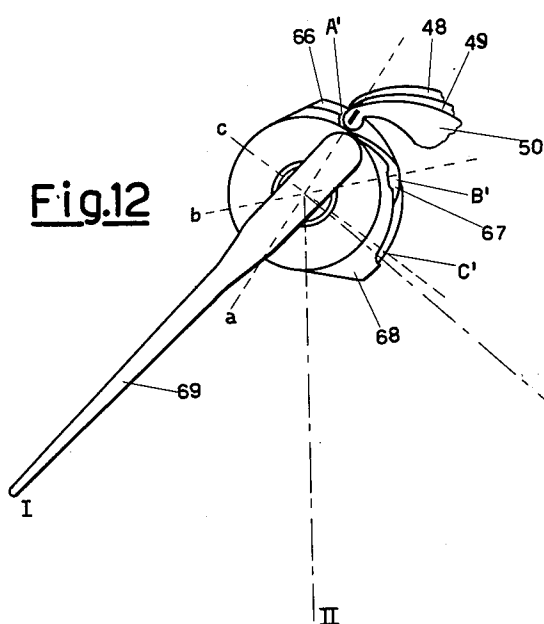
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6 Sheets-Sheet 6



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BUTTON-HOLE MAKING DEVICE APPLIED TO SEWING MACHINES

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Filed Aug. 19, 1955, Ser. No. 529,465

Claims priority, application Italy May 26, 1955

1 Claim. (Cl. 112-158)

This invention relates to the making of buttonholes and more particularly to provide a device, which can be applied to a zigzag sewing-machine, this device being fitted with a lever which, suitably actuated by hand, acts at the same time on the three known mechanisms of the sewing-machine, i.e. displacement of the seam-line, variation of the amplitude of the zigzag, and the setting of the cloth feed.

The device of the invention is characterized in that the above-mentioned lever can be set in three distinct fixed positions to which the correct position of the three mechanisms above mentioned corresponds in order to make the buttonhole.

More particularly, the three mechanisms are actuated at the same time by a small block having a certain shape, this block being fixed to the hand-actuated lever.

A further feature of the invention is that the small block affixed to the lever is in contact with three levers acting, respectively, on the three mechanisms of the machine so that the machine is allowed to sew the normal straight seam or the zigzag seam by simply displacing said hand-actuated lever.

The device of the invention, moreover, is mainly located within the frame of the machine and actuates the three above-mentioned mechanisms through controls also located within the frame so that, during operation, the outer control members for such mechanisms remain stationary.

The details of the device will be better understood from the following description and the accompanying drawings, wherein:

FIG. 1 is a lengthwise sectional view of the sewing-machine, showing the device for making the button-holes as applied to the machine.

FIG. 2 is a side elevational view of the machine, showing the three control members for manually displacing the needle, setting the zigzag and adjusting the stitch, respectively.

FIGS. 3, 4, 5, 6 and 7 show details of the devices for displacing the seam line, and for the variation of the zigzag.

FIGS. 8 and 9 show details of the stitch adjusting device.

FIG. 10 is a cross sectional view of FIG. 11, taken along line 10-10 showing the device controlling the making of button holes.

FIG. 11 is a plan view of the device of FIG. 10.

FIGS. 12, 13 and 14 represent the shaped block, the three sections thereof and the shape of the button-hole corresponding to the three positions, respectively.

FIGURE 15 is a cross-sectional view taken along section line 15-15 of FIGURE 11, and

FIGURE 16 is a cross-sectional view of FIGURE 15.

The sewing-machine represented, by way of example, in FIG. 1, has an arm 1, fitted with lid 2 hinged in the upper portion of said arm and a bedplate 3. The cloth pressing bar 4 has, in its lower portion, the presser foot 5. The needle-bar 6 has, in its lower end, the needle 7. In the horizontal portion of the arm, there is the main shaft 8 driven by motor 9 through belt 10 wound over sheave 11, or by a pedal drive not shown in the drawing.

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From the front part of the arm protrude levers 12 and 13, knob 14 and push-button 14a. The upper lever 12 serves for the side displacement of the needle in two directions, i.e. left-hand and right-hand, with respect to a middle position. That is to say that to the middle position of lever 12 with respect to slot 15 a seam coincident with the central line corresponds, while to the R.H. or L.H. position of lever 12 a R.H. seam or a L.H. seam corresponds, respectively.

Lever 13, instead, controls the width of the seam; by displacing said lever, therefore, from one end to the other of slot 16, the seam width can be varied from the straight seam to the zigzag seam of the maximum amplitude.

Knob 14 controls and limits the length of the stitch. Pushbutton 14a serves to effect the reversal of the cloth-feed.

The peripheral portion of knob 14 bears a graduation. When the 0 point of said graduation coincides with pointer 14b', the length of the stitch is nil. By rotating knob 14 from the 0 position to the end of the scale, stitch lengths varying from nil to a maximum value can be obtained.

To every position of the knob a determined length of stitch, considering a forward cloth feed, corresponds. By depressing pushbutton 14a the direction of cloth feed is reversed.

The device which can be actuated by lever 12, for the side displacements of the needle, comprises the arcuate lever 18, pivoted at 19 (FIG. 3). Rocking lever 21 is pivoted at 20 to piece 21a bearing a pin 20a. Lever 21 bears, on its upper face, a groove limited by the two shoulders 22 and 22a, said groove being apt to give seat to a cam 23 (FIG. 4) fixed to an end of the vertical shaft 24. This latter bears the worm-wheel 25 (FIG. 1) engaging the worm 26 keyed on the mainshaft 8. The rotation of mainshaft 8 causes cam 23 to rotate and consequently effects a rocking movement of lever 21 about pivot 20. By manually displacing lever 12, the arcuate lever 18, fixed therewith and engaging pin 20a, causes the displacement of fulcrum 20 and consequently of lever 21 with respect to the vertical shaft 24.

Spring 21b, an end of which is affixed to member 21a while the other end is affixed to arm 1, ensures the return movement of lever 21, which latter can be consequently displaced in a direction only by lever 12.

The coupling of lever 12 with lever 18, realized by screws, is adjusted in such a way that to the three positions, central, R.H. and L.H. of the needle bar the three respective positions of lever 12 in its suitably shaped slot 15 correspond. The lower face of lever 21 is fitted with a curved groove limited by shoulders 27 and 27a. Within this groove sector 28 can slide (FIGS. 4 and 5) an end of which is pivoted to an end of the connecting rod 29 by means of pin 30, which latter bears, in its lower portion, the roller 31.

This roller engages groove 32 of the zigzag adjusting lever 33 (FIGS. 6 and 7). This lever 33, which is a bell-crank lever, bears in the end opposite to the groove a pin 33a which can be actuated from inside the sewing-machine and is fulcrumed on pin 34. Lever 13 which can be actuated from outside and is also a bell-crank lever, draws lever 33 by means of the adjustable eccentric 13a. The return movement of lever 33 is ensured by the helical spring 34a, wound over pin 34. The tension of the spring is controlled by the position of the crenellated washer 34b the position of which is checked by the spring actuated pin 34c. Eccentric 13a is fixed to lever 13 by means of a screw. This expedient is essential for adjusting the position of lever 13 in its slot 16. The connecting rod 29 is connected by means of pivot 36 to arm 35 fulcrumed to the vertical shaft 37. On pivot 36 the block 38 is mounted

(FIG. 3) and to said block the bar 39 is fixed, which laterally displaces the supporting member 6' of the needle-bar.

Obviously the amplitude of the zigzag depends upon the position of sector 28 in the lower groove of the rocking lever 21. When sector 28 is in line with pivot 20 the displacement of the connecting rod 29 is nil; consequently the bar 39 and therefore also the needle bar 6 are not subjected to lateral displacements; in this case a straight seam is effected.

When displacing, by means of lever 13, the position of sector 28 from the position correspondent to pivot 20 to the other end of lever 21, the displacement of needle bar is increased from nil to a maximum value.

The two pins 13b, actuated by the two buttons 17, can adjust the displacement of lever 13 and fix said lever in any desired position along slot 16.

By varying the position of lever 12 also the position of the reference line of the seam varies. The lateral displacement of the needle is accompanied by a similar oscillation of the shuttle, caused by the oscillation of arm 35 and consequently by the oscillation of the vertical shaft 37 which latter is connected, through members (not shown herein) placed under the base plate, to the shuttle driver; said connecting members are illustrated in the Italian patent to Necchi No. 363,084.

The two devices, viz for the displacement of the needle and for adjusting the zigzag are equipped with a dual control: as a matter of fact, member 21a which, via the elements described above laterally displaces bar 39 and consequently the needle bar, can be controlled either by acting from outside on lever 12 or by acting from inside on the pin 20a. Similarly the zigzag adjusting lever 33 can be displaced either by acting from outside on lever 13 or by acting from inside on pin 33a.

Pushbutton 14a controls the small plate 14b (FIGS. 8 and 9) fulcrumed at 41 to the frame of the sewing-machine. This small plate has a curved end so as to encircle bushing 40a of the bell-crank lever 40. This latter is pivoted to the small connecting rod 42 on the axis of bushing 40a and bears on the opposite end the small pin 40b. Connecting rod 42 is pivoted, at its other end, to lever 43, the head of which engages the eccentric 44 fixed to the main shaft 8. The other end of lever 43 is connected, via junction block 44a to the shaft of the feeding mechanism, which shaft, through means not herein described but known, actuates the feed mechanism.

On the arbor driven by knob 14 is fitted the cam 14c having a groove the width of which grows from a minimum to a maximum value corresponding to a whole revolution about its axis. The inner edges of said groove are sloping so as the planes, in infinite number, which contain the axis of the cam, intercept on said groove trapezia of a width which is increased from a minimum to a maximum value. Pivot 14d, having a cone frustum shape, and fixed onto plate 14b engages the groove of cam 14c. The diameter of the minor basis of the frustum of cone equates the minimum width of the groove, measured at the bottom of said groove.

Consequently, by rotating knob 14 in one direction, the groove compels pivot 14d to displace itself and therefore plate 14b, fixed therewith, is compelled to rotate about pivot 41, moving also lever 40.

By rotating said knob in a direction opposite to the former, lever 40 rotates in a direction opposite to the former for it is being urged by helical spring 40c an end of which is affixed to lever 40 and the other end in the neighbourhood of the baseplate of the machine.

To each position of knob 14, with pin 14d urging a side of the groove and kept in this position by the tension of spring 40c, there corresponds a seam characterized by a definite length of stitch and a definite cloth feeding.

When the cloth feeding is to be reversed, the pushbutton 14a is actuated: this pushbutton, by acting on member 14b causes it to rotate so that pin 14d will be

urged against the side of the groove opposite to the one it had been acting on. When pushbutton 14a is released, lever 40 returns to the original position, recalled by spring 40c.

Also the stitch adjusting mechanism described has a dual control: in fact lever 40 which acts on the small connecting rod 42 and consequently also on the stitch adjusting lever 43, can be controlled either by acting from outside by pushbutton 14a and knob 14, or from inside by acting on pin 40b.

To have a proper setting of the mechanism cam 14c is to be keyed on its shaft by adjusting its position, both axially and radially, so that when lever 43 is in the neutral position (no feed) pin 14d be engaged by the minimum section of the groove of the cam.

To prepare the button-holes without being compelled to rotate the cloth, by employing the zigzag sewing-machine hereinbefore described, it would be necessary to act, at the same time, on the outside control members 12, 13, 14 and 14a.

As a matter of fact, to prepare the button-hole, formed from the parts A, B, C, D (FIG. 14) the several mechanisms of the machine are to be set in position as follows: to perform section A it is necessary to have a L.H. seam line, an amplitude of the zigzag restricted to a certain extent, cloth feed in a certain direction and with a certain stitch length.

For performing section B, it is necessary to have the needle placed in the middle part, a maximum zigzag amplitude and cloth feed zero.

For section C the same positions adopted to perform A are to be employed, except the cloth feed direction is reversed. For section D, finally, the same positions adopted for section B.

It is apparently impossible to perform the necessary displacements to prepare the button-hole by acting on all the outside control members of the machine at the same time.

It is an object of the invention to provide a device which, by simply displacing a lever located in the outer part of the machine, allows obtaining according to the positions of this lever button-holes of any length whatever.

The device of the invention is mounted on plate 46 fixed to the upper part of the arm 1 of the sewing-machine.

About pivot 47, borne by plate 46, levers 48, 49, 50 are fulcrumed.

Lever 48 is connected to the bell crank lever 52 through the bar 51 the length of which can be adjusted; bell crank lever 52, in turn, actuates the stitch adjusting lever 40 via the bar 53 fixed to small pin 40b of lever 40. Lever 49 has a notch 54 in which pivot 55 is engaged, this pivot being fixed to plate 56. In its turn said plate is affixed to shaft 57 which latter is terminated by a curved arm having a notch 58.

Consequently lever 49, during its displacement about pivot 47, draws plate 56 thus compelling shaft 57 to rotate about its own axis.

Notch 58, the end portion of shaft 57, engages the pin 33a fixed to lever 33 which lever belongs to the unit controlling the amplitude of the zigzag. Lever 50 is fitted with notch 59 wherein pivot 60 is engaged, said pivot being fixed to plate 61; said plate is, in turn, fixed to shaft 62 which latter is terminated by a curved portion fitted with notch 63. Lever 50, therefore, during its rotation about pivot 47, draws plate 61 and compels shaft 62 to rotate in sleeve 64 soldered to plate 46.

Notch 63, the end portion of shaft 62, is engaged by pin 20a fixed upon member 21a which latter belongs to the unit controlling the displacements of the needle.

The organ capable of suitably displacing the three levers is the small shaped block 65, which bears the profiled edges 66, 67 and 68 and is fixed to the control lever 69. The block 65, fitted with the central bushing 70 is pivoted on pivot 71 fixed to plate 46 at a suitable distance

from pivot 47 so that the profiled edges 66, 67 and 68 will contact the three levers 48, 49 and 50 respectively.

Said block comprises three sections, viz A', B', C'. Lever 69 can be placed in three different positions corresponding to the contact of the three levers 48, 49, 50 with the block in the sections A', B', C' respectively.

Obviously in these three sections the radii of the shaped edges, measured from the axis of rotation, have a certain length so that the levers in contact and thus also the devices for varying the position of the seam line, for adjusting the amplitude of the zigzag and for controlling the cloth feed, are controlled via the elements ending at the pins 20a, 33a and 40b, respectively, so that they are in the correct position for making the button-hole.

As a matter of fact when lever 69 is in the "I" position, that is when section A' is in contact with the three levers, the radii of the profiled edges 66, 67 and 68 in the section A' displace respectively levers 48, 49 and 50 until the positions are reached corresponding to the forward feed of the cloth, zigzag with a certain amplitude and seam line on the left hand end. In this way the section A of the button-hole is performed.

When the desired length of the section A is attained, lever 69 is displaced to the position II until the section B' is in contact with the end of levers 48, 49 and 50 which are then in such a position as to have the cloth feed speed zero, zigzag maximum and needle in the middle position.

The section B of the buttonhole is thus obtained. Afterwards, lever 69 is displaced to the position III until section C' of the block is brought in contact with the levers. These latter are thus in a position such as to have a reverse cloth feed, zigzag of amplitude equal to the one used for the section A and seam line on the right hand end.

The section C of the button-hole is thus performed. As soon as a length equal to the one of section A is attained; lever 69 is brought back to position II, in centre, that is with the section B in contact with the levers. The section D of the button-hole, equal to section B is performed and the button-hole is thus completed.

Obviously sections A', B' and C' must have radii traced with great accuracy for it depends upon them the perfect making of the button-holes.

Sections A', B' and C' are to be connected to each other by suitable radii having a smooth path, without however fixing the dimension of the connecting radii because these connections do not have a direct influence on the making of the button-holes.

To obtain a better appearance of the four sections of the buttonhole it is advisable to displace lever 69 from a position to the next by the most swift possible motion. Bell crank lever 72, fulcrumed on the same pivot 47 has an end in contact with pivot 73 which in turn is fixed to lever 74 fulcrumed about pivot 75. By manually displacing lever 74 from the position indicated by full line in FIG. 11 to the position in dotted lines in the same figure, pivot 73 drives lever 72 to rotation so that end 72', suitably bent, will compel levers 48, 49 and 50 to rotate clockwise removing them from contact with the

profiles 66, 67 and 68. This is useful in order to readily remove block 65 from pivot 71, so that the sewing-machine is allowed to operate as an ordinary zigzag sewing machine. When lever 74 is in the original position with the block 65 mounted, lever 72 is recalled by spring 76, thus allowing levers 48, 49, and 50 to return in contact with the respective profiled edges.

In fact this contact is ensured at all times by the recall springs 40c, 34a and 21b.

It is intended that the embodiment described is by way of example only and it is apparent that the members inserted between the external lever and the three devices of the sewing-machine may be different from the ones described without thereby avoiding the scope of the present invention.

For instance the block having profiled edges could be replaced by a system of levers suitably connected to an externally placed control member.

What I claim is:

In a zigzag sewing machine comprising a frame, a main shaft supported by said frame, a needle bar, a first mechanism driven by the main shaft and actuating the needle bar for a vertical reciprocal movement, a cloth feeder, a second mechanism connected with the latter and actuated by the main shaft, a regulating device for said second mechanism for varying the stroke and inverting the direction of cloth feeding, a third mechanism actuated by the main shaft and displacing the needle bar at right angles to the direction of cloth feeding, two regulating devices for said third mechanism for performing respectively a variation of the amplitude of displacement of the needle bar and lateral displacements of the seam line, the combination comprising feeler means individually associated with said regulating devices, three position selecting surfaces formed into a camblock, a handle fixed to said camblock to rotate manually the latter about an axis affixed to the frame of said sewing machine, said camblock being independent of said main shaft and acting on said feeler means for maintaining them in a predetermined operative position and angularly spaced indexing means on each of said surfaces corresponding each to one of the sewing seams forming a button hole.

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