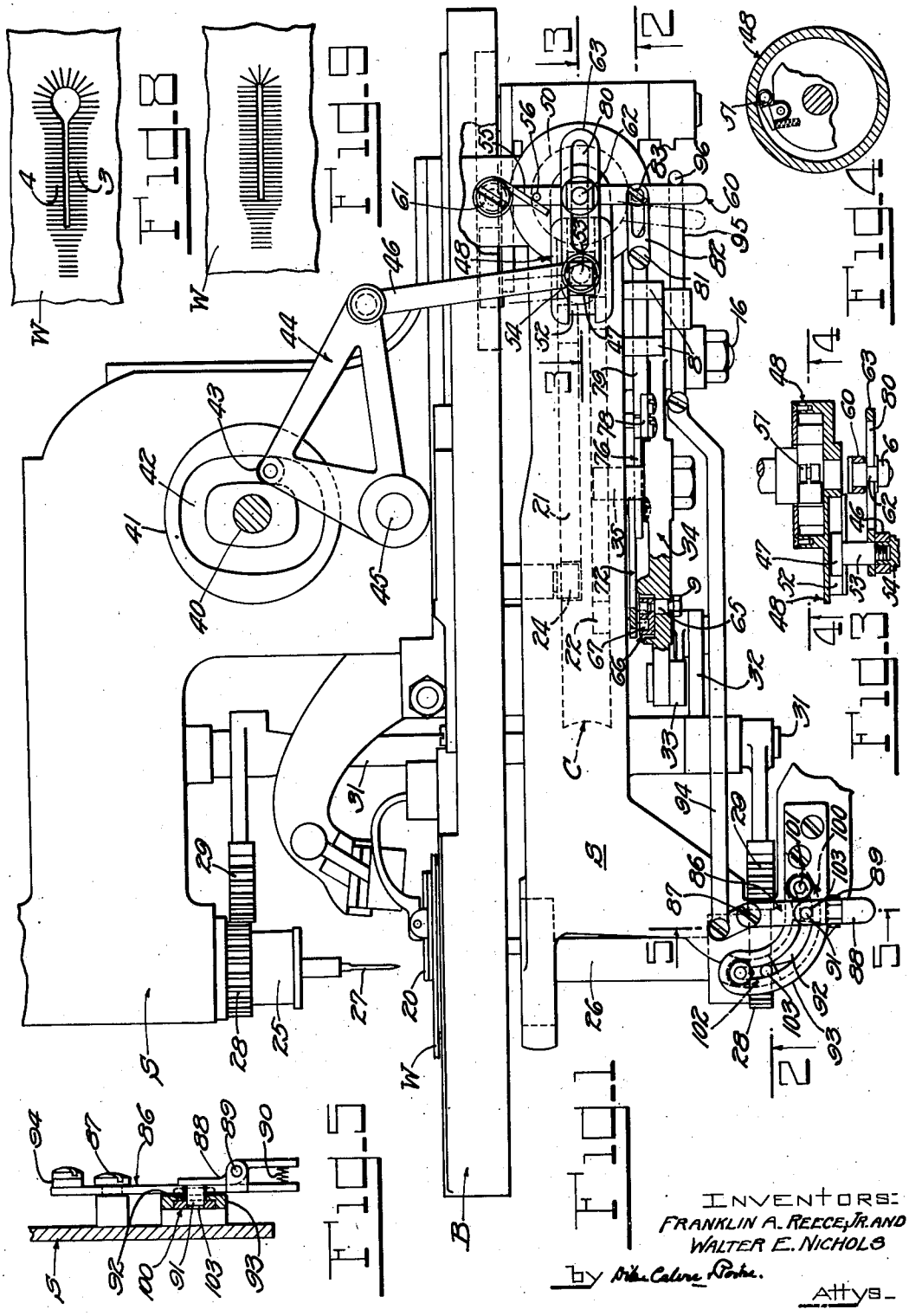
Aug. 2, 1949. F. A. REECE, JR., ET AL 2,477,941

BUTTONHOLE SEWING MACHINE

Filed April 4, 1946 3 Sheets-Sheet 1



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BUTTONHOLE SEWING MACHINE

Filed April 4, 1946 3 Sheets-Sheet 2

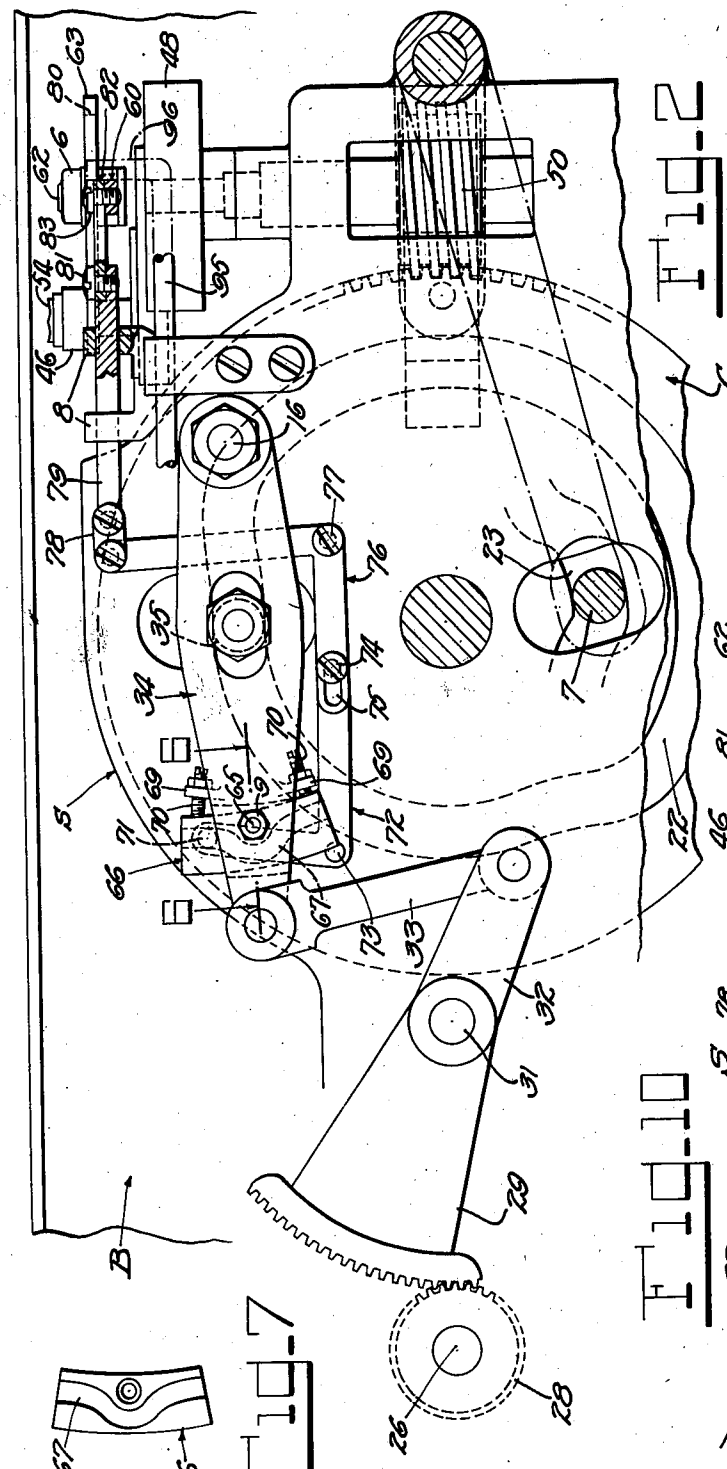

FIG-2

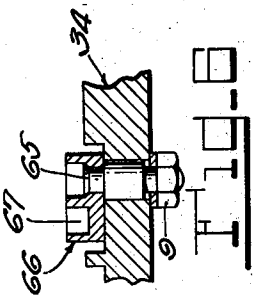

FIG-8

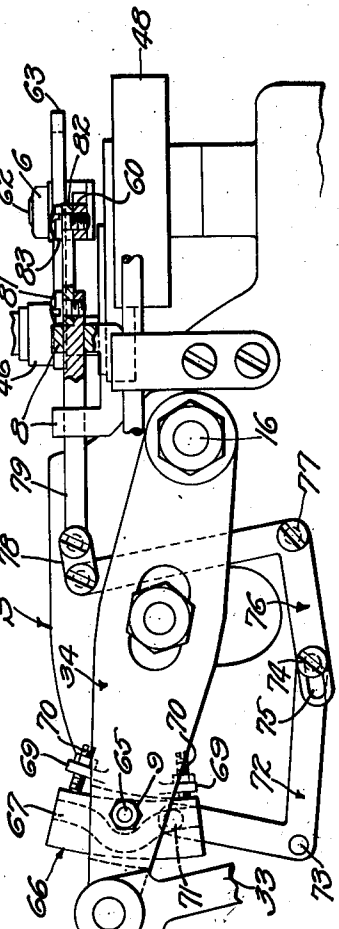

FIG-10



FIG-7

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BUTTONHOLE SEWING MACHINE

Filed April 4, 1946 3 Sheets-Sheet 3

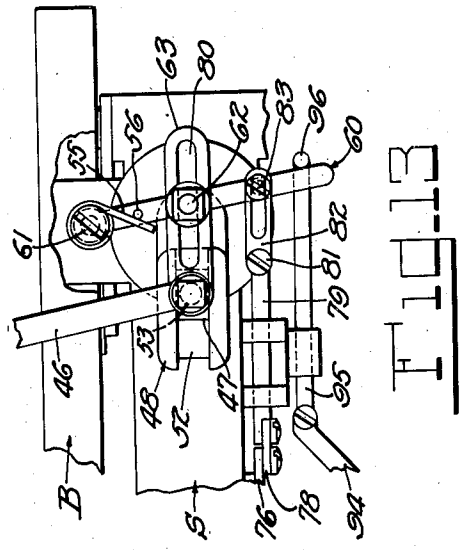

Fig. 13

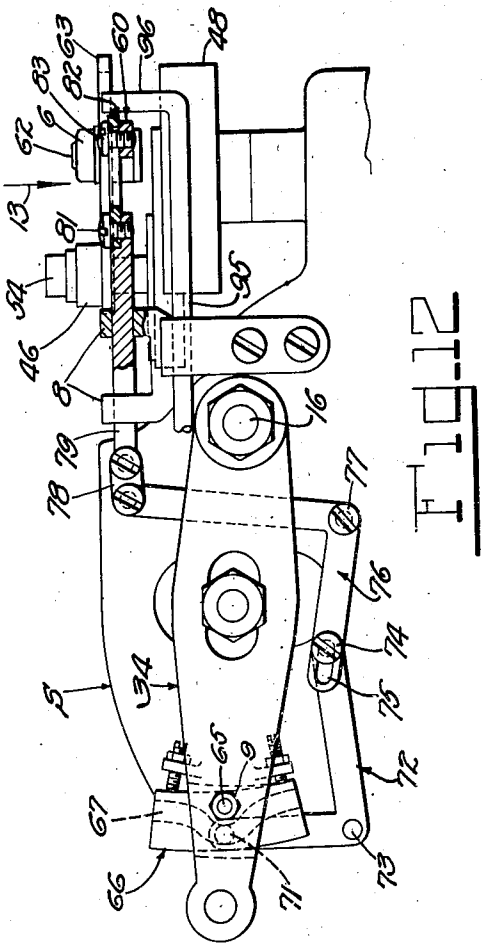

Fig. 12

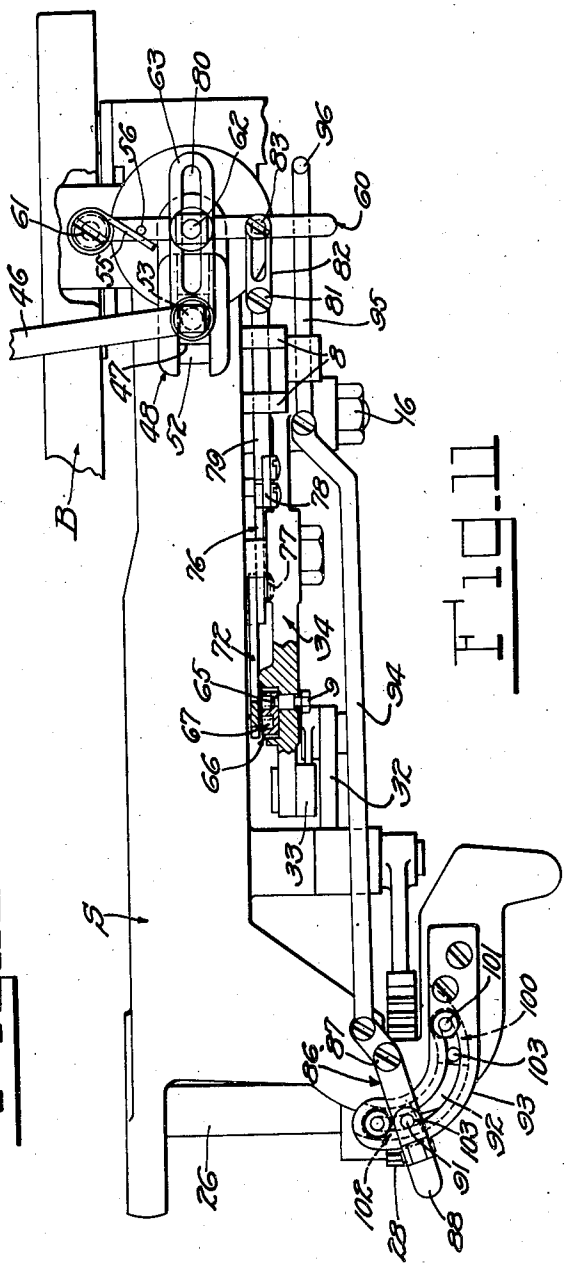

Fig. 11

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# UNITED STATES PATENT OFFICE

2,477,941

## BUTTONHOLE SEWING MACHINE

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Application April 4, 1946, Serial No. 659,588

9 Claims. (Cl. 112—71)

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This invention relates to buttonhole sewing machines used in the sewing of buttonholes of the type known as eyelet-end buttonholes, by which is meant a buttonhole having substantially radially disposed stitches around one end, whether the said end is enlarged to form an eye or not. In sewing such buttonholes, stitching begins at the end opposite the eyelet, progresses along one side, then around the eyelet-end, and finally along the other side. Eyelet-end buttonholes are of two main classes, open-end buttonholes and fly-bar buttonholes. The machine embodying the present invention can be used for sewing either of these types of buttonholes.

It has been found in the use of eyelet-end buttonhole sewing machines that it is desirable to be able to vary the number of stitches to be put in on the two sides of the buttonhole; also to be able to change the machine quickly so that a no-eye buttonhole can be sewn immediately after sewing an eyelet-end buttonhole, and yet put in a suitable number of stitches at the rounded end of the buttonhole whether or not an eye is formed. For instance, it is frequently desirable to be able to sew a no-eye buttonhole in the lapel of a coat immediately after sewing eyelet-end buttonholes in the edge of the coat. Our present invention provides means which automatically adjusts the feed during the sewing of the buttonhole so that the number of stitches on one side of the buttonhole can be varied with respect to the number of stitches on the other side, and also provides means for omitting the necessary number of stitches at the rounded end when a no-eye buttonhole is sewn, the remaining stitches being spaced uniformly.

In general the machine embodying our invention is of the type show in the patent to Kiewicz, No. 1,726,153, in which the stitching mechanism above and below the work is given longitudinal, lateral, and rotative movements. These movements of the work holder are effected by a main cam and related mechanism carried by the movable stitching frame.

Referring now to the drawings:

Fig. 1 is a side elevation of a substantially complete buttonhole sewing machine having applied thereto mechanism embodying the present invention;

Figs. 2 and 3 are sections taken respectively on the lines 2—2 and 3—3 of Fig. 1;

Fig. 4 is a section taken on the line 4—4 of Fig. 3;

Fig. 5 is a section taken on the line 5—5 of Fig. 1;

Fig. 6 is a section taken on the line 6—6 of Fig. 2;

Fig. 7 is a detail view;

Figs. 8 and 9 are plan views of different types of buttonholes the present machine is capable of stitching;

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Fig. 10 is a view similar to Fig. 2 but with the parts in a different operative position;

Fig. 11 is a view similar to Fig. 1 but with certain parts differently adjusted;

Fig. 12 is a view similar to Figs. 2 and 10 but with the parts in a different operative position after the adjustment of Fig. 11 has been made; and

Fig. 13 is a view looking in the direction of the arrow 13 in Fig. 12.

The machine comprises a stationary work-holding or bed frame B, carrying clamps 20 for holding the work W in which buttonholes are to be formed, and a movable stitching frame S carrying the stitching instrumentalities and buttonhole cutting devices together with mechanism for imparting the necessary movements to the stitching frame to position the stitches and for other purposes.

The stitching instrumentalities comprise the needle 27 carried by the upper turret 25, and a conventional looper (not shown) carried by the lower turret 26. The turrets 25 and 26 are operated in the usual manner by the turret operating lever 34 and main cam C. The main cam C is carried on the stitching frame S and is provided with three grooves 21, 22 and 23 of which the groove 22 on the under surface cooperates with a cam roll 35 to move the turret operating lever 34. The groove 21 cooperates with the fixed roll 24 mounted on the bed frame B to move the stitching frame as required and to feed the stitching instrumentalities with respect to the work. The groove 23 cooperates with a cam roll 7 to provide the necessary lateral motion of the stitching frame S with respect to the work. This lateral movement of the stitching frame S is required during the barring of the buttonhole and in putting in the stitches at the eye end of the buttonhole. The main cam C is driven by a worm 50 (Fig. 2) engaging teeth on the edge of the cam and the worm is given a variable step-by-step movement by a feed crank 48 and a one-way driving connection which is preferably of the roller clutch type shown at 51 (Figs. 3 and 4). This crank is operated by a link 46 connected to one arm of a bell-crank 44 pivoted at 45 to the stitching frame S and carrying on its other arm a cam roll 43 in the groove 42 of the cam 41. This cam is fixed to shaft 40 which is driven by a pulley (not shown).

In general the turret-operating mechanism comprises the turret operating lever 34 pivoted at 16 to the stitching frame S, the link 33 connected to an arm 32 on the gear sector shaft 31, the gear sectors 29, and the gears 28 which operate the upper and lower turrets 25 and 26.

The mechanism described thus far is conventional, and provides means for rotating the main cam step by step, for feeding the stitching devices lengthwise and laterally of the button hole

and for rotating the turrets to stitch around the eye of the button hole.

The mechanism by which the number of stitches on one side of the buttonhole may be varied with respect to those put in on the other side will now be described. It will be assumed that the machine is set to put in a given number of stitches on the first side 3 (see Fig. 8) and that it is desired to put in more stitches on the second side 4. Accordingly, it is necessary to shorten the feed of the stitching mechanism during the stitching of the second side so that more stitches will be put in.

The oscillating feed crank 48 is provided with a way 52 in which is slidably mounted a pivot block 47 carrying a pivot stud 53 (Fig. 3) which is received in the eye of link 46. The outer end of the pin 53 passes through a hole in a link 63 which is also slotted as shown at 80 and the parts are held in position on the pin by a nut 54. The slot 80 in the link 63 receives a pin 62 mounted on a swinging arm 60. This arm is pivoted at 61 to the stitching frame S and is normally held to the right, as shown in Fig. 1, by the spring 55 acting on the pin 56. Accordingly, if the swinging arm 60 is moved to the left, it moves the connecting rod pin 53 on the block 47 with it and increases the effective length of the crank. This turns the worm 50 through a smaller angle and consequently turns the main cam C a smaller amount, shortening each step of the feed.

The movement of the swinging arm 60 as required is accomplished by the following mechanism. On the turret-operating lever 34, see particularly Figs. 1, 2, 6, 10 and 12, there is pivotally mounted by a pivot 65 and clamping nut 9, a stitch feed varying cam 66 (see Fig. 7) having a curved cam track 67. The turret-operating lever 34 is provided with two ears 69 in which are screw-threaded studs 70. To adjust the mechanism to change the number of stitches which will be put in on the second side of the buttonhole, the clamping nut 9 is loosened. Then one of the studs 70 is unscrewed a little and the other is screwed in further, tilting the cam on the turret-operating lever. When adjusted to the position required the clamping nut 9 is tightened.

In the cam groove 67 of the stitch feed varying cam 66 is a cam follower 71 mounted on one arm of a bell crank 72 pivoted at 73 to the stitching frame S. The other end of the bell crank carries a stud 74 which is movable in a slot 75 formed on one arm of a second bell crank 76. This second bell crank is pivoted at 77 on the stitching frame S and its other arm is connected by a link 78 to a rod 79 which slides in guides 8 secured to the stitching frame S. The rear end of the rod 79 is connected by a pivot 81 to a slotted link 82 which engages a stud 83 on the swinging arm 60.

Accordingly, when the proper point in the eye of the buttonhole is reached and the turret-operating lever 34 swings about its pivot 16 to rotate the turrets, the stitch feed varying cam 66 moves the cam follower 71 from the position shown in Fig. 2 through the position shown in Fig. 12 to the position shown in Fig. 10. This moves the bell cranks 72 and 76, as shown in Fig. 10, and pulls the swinging arm 60 to the left, as shown in Fig. 1, thereby increasing the effective length of the crank 48 so that more stitches will be put in on the succeeding side of the buttonhole.

The cam groove 67 in the stitch feed varying cam 66 on the turret-operating lever 34 is given its peculiar shape for the following reasons: The movement of the bell crank levers 72 and 76 produced by the movement of the stitch feed varying cam 66 takes place during the stitching of the eye and since the movement of the bell crank levers affects the length of feed during this time the cam is laid out so that the change in the positions of the bell cranks during the movement of the cam from one extreme position to the other will not interfere with the rate of feed, around the eye, which at this time is controlled by other mechanism which will be described hereafter. By this means the change in the length of feed effected by the cam 66 does not occur until the portion of the eye which is sewn during the movement of the turrets 25 and 26 is completed and the sewing of the second side of the buttonhole is about to begin.

The mechanism by which the machine may be changed quickly from sewing an eyelet-end buttonhole to sew a no-eye buttonhole or vice versa and the number of stitches put in during the stitching of the eye may be reduced or increased as required, will now be described. At 86 (see Figs. 1 and 5) is shown an eye-feed adjusting handle pivoted at 87, and provided with a latch 88 moving about a pivot 89 and normally held in latched position by a spring 90. The latch carries a pin 91 which can move along a slot 92 in a quadrant 93, see also Fig. 11, secured to the stitching frame of the machine. At the right hand end of the slot 92 in the quadrant 93 is located a stop piece 100 adjustably held to the quadrant by a bolt 101. Likewise at the left hand end of the quadrant there is another adjustable stop piece 102. Each stop piece has a hole 103 in it to receive the pin 91. By pressing the handle of the latch 88 the pin 91 can be withdrawn from the hole and the handle then moved along the quadrant 93 and the pin 91 inserted in the other hole 103. The stop pieces 100 and 102 are adjustable along the quadrant 93 as required in sewing eyes of different sizes. The upper end of the eye-feed adjusting handle 86 which extends beyond the pivot 87 is connected to a rod 94, the other end of which is connected to a sliding rod 95 bent at right angles to form a movable stop 96 (see Figs. 1, 2, 11 and 12). Adjustment of the handle 86, therefore, changes the position of the stop 96. This stop 96 is in the path of the swinging arm 60 and limits its movement to the right as seen in Figs. 1 and 13.

In Figs. 1 and 2 the parts are shown in the position which they occupy when a buttonhole having an eye such as is shown in Fig. 8 is to be sewn. In this case the eye-feed adjusting handle 86 is at the extreme right and the stop 96 is in its extreme left hand position and, therefore, limits the movement of the swinging arm 60 to the right. When a no-eye buttonhole such as is shown in Fig. 9 is to be sewn, the eye-feed adjusting handle 86 is placed in the position shown in Fig. 11 and the stop 96 is moved to the right. When the stop 96 is in the right hand position shown in Fig. 11 the block 47 is pulled to the right as shown in Fig. 13 by the swinging arm 60 and spring 55 as soon as the stitch feed varying cam 66 reaches the position shown in Fig. 12. The shift of position of the block 47 shortens the effective length of the crank 48 and consequently increases the distance which the main cam C is moved at each stroke of the crank 48. Since the shorter the effective length of the crank 48, the greater the annular distance through which the cam C and the turrets 25, 26 will be turned for each revolution of the main shaft 40, the machine in this adjustment