

- [54] **ONE STEP BUTTONHOLE OPERATING AND INDICATING DEVICES**
- [75] Inventors: **John W. Casner; James A. Transue,**
both of Elizabeth; **John Skiba,**
Clark, all of N.J.
- [73] Assignee: **The Singer Company, New York,**
N.Y.
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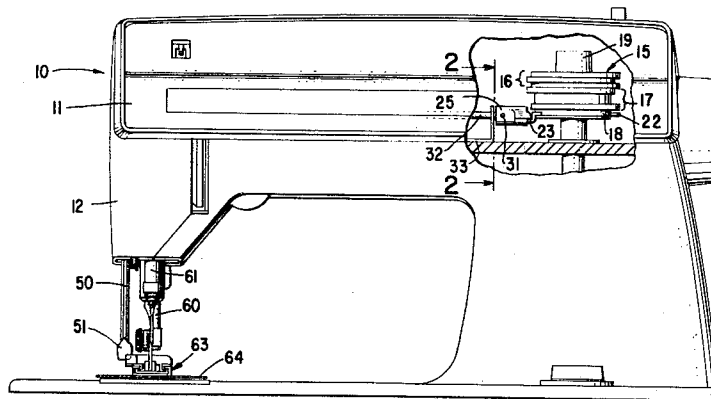
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3,656,443	4/1972	Ross	112/158 B X

Primary Examiner—Werner H. Schroeder
Attorney, Agent, or Firm—Marshall J. Breen; Chester A. Williams, Jr.; Robert E. Smith

[57] **ABSTRACT**
A device used in conjunction with a closed pattern unit such as a buttonhole mechanism, to indicate the starting position to an operator, to initiate the steps as required for activating the closed pattern unit, and, when stored during non-use, to allow the closed pattern unit to recycle to a known position from which it will be ready to begin a new closed pattern. The device, through a linkage arrangement, presents a red flag to view adjacent a needle bar of a sewing machine when a tripping rod lever is positioned to be actuated by a presser device movable with the work material for automatically actuating the closed pattern unit. Placing of the tripping rod lever in a stored position causes the lever to be positioned by a resilient member so as to recycle the closed pattern unit to a known position from which a new closed pattern may be initiated.

3 Claims, 5 Drawing Figures



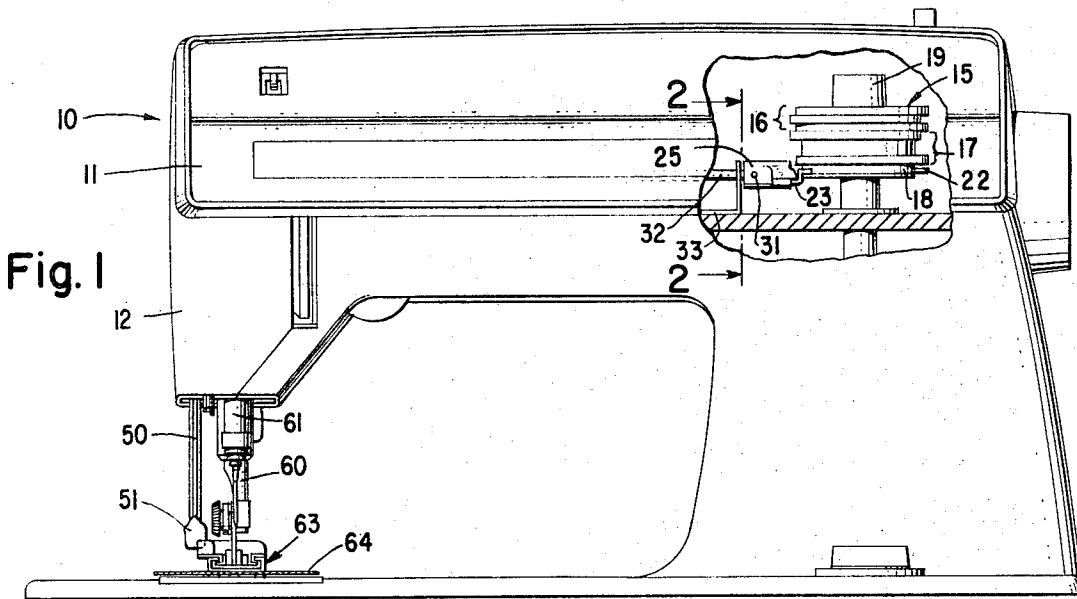


Fig. 1

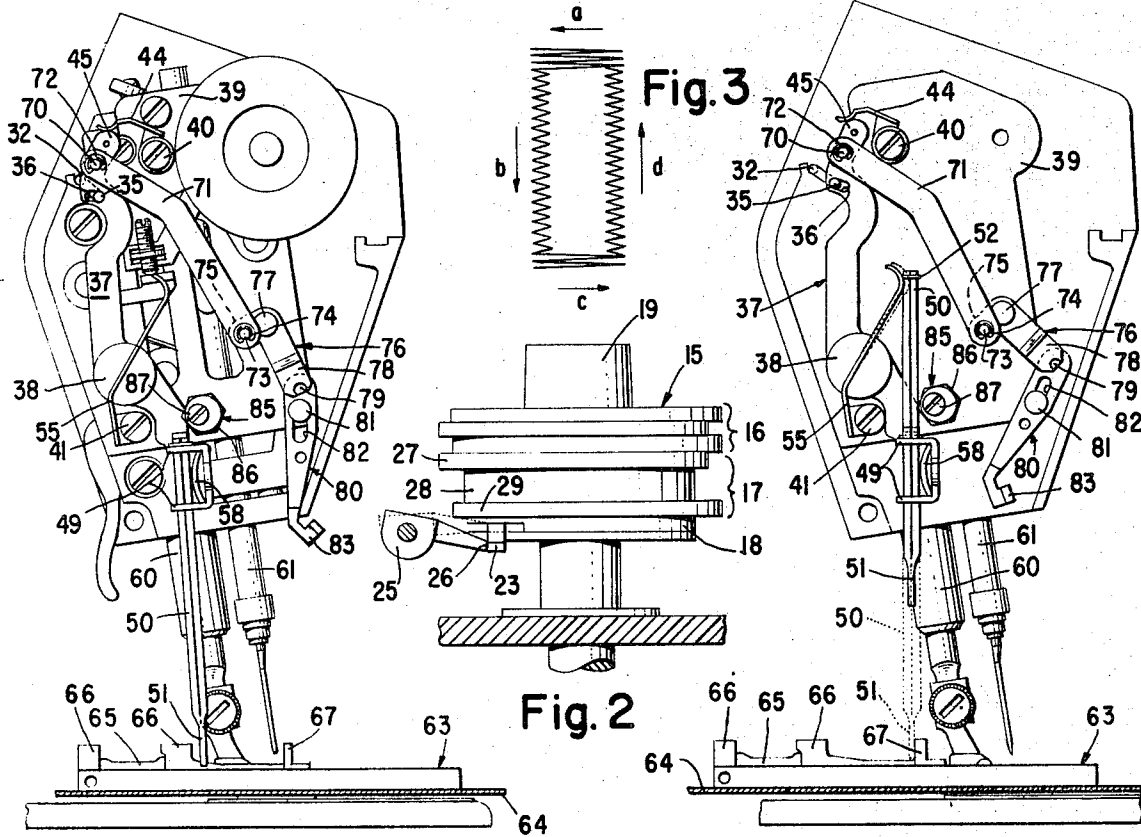


Fig. 2

Fig. 3

Fig. 4

Fig. 5

ONE STEP BUTTONHOLE OPERATING AND INDICATING DEVICES

BACKGROUND

Sewing machines having the capability for generating a closed pattern such as a buttonhole are able to complete a buttonhole in 4, 2 or 1 step depending on machine complexity. In those machines capable of making a buttonhole in four steps some means of rotating the buttonhole producing cams into the proper position after each step is required and is generally provided for by a knob directly connected to the buttonhole cams. In making a two step buttonhole generally the buttonholing cams are rotated through a clutch mechanism which is disengaged after a buttonhole end is produced and the buttonhole cams are held stationary while a buttonhole side is being formed. After the buttonhole side reaches the proper length the clutch mechanism is manually reengaged and the second end is formed while the buttonhole cams are rotated after which the final side is formed while the buttonhole cams again are stationary.

The U.S. Pat. No. 3,656,443, Apr. 18, 1972 of Ross discloses a one step buttonhole making machine wherein the buttonholing cams are mounted on a clutch device and wherein rotation of the cams may be detained by a ratchet and pawl arrangement. A sliding presser foot is utilized having adjustable cams means thereon to initiate the buttonholing steps by releasing the pawl from the ratchet.

In the above one step buttonhole device there exists the possibility that the buttonhole will not be initiated in the position expected by the operator. Indeed the initial position of the cams must be determined by an operator prior to initiating stitching of a buttonhole in order to insure proper placement of the buttonhole. The cams, however, are accessible to an operator who can attain the desired starting position by depressing a button. A problem is created where the buttonholing cams are not visible or accessible, for instance when by the inclusion of a cam removal device for replaceable cams on the top of a cam stack, the buttonholing cams are hidden in the middle of the cam stack.

SUMMARY OF THE INVENTION

The present invention seeks to obviate the above drawbacks by providing a device which, when used in a system where a one-step buttonholing foot initiates the steps required of 2 or 4 step buttonholing cams, will insure that the cams are always in a known position so as to initiate a new buttonhole in a known direction and will provide a positive indication of the correct position of the device for initiating a buttonhole.

To accomplish these objectives the device utilizes a tripping rod lever which may be positioned for influence by an abutment on a movable presser foot, to reposition the tripping rod lever and a linkage arrangement slidably supporting the lever. The linkage arrangement is operatively connected to a clutch control mechanism of a clutch driving the buttonhole cams. Thereby, a one-step buttonhole may be produced.

The tripping rod lever is slidable into a stored position when not in use. In this stored position the tripping rod lever is urged by a leaf spring to a position which through the linkage arrangement positions the clutch control mechanism to allow the buttonhole cams to ro-

tate to a known start position at which point they are held declutched from the sewing machine drive.

To sew a buttonhole, the sewing machine must first be placed in the buttonhole mode of operation and the one-step buttonhole foot must be installed. Thereafter the tripping rod lever may be slid into operative position and pulled forward until a second linkage, connected to the linkage arrangement supporting the tripping rod lever, presents a projection to the view of the sewing machine operator indicating that the proper position of the tripping rod lever has been achieved.

In the event that the operator discontinues sewing of a buttonhole prior to completion, at any point, placing of the tripping rod lever in the stored position will cause the buttonhole cams to rotate with machine operation to the known start position in which position they will be held until the operator once again manipulates the tripping rod lever to initiate a buttonhole.

DESCRIPTION OF THE DRAWINGS

The invention will be described by reference to the accompanying drawings in which:

FIG. 1 is an elevation of a sewing machine with a portion removed to show the internal construction of the upper part of a cam stack;

FIG. 2 is an enlarged view of the upper portion of the cam stack as seen from line 2—2 of FIG. 1;

FIG. 3 is a diagrammatic view of a buttonhole made by the buttonhole cams seen in FIG. 2;

FIG. 4 is a head end elevational view of the sewing machine of FIG. 1 with the face plate removed to show the details of construction of the operating and indicating device; and

FIG. 5 is a view similar to FIG. 4 but showing the parts in a different position.

In FIG. 1 is shown a sewing machine 10 having a hinged upper lid 11 shown in the closed position, beneath which are located the controls for zigzag motion and the pattern cam selection system. The machine is also provided with an outer casing including a face plate 12. For details of the pattern cam selection system reference may be had to the patent application Ser. No. 354,409, filed Apr. 26, 1973, for a Cam Selection Module which patent application is hereby incorporated by reference and made a part of this application. In that patent application is described a pattern cam selection system having a plurality of cam followers, some of which cooperate with a replaceable cam or with buttonhole cams, or when not used those cam followers are placed in a position where they will be ineffective to control the sewing machine operation.

Exposed through a portion of the sewing machine removed in FIG. 1 to show some of the pertinent details is an upper portion of a cam stack 15.

The upper portion of the cam stack 15 includes a replaceable cam 16, a buttonhole cam assembly 17, and a buttonhole cam assembly clutch mechanism 18. The replaceable cam unit is associated with a cam removal device 19.

The clutch mechanism 18 of the buttonhole assembly 17 may be constructed in accordance with the teachings of the U.S. Pat. No. 3,585,877, June 22, 1971, of Marsh et al. which is incorporated herein by reference. This clutch mechanism includes diametrically opposed clutch separating pawl tabs each arranged at a different elevation and including an upper tab 22 and a lower tab 23. The rotation of the buttonhole assembly 17 is pre-

vented by impingement of an abutting end 26 of an abutment member 25 against either the upper tab 22 or the lower 23 (see also FIG. 2). For the purposes of explaining the subject of this invention it is sufficient to note that the buttonhole cam assembly contains a feed cam 27, and blank cam 28, and a needle field cam 29 utilized to determine neutral position of zigzag motion derived from a zigzag cam elsewhere in the cam stack. The blank cam 28 is utilized to store the feed cam follower when not used to track the feed cam 27 or a feed cam in the replaceable cam 16.

When the abutting end 26 of the abutment member 25 is shifted out of impingement with the upper tab 22 to the position shown in solid lines in FIG. 2, the buttonhole cam will rotate while the barring stitches *a* in FIG. 3 are formed. When the abutting end 26 of the abutment member 25 impinges the lower ear 23 as is shown in solid in FIG. 2, rotation of the buttonhole cams will stop and line of left side stitching *b* shown in FIG. 3 is formed. Repositioning the abutment member 25 to the position shown in phantom lines in FIG. 2 will allow the buttonhole cams to rotate once again while the barring stitches *c* in FIG. 3 are fashioned. When the abutting end 26 of abutment member 25 impinges once again on upper ear 22 of the clutch mechanism 18 rotation of buttonhole cams will cease and the right side stitching *d* in FIG. 3 is formed to close up the buttonhole.

The abutment member 25 is affixed by a set screw 31 to a rod 32, the rod 32 being supported in the sewing machine 10 by brackets 33 only one of which is visible. The end of the rod 32 opposite that attached to the abutment member 25 is fashioned into a crank 35 which projects into a cam slot 36 of lever 37 pivoted on a shouldered rivet 38 attached to a mounting plate 39 (see FIGS. 4 and 5). The mounting plate 39 is affixed to the frame of the sewing machine 10 by screws 40 and 41. The screw 40 also adjustably clamps a first leaf spring 44 which impinges on a circular end 45 of the lever 37 and aids to retain the lever and through it the crank 35, rod 32 and abutment member 25 in one of two stable positions.

The end of the lever 37 opposite the circular end 45 is formed with a pair of spaced lugs 49 at right angle to the lever. The lugs are fashioned aligned with noncircular holes which receive a tripping rod lever 50 of similarly noncircular cross-sectional shape having a flattened paddle 51 on one end and a snap ring 52 on the other end thereby slidably retaining the tripping rod lever on the lugs 49. A second leaf spring 55 adjustably clamped to the mounting plate by the screw 41 impinges on the tripping rod lever 50 when the lever is in the elevated position shown in FIG. 5 for a purpose which will be explained below. A formed leaf spring 58 trapped between the lugs 49 of the lever 37 and bears against the tripping rod lever 50 to assist in retaining the tripping rod lever in any position in which it is placed.

In FIG. 4 is shown the entire head end of a sewing machine including portions of the pressure regulating mechanism for a presser bar 60 and the gate mechanism for a needle bar 61. In the interest of clarity FIG. 5 includes only those parts which are pertinent to the present invention, however, in a different position than that shown in FIG. 4. Attached to the presser bar 60 is a sliding presser foot 63 normally spring biased to the position indicated in FIG. 4. The sliding presser foot 63

is driven with the work material 64 on which a buttonhole is being made to a position as indicated in FIG. 5 by the feed system of the sewing machine. A button 65, one of those for which the buttonhole is being made, when inserted between jaws 66 on the sliding presser foot 63, will position an abutment 67 so that the abutment when moved with the sliding presser foot by work material will eventually engage and shift the flattened paddle 51 and consequently the tripping rod lever 50 for a purpose to be described below.

It has been noted that the position of the rod 32, crank 35, cam slot 36, lever 37 and tripping rod lever 50 is different in FIG. 5 from the position shown in FIG. 4. Movement of flattened paddle 51 of the tripping rod lever 50 rearwardly by the abutment 67 from the position shown in FIG. 4 to that shown in FIG. 5 will move the lever 37 clockwise and cause cam slot 36 of lever 37 to move the crank 35 and rod 32 counterclockwise. This will cause motion of abutment member 25 from the position shown in solid lines in FIG. 2 to that position shown in phantom lines thereby allowing the buttonhole cams 17 to rotate to produce barring stitches *c* shown in FIG. 3. Following this, the abutting end 26 of abutment member 25 will impinge on upper ear 22 of buttonhole clutch mechanism 18 and the rotation of the buttonhole cams 17 will be stopped so that the right side stitching *d* shown in FIG. 3 will be formed.

In FIG. 5 the position of the tripping rod lever 50 is shown in phantom lines as it would be when urged to this position by abutment 67 of the sliding presser foot 63. The tripping rod lever 50 is shown in solid lines in the position it would assume if displaced upwardly from the position indicated in FIG. 4 or if displaced upwardly from the position indicated in phantom lines in FIG. 5. The action of the second leaf spring 55 on the upwardly displaced tripping rod lever 50 imparts a clockwise movement to the lever 37. From the discussion of the preceding paragraph it will be noted that this position of parts will cause the abutment member 25 to impinge on upper tab 22. When next the tripping rod lever is lowered and drawn forward to the position indicated in FIG. 4, the machine operator will be certain which portion of a buttonhole the machine will form when stitching is initiated, and she can orient the work accordingly.

The abutment member 25 impinges on the lower ear 23 of the buttonhole clutch mechanism 18 when the tripping rod lever 50 is pulled forward and the upper portion of the lever 37 containing cam slot 36 causes the crank 35 of rod 32 to rotate clockwise. To insure that the abutting end 26 of abutment member 25 impinges squarely on lower ear 23 of buttonhole clutch mechanism, an eccentric stop 85 is provided for the lever 37. The eccentric stop is fashioned with a hexagonal head 86 to simplify adjustment. The stop is firmly held in the proper position by means of a screw 87 threaded into the mounting plate 39. To insure proper impingement of the abutting end 26 of the abutment member 25 on the upper tab 22 of the buttonhole clutch mechanism 18 the position of the abutment member on the rod 32 may be adjusted by means of the set screw 31 after the adjustment of the eccentric stop 85 which positions flag end 83 relative to face plate 12.

To provide a visual indication of the proper position of the tripping rod lever to initiate a buttonhole an additional linkage is supplied. A pin 70 affixed to the

lever 37 between the cam slot 36 and the circular end 45 projects through one end of a link 71 which is held there by a snap ring 72. The opposite end of the link 71 similarly is attached by a pin 73 held by a snap ring 74, the pin 73 being affixed to an arm 75 of a bell crank 76 pivoted on a shouldered rivet 77 fastened to the mounting plate 39. The second arm 78 of the bell crank is pivoted at 79 to the end of an indicator link 80 which is itself pivotable and slidable on shouldered rivet 81 affixed to the mounting plate 39 through a slot 82 in the indicator link. A flag end 83 of the indicator link 80 may be painted an eye catching color to attract attention when the tripping rod lever 50 and flattened paddle 51 on the end thereof is pulled forward as is shown in FIG. 4 causing the lever 37 to draw the link 71 back and rotate the bell crank 76 clockwise, as shown in FIG. 5 resulting in the indicator link 80 pivoting and sliding about the shouldered rivet 81 and projecting the flag end 83 of the indicator link out from under the face plate 12 of the sewing machine 10 adjacent the needle bar 61. When the tripping rod lever 50 and the flattened paddle 51 is moved by abutment 67 of sliding presser foot 63 to the position shown in FIG. 5, lever 37 pushes the link 71 forward rotating the bell crank 76 counterclockwise thereby sliding and pivoting the indicator link 80 about the shouldered rivet 81 so that the flag end 83 is withdrawn from the sewing operator's view upwardly behind the face plate 12.

Having thus set forth the nature of this invention what is claimed herein is:

1. In a sewing machine having a frame, a closed pattern unit within said frame, said closed pattern unit operable in steps from a start position to produce a closed pattern, a presser device including a portion movable with a work fabric, a mounting plate supported on said frame, and a linkage mounted on said mounting plate and including a tripping rod lever slidable to a stored position or to an operative position to be actuated by said movable portion of said presser device, said link-

age and said tripping rod lever connecting said movable portion of said presser device with said closed pattern unit to initiate said step wise operation, wherein the improvement comprises:

- a. means associated with said linkage for indicating said start position of said closed pattern unit, and,
- b. means acting on said tripping rod lever when said lever is in said stored position for causing said lever to initiate the steps of said closed pattern unit required to arrange said closed pattern unit in said start position.

2. In a sewing machine as claimed in claim 1 wherein said means associated with said linkage to indicate said start position of said closed pattern unit includes a connecting link having one end connected with said linkage mounted on said mounting plate; a bell crank with first and second arms rotatably mounted on said mounting plate adjacent the other end of said connecting link and having said first arm pivoted to said connecting link; and indicator shiftably supported on said mounting plate adjacent to said bell crank, and means operatively connecting to a second arm of said bell crank with said indicator for shifting said indicator into a visible exposed position relatively to said sewing machine frame at that position of the aforesaid linkage, connecting link and bell crank corresponding to said start position of said closed pattern unit; and for shifting said indicator into a hidden position with respect to said frame at any other position of the aforesaid linkage, connecting link and bell crank.

3. In a sewing machine as claimed in claim 1 wherein said means acting on said tripping rod lever includes a resilient member mounted on said mounting plate and coacting with said tripping rod lever in said stored position to place said tripping rod lever and said linkage in a position to initiate said step wise operation of said closed pattern unit to said start position.

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