

June 27, 1961

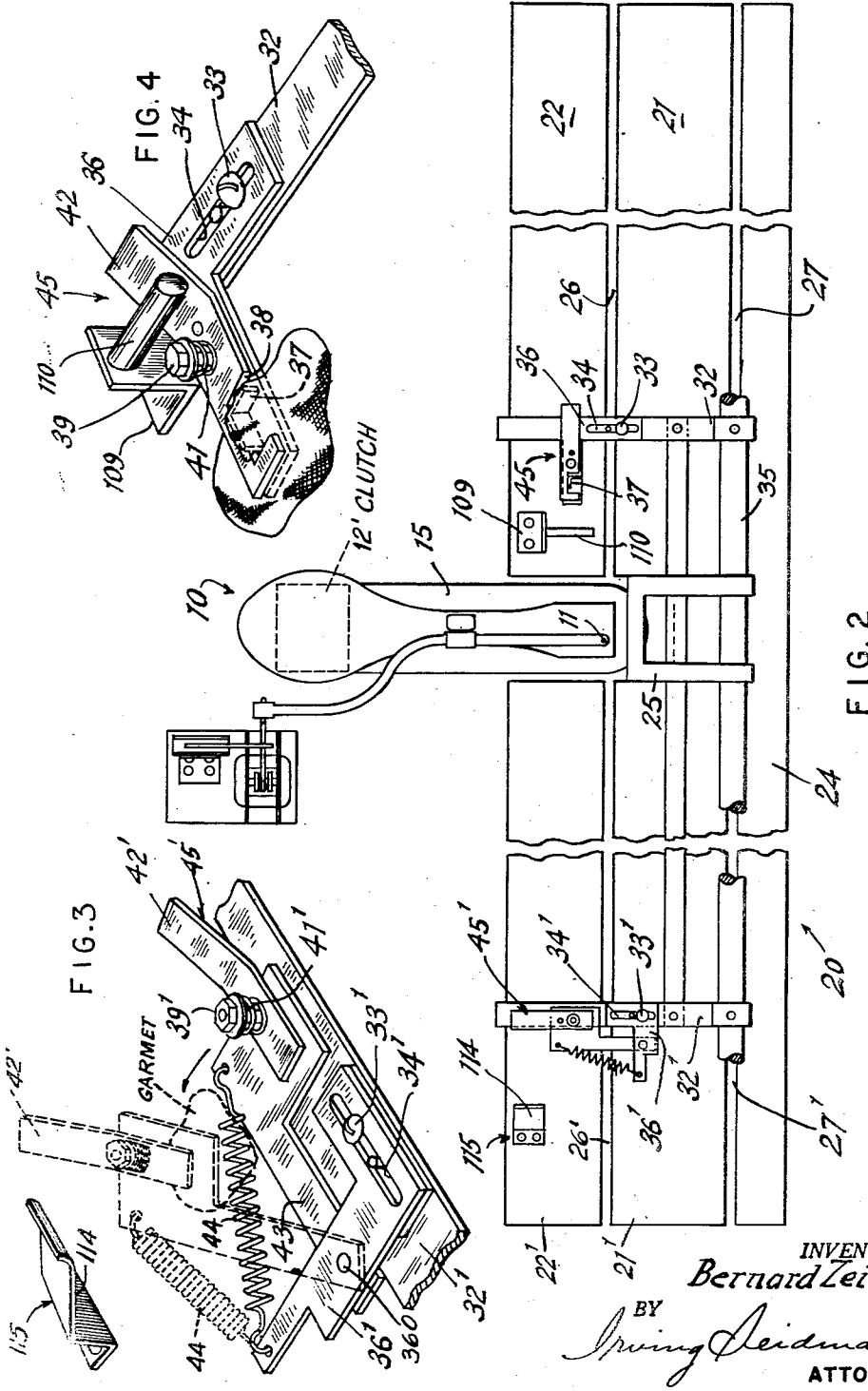
B. ZEITLIN

2,989,934

AUTOMATIC CLAMP RELEASE FOR SEWING MACHINE

Filed May 21, 1958

5 Sheets-Sheet 2



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5 Sheets-Sheet 3

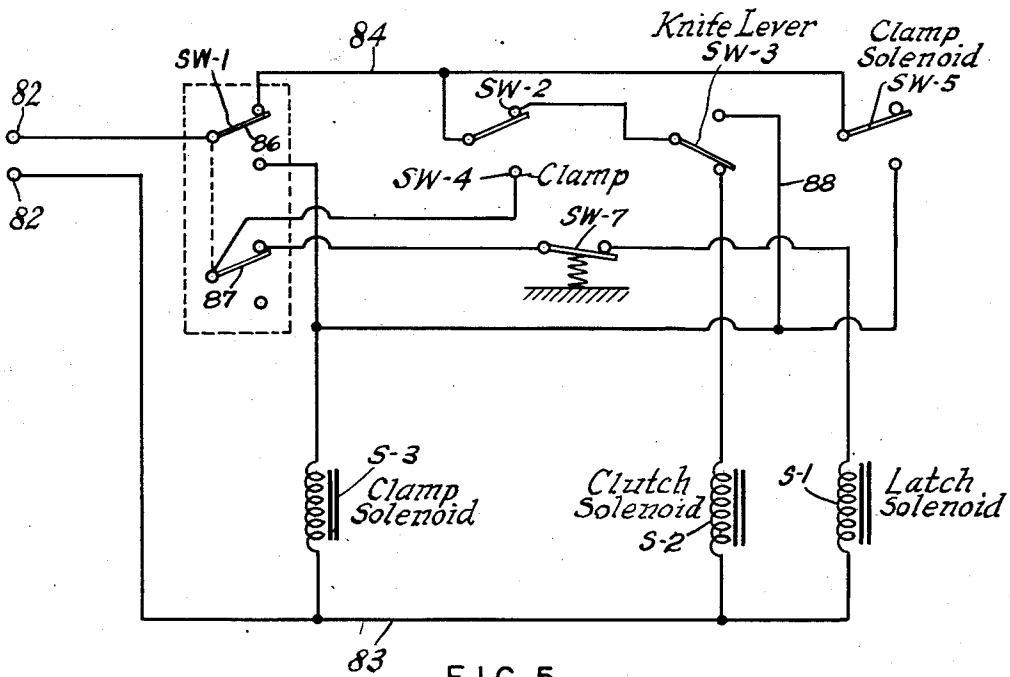


FIG. 5

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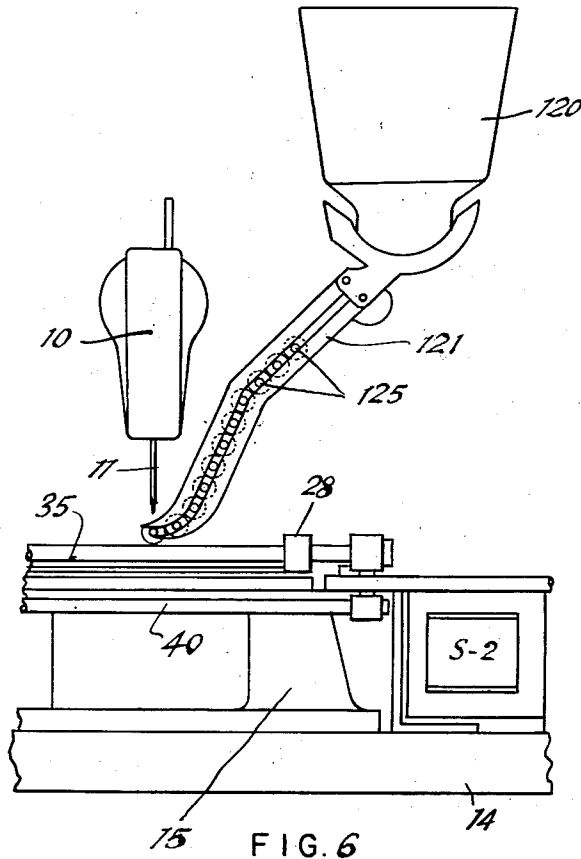
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AUTOMATIC CLAMP RELEASE FOR SEWING MACHINE

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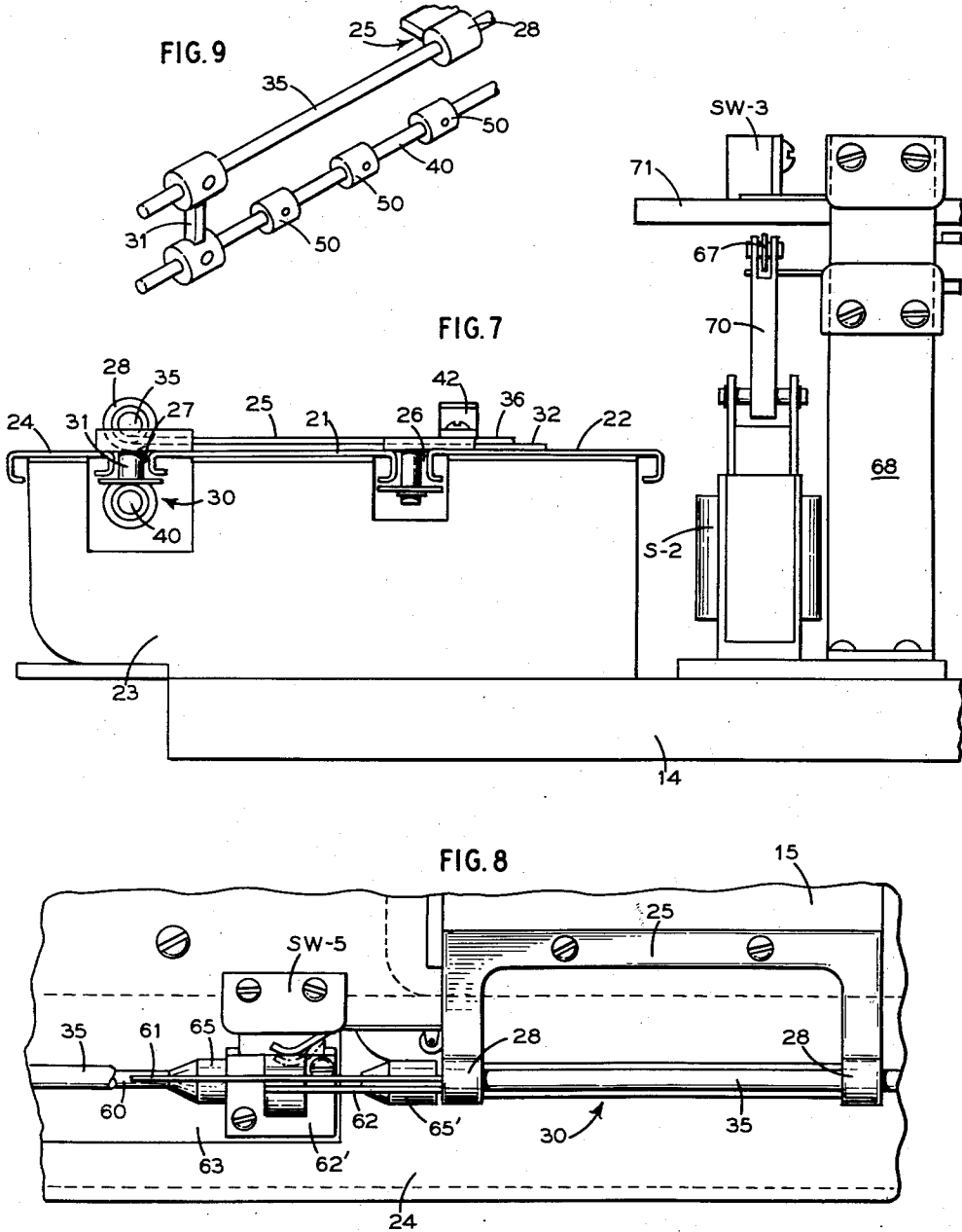
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AUTOMATIC CLAMP RELEASE FOR SEWING MACHINE

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5 Sheets-Sheet 5



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1

2,989,934

AUTOMATIC CLAMP RELEASE FOR SEWING MACHINE

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 5 Claims. (Cl. 112-110)

This invention relates to automatic sewing machines and, more particularly, to novel workpiece clamping means for holding a workpiece as it is automatically stepped relative to a sewing head and including means for automatically releasing the clamping means at the end of a work sequence.

In my copending application Serial No. 720,901, filed March 12, 1958, I have described and illustrated a relatively inexpensive garment clamping and positioning attachment easily attachable to either a lock stitch or chain stitch buttonhole sewing machine, or to a button sewing machine, and incorporating automatic positioning controls cooperable with the usual machine controls to effect automatic movement of the garment to successive buttonhole or button positions responsive to completion of the buttonhole or button sewing at each preceding position.

This attachment comprises an extended support securable to the platen of the machine and carrying a reciprocable slide biased to move in one direction transversely of the platen. Selectively positionable abutments are provided on the slide and engaged by positioning stop means released by cams operated by a solenoid. Responsive to completion of each buttonhole button sewing cycle, the solenoid is energized to release the stop means for movement of the slide to the next position.

The slide carries spaced garment clamps movable over the extended support. Before starting the automatic cycle, the operator clamps a garment to the slide, after which the operator closes a switch to start the cycle and proceeds to load another machine. At the end of the buttonhole forming or button sewing sequence, the operator manually releases the clamps and removes the garment.

With this attachment, one operator can handle six machines or more by successively loading the several machines and starting their operating cycle and then returning to the first machine to remove the completed garment and re-load the machine. However, to unload each machine, the slide-carried garment clamps must be manually released, and this somewhat delays the overall operation.

In accordance with the present invention, the cycle is appreciably accelerated by providing means for automatically opening the garment clamps when the last buttonhole or button sewing cycle is completed. In addition, the stop operating solenoid, which has previously been deenergized responsive to clamping movement of the work clamp on the machine, is deenergized much sooner in the cycle responsive to movement of the stop operating cams to the release position.

As a further feature, one of the garment clamps is so designed as to maintain the garment under tension during the operating cycle.

For an understanding of the invention principles, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing. In the drawing:

FIG. 1 is a front elevation view of a button sewing machine embodying the invention;

FIG. 2 is a partial plan view of the work support extension and the garment clamps;

FIGS. 3 and 4 are perspective views of the automatic releasing means for the garment clamps;

2

FIG. 5 is a schematic wiring diagram of the interlock controls;

FIG. 6 is a partial front elevation view illustrating the button hopper and guide means;

FIG. 7 is a left end elevation view of the apparatus;

FIG. 8 is an enlarged partial plan view thereof illustrating the support bracket; and

FIG. 9 is a perspective view of the slide.

Referring to FIGS. 1 and 2, a button sewing machine, generally designated at 10, is illustrated as including a movable platen 15, a needle 11, a clutch operating lever 12, and a clamp operating lever 13. Lever 12 operates a conventional sewing machine clutch 12', such as shown and described, for example, in U.S. Patent No. 1,730,014 issued October 1, 1929. Machine 10 is mounted on a support surface or table 14, and includes the usual movable and releasable work clamps which are operable to clamp the work against plate 15 during the sewing operation. To simplify the disclosure, these sewing machine clamps have not been illustrated.

Referring to FIG. 6, the buttons 125, which are of the type having a non-circular stem having one lateral dimension in excess of the other and which is laterally pierced for sewing, are disposed in a hopper 120. From hopper 120, the buttons move down a slotted guide 121 with the stems projecting from the slot. The slot in guide 121 is substantially equal in width to the lesser lateral dimension of the button stems so as to properly orient the sewing apertures relative to needle 11. A stop (not shown) holds the buttons spaced from needle 11 and, just in advance of each sewing cycle, a finger (not shown) moves the leading button to align its stem aperture with needle 11.

As is well-known in the art, this machine has a constantly running motor which may be selectively coupled to the button sewing components by engaging the clutch through operation of lever 12. In using the machine in the normal manner, an operator positions a garment on platen 15, operates lever 13 to move the usual sewing machine clamp or clamps to hold the garment fixed on the platen, and then operates lever 12 to engage the clutch. This starts the stitching operation of needle 11 and, when this stitching cycle is completed, the clutch is automatically disengaged.

In accordance with the present invention, an attachment, generally indicated at 20, is operatively combined with levers 12 and 13 and platen 15 of machine 10 in such a manner that machine 10, when started at a first button location, automatically forms stitches of a series of buttons in succession, and then automatically shuts off after stitching of the last button.

Device or attachment 20 includes garment support means in the form of horizontal surface wings or extensions 21, 22, 21', 22' on each side of platen 15 and substantially coplanar therewith. The wings or extensions are secured to cross members 23, 23' resting on surface 14, and the cross members are interconnected by a relatively narrow and elongated horizontal surface front member 24. For a purpose to be described, members 21, 21' are spaced from members 22, 22' to provide slots 26, 26', and member 24 is spaced from members 21, 21' to provide slots 27, 27'.

A U-shape bracket 25 is screwed or bolted to the forward edge of platen 15, and the ends of the legs of bracket 25 are formed to provide spaced bearings 28 for the upper rod 35 of a slide generally indicated at 30 and including a lower rod 40 beneath rod 35 and rigidly connected thereto by posts 31 extending through slots 27, 27'. Slide 30 is reciprocable transversely of platen 15 by virtue of the sliding mounting of rod 35 through bearings 28.

3

Rod 35 has secured thereto straps 32, 32' extending rearwardly from the rod and carrying headed pins 33, 33' engaged in slots 34, 34' of flat angle brackets 36, 36'. The inner end of bracket 36 has an angular projection 37 thereon surrounded by a rectangular notch 38 in a garment clamp 45 held to bracket 36 by a stud 39 and a spring 41. Clamp 45 is a bent strap having its inner end lying against bracket 36 and its outer end 42 sloping outwardly and upwardly. When end 42 is pressed downwardly, a garment may be positioned between bracket 36 and clamp 45, being firmly gripped by notch 38 cooperating with projection 37.

Bracket 36' has a flat plate 43 swingably pivoted thereon at 360 and biased counterclockwise by a spring 44 connected between bracket 36' and plate 43. A clamp 45', comprising a bent strap, is held to plate 43 by a stud 39' and a spring 41', and has a rearwardly and upwardly sloping end 42'. In securing the garment in clamp 45', plate 43 is swung clockwise, end 42' is depressed to open the clamp and released to clamp the garment between parts 43 and 45, and plate 43 is released. Spring 44 thereupon pulls clamp 45' away from clamp 45 to stretch the garment flat between the clamps.

Rod 40 has mounted thereon abutments 50 adjustably positionable along this rod by means of set screws 51. These abutments are positioned along rod 40 in accordance with the spacing of the buttonholes. Slide 30 is biased to the left, as viewed in FIG. 1, by a spring tension device 55 having its flexible wind-up element 52 connected to the end of rod 40 adjacent a limit stop 53 on this rod. Stop 53 is arranged to operate a toggle limit switch SW-1, mounted on a bracket 54 on a member 23', after completion of the last buttonhole.

Abutments 50 cooperate with stop levers 61, 62 pivotally mounted on a bracket 62' on a base 63 secured to support 14. Springs 64 bias the levers to the position shown in FIG. 1. Lever 61 is normally in a position where its upper end will engage an abutment 50, whereas the abutment engaging end of lever 62 is normally retracted. Both levers have ends cooperable with cams 65, 65' adjustable along the normally outwardly biased plunger 60 of a solenoid S-1 mounted on base 63.

When solenoid S-1 is energized as described in connection with FIG. 5, plunger 60 is retracted. Cam 65 swings lever 61 clockwise to disengage stop 50, and cam 65' swings lever 62 counterclockwise into the path of the next abutment or stop 50, all with reference to FIG. 1. Device 55 pulls slide 30 to the left until the next abutment 50 engages lever 62. When solenoid S-1 is deenergized, plunger 60 is extended under spring bias. Cam 65' releases lever 62 from stop 50 and cam 65 releases lever 61 into the path of this stop. Device 55 moves the slide 30 a short distance until stop 50 engages lever 61.

In accordance with the invention, a stop 100 on plunger 60 engages the operator 105 of a normally closed switch SW-7 included in the energizing circuit of solenoid S-1. Thus, as soon as solenoid S-1 is energized to retract its plunger 60, stop 100 engages operator 105 to open switch SW-7 and de-energize solenoid S-1. Plunger 60 thus extends to disengage cams 65, 65' from levers 61, 62, as soon as levers 61, 62 have been operated. This accelerates the operating cycle.

A switch SW-5 is mounted on support 23' adjacent slide 30, and has an operator so disposed that, when an abutment or stop 50 is engaged with either lever 61 or lever 62, switch SW-5 is open. When solenoid S-1 is energized to release slide 30, the movement of an abutment 50 releases the operator to close switch S-5 until the next abutment engages lever 62.

Clutch lever 12 extends through the forked free end of a lever 67 pivoted, intermediate its ends, on a bracket 68 adjacent a solenoid S-2 mounted on support 14. The other end of this lever is secured to the plunger 70 of solenoid S-2. A bracket 71 on solenoid S-2 supports a

4

switch SW-3 having an operator 72 engageable with lever 16 which operates the sewing machine knife. In the known button sewing machine which is schematically illustrated in the drawings this knife, after completion of the stitching cycle operates to cut the thread. When lever 16 is raised as the knife cuts the thread, the lever operates switch SW-3 to open the circuit of clutch solenoid S-2.

Clamp lever 13 has an extension arm 73 rigidly secured to its free end and connected to the plunger 75 of a solenoid S-3 mounted on support 14. Arm 73 extends between the operators of switches SW-2 and SW-4 mounted on a bracket 74 on the base of solenoid S-3. The end of arm 73 connected to plunger 75 moves down when the usual sewing machine clamps are raised from platen 15, and moves up when these usual sewing machine clamps are lowered to press the fabric against platen 15. As arm 73 moves down, it closes switch SW-4 in the energizing circuit of solenoid S-1, and as arm 73 moves up, it closes switch SW-2 in the energizing circuit of clutch solenoid S-2.

Referring to FIG. 5, electric potential is supplied to the control circuit at terminals or contacts 82. One contact 82 is connected to line 83 directly, and the other contact 82 is connected to switch SW-1 which, when thrown to the "on" position, connects line 84 to the other contact 82. Switch SW-1 is a double pole, double throw toggle switch having arms 86 and 87. In the "on" position, arm 86 connects line 84 to the contact 82, and arm 87 connects solenoid S-1 to switch SW-4. In the "off" position, to which switch SW-1 is operated by limit stop 53, arm 86 energizes sewing machine clamp lifting solenoid S-3, and arm 87 opens the circuit of solenoid S-1.

To use the apparatus, the operator pulls slide 30 back until the abutment 50 next adjacent limit stop 53 is engaged with the end of lever 61. The operator then clamps the garment in clamps 45, 45' making adjustments until the first button location is aligned with needle 11. Abutments 50 are then adjusted along rod 30 at the desired button spacings.

The operator then moves switch SW-1 to the "on" position illustrated in FIG. 5. As arm 86 disengages its lower contact, solenoid S-3 is deenergized to move lever 13 and arm 73 to drop the sewing machine clamps against the work to hold the latter fixed to platen 15. Arm 73 on clamp lever 13 opens switch SW-4 and closes switch SW-2. As arm 86 engages its upper contact, the clutch solenoid is energized through line 84, switch SW-2, switch SW-3, and line 83.

The machine 10 starts its button sewing cycle, and, when the button sewing cycle is complete, the knife descends to cut the thread. Lever 16 operates switch SW-3 to engage its upper contact, thus deenergizing clutch solenoid S-2 and energizing sewing machine clamp lift solenoid S-3 through conductor 88. As these sewing machine clamps lift, arm 73 moves down to open switch SW-2 and close switch SW-4. Meanwhile the knife lifts and lever 16 moves switch SW-3 to engage its lower contact. However, clutch solenoid S-2 is not reenergized as switch SW-2 is open.

Closure of switch SW-4 energizes solenoid S-1 through arm 87 of switch SW-1 and switch SW-7. Plunger 60 moves into the solenoid, swinging lever 61 clockwise (FIG. 1) and lever 62 counterclockwise (FIG. 1). This releases the first abutment 50, and slide 30 is drawn to the left until the next abutment strikes lever 62. During such abutment release, switch SW-5 is closed, by stop 100 releasing the switch operator, to maintain the sewing machine clamps lifted but, as such next abutment engages lever 62, switch SW-5 is reopened, by stop 100 re-engaging the switch operator, to drop the clamps. Meanwhile, as stop 100 engaged operator 105, switch SW-7 was opened to deenergize solenoid S-1, so that plunger 60 was spring biased to the extended position restoring levers 61, 62 to the position of FIG. 1.

5

As the sewing machine clamps drop to press the work against platen 15, lever 13 moves up to open switch SW-4 and re-close switch SW-2 to restart the sewing cycle. When the last button sewing operation is completed, release of slide 30 causes stop 53 to move switch SW-1 to the "off" position. Arm 86 engages its lower contact to energize sewing machine clamp lift solenoid S-3 and opens the circuit of clutch solenoid S-2 as it disengages its upper contact. Arm 87 opens the circuit of solenoid S-1.

As the garment is pulled slightly past the last button position to engage limit stop 53 with switch SW-1, clamps 45 and 45' are automatically opened. The opening means comprises a bracket 109 on section 22 carrying a pin 110. This pin engages end 42 of clamp 45 to depress this end to release the clamp. Clamp 45' is released by its sloping end 42' engaging the sloping upper wall 114 of a bracket 115 secured to section 22'. The operator then removes the garment and re-loads the machine. The operating cycle is such that an operator has time to load several machines before the first machine is ready for re-loading after automatic sewing of a series of buttons.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. In combination with a button sewing machine of the type including a platen, a sewing needle, a work clamp operating lever, a clutch operating lever, and a knife operating lever, and performing a button sewing cycle responsive to engagement of the clutch by actuation of its operating lever; an attachment for automatically positioning successive button locations of a garment in operative relation to such needle, comprising work surface extensions supported on either side of said platen; a slide mounted for reciprocation substantially transversely of said platen and extensions; means biasing said slide to move in one direction transversely of the platen; a pair of openable garment clamps secured to said slide for movement over said extensions and platen; abutments adjustably mounted on said slide in longitudinally spaced relation corresponding to the buttonhole location spacing; stop means on said attachment normally engaging an abutment to hold the slide against movement during sewing of a button to a garment; cam means operable, when actuated, to disengage said stop means from an abutment and position said stop means to engage the following abutment; a solenoid operable, when energized, to actuate said cam means; means, including a switch actuated by one of said operating levers at the end of a button sewing cycle, effective to energize said solenoid; means, including a switch operable by said cam means when actuated by said solenoid, effective to re-engage said clutch to re-start the cycle; and means engageable by said garment clamps adjacent the limit of movement of said clamps in said one direction to open said garment clamps.

2. An attachment as claimed in claim 1 in which said clamps are mounted on arms extending normal to said slide over said extensions; one of said garment clamps being pivoted on its mounting arm; and spring means biasing said one clamp to swing away from the other garment clamp to stretch a garment taut therebetween.

3. An attachment as claimed in claim 1 in which said clamps are mounted on arms extending normal to said

6

slide over said extensions, each arm being flat and each clamp comprising a flat strip bent intermediate its ends and including a clamp section spring biased toward its support arm and an operating section projecting obliquely upwardly from the support arm; said garment clamp opening means comprising cams riding over and depressing said operating sections to pivot the clamp sections away from the support arms.

4. An attachment as claimed in claim 1 in which said clamps are mounted on arms extending normal to said slide over said extensions; one of said garment clamps being pivoted on its mounting arm; spring means biasing said one clamp to swing away from the other garment clamp to stretch a garment taut therebetween; each arm being flat and each clamp comprising a flat strip bent intermediate its ends and including a clamp section spring biased toward its support arm and an operating section projecting obliquely upwardly from the support arm; and said garment clamp opening means comprising cams riding over and depressing said operating sections to pivot the clamp sections away from the support arms.

5. In combination with a button sewing machine of the type including a platen, a sewing needle, a work clamp operating lever, a clutch operating lever, and a knife operating lever, and performing a button sewing cycle responsive to engagement of the clutch by actuation of its operating lever; an attachment for automatically positioning successive button locations of a garment in operative relation to such needle, comprising work surface extensions supported on either side of said platen; a slide mounted for reciprocation substantially transversely of said platen and extensions; means biasing said slide to move in one direction transversely of the platen; a pair of openable garment clamps secured to said slide for movement over said extensions and platen; abutments adjustably mounted on said slide in longitudinally spaced relation corresponding to the button location spacing; stop means on said attachment normally engaging an abutment to hold the slide against movement during sewing of a button to a garment; cam means operable, when actuated, to disengage said stop means from an abutment and position said stop means to engage the following abutment; a solenoid operable, when energized, to actuate said cam means; means, including a switch actuated by one of said operating levers at the end of a button sewing cycle, effective to energize said solenoid; means, including a switch operable by said cam means when actuated by said solenoid, effective to reengage said clutch to re-start the cycle; and a normally closed switch in the solenoid energizing circuit and opened by said cam means when the latter are actuated by said solenoid.

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