March 26, 1963 B. ZEITLIN 3,082,719

AUTOMATIC WORK POSITIONING ATTACHMENT FOR BUTTON HOLE MACHINE

Filed March 12, 1958 7 Sheets-Sheet 1

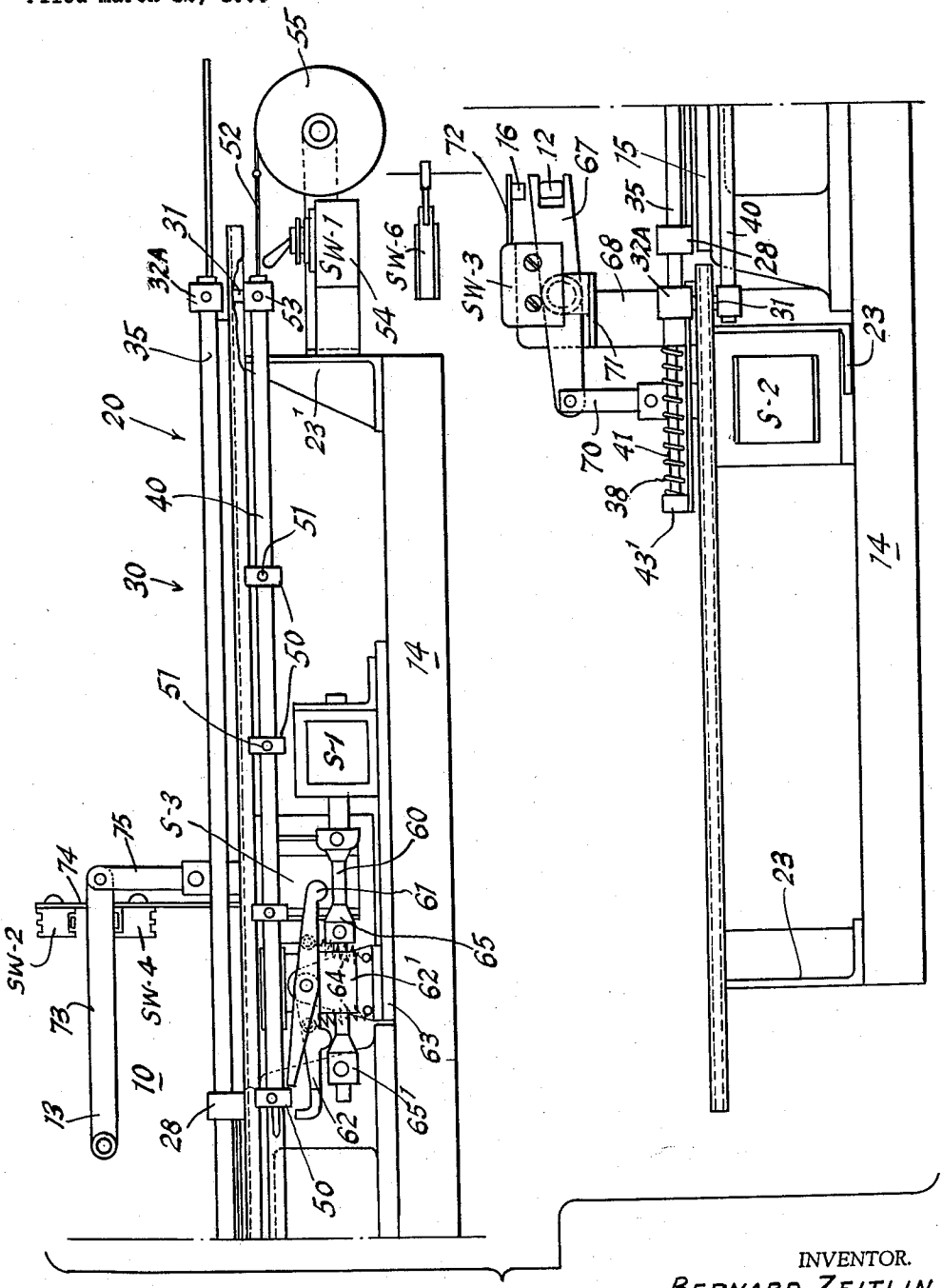


FIG. 1

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AUTOMATIC WORK POSITIONING ATTACHMENT FOR BUTTON HOLE MACHINE

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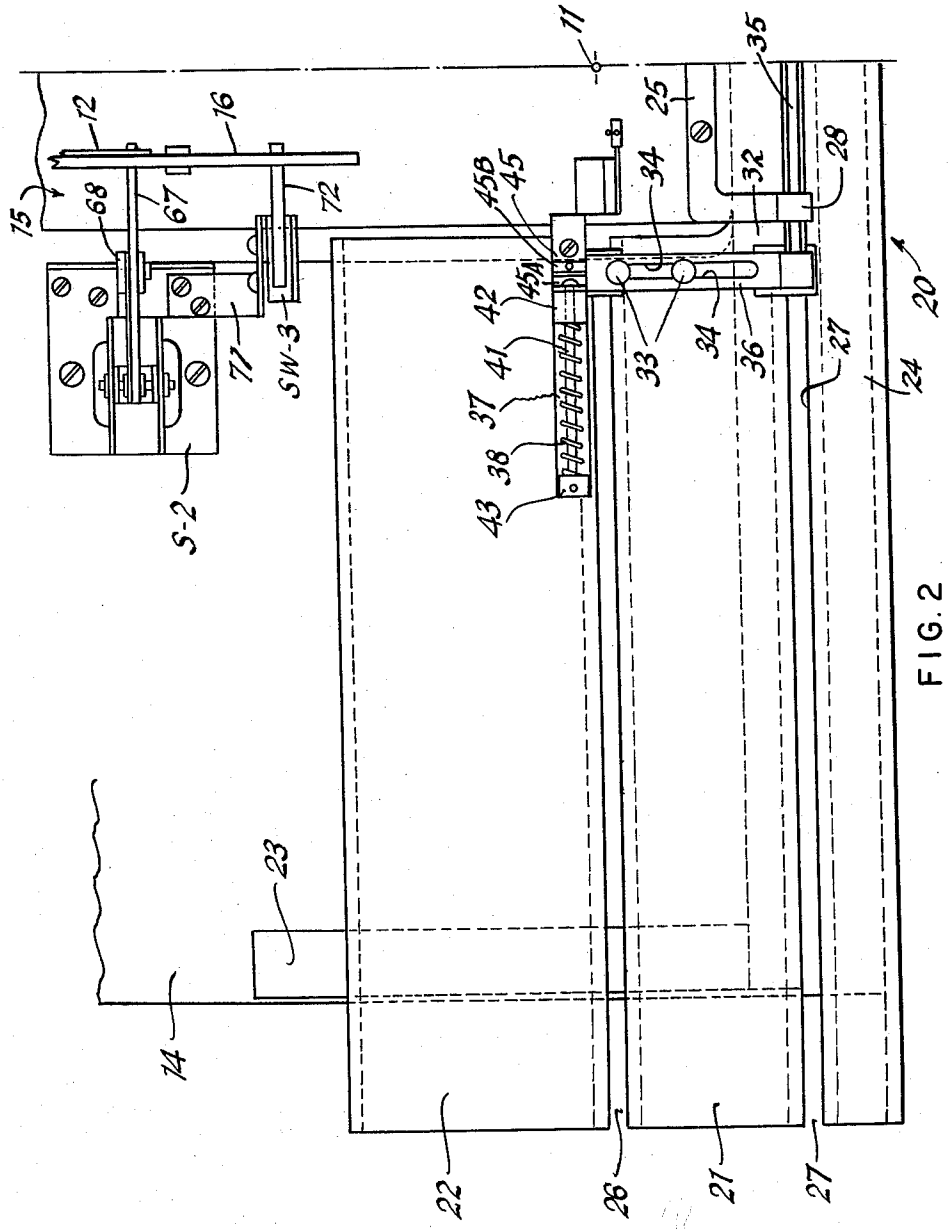


FIG. 2

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AUTOMATIC WORK POSITIONING ATTACHMENT FOR BUTTON HOLE MACHINE

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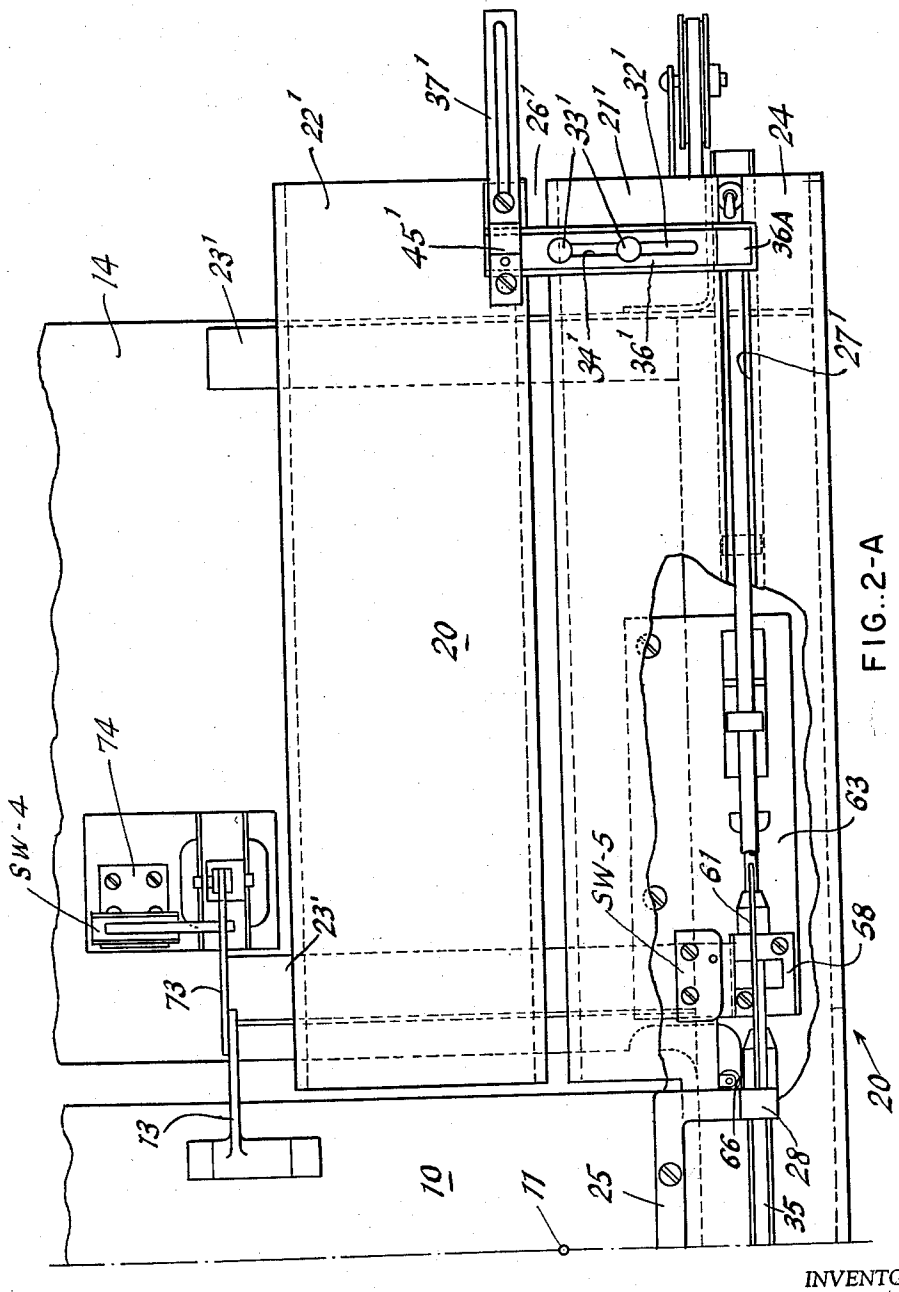


FIG. 2-A

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AUTOMATIC WORK POSITIONING ATTACHMENT FOR BUTTON HOLE MACHINE

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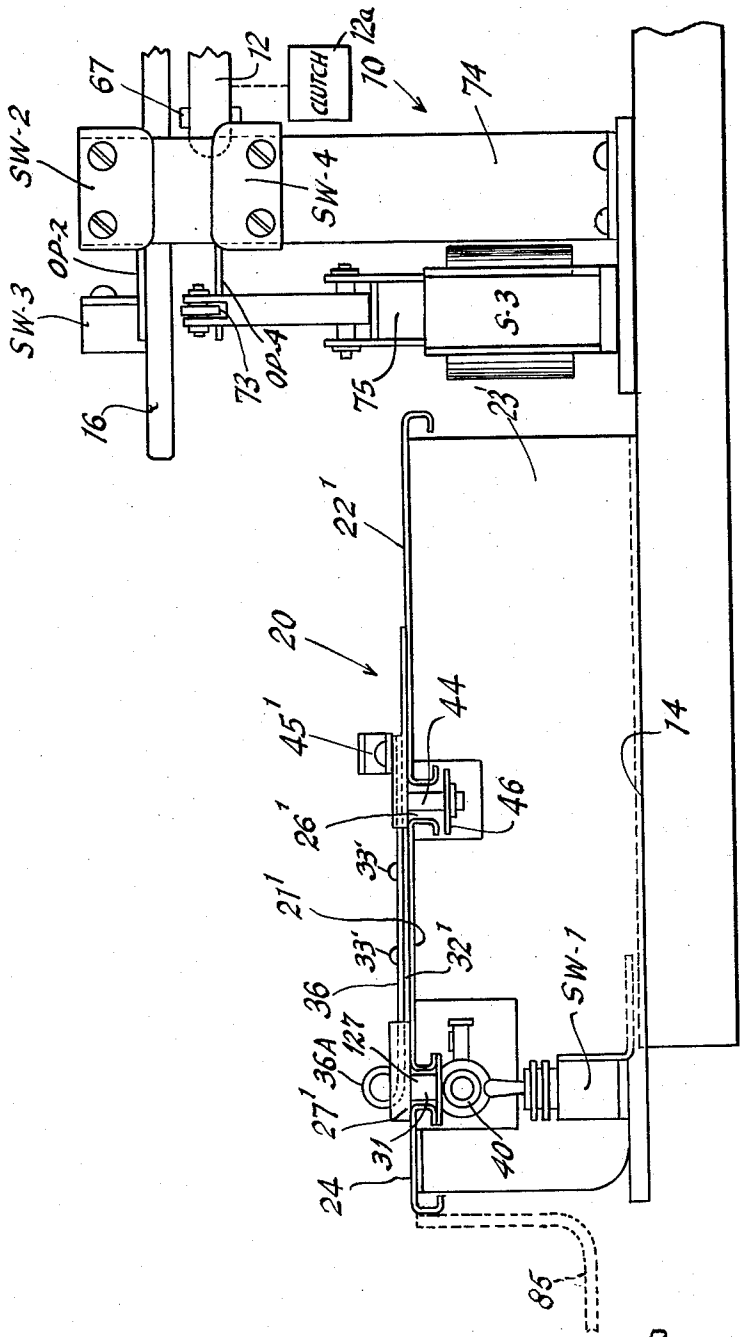


FIG. 3

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AUTOMATIC WORK POSITIONING ATTACHMENT FOR BUTTON HOLE MACHINE

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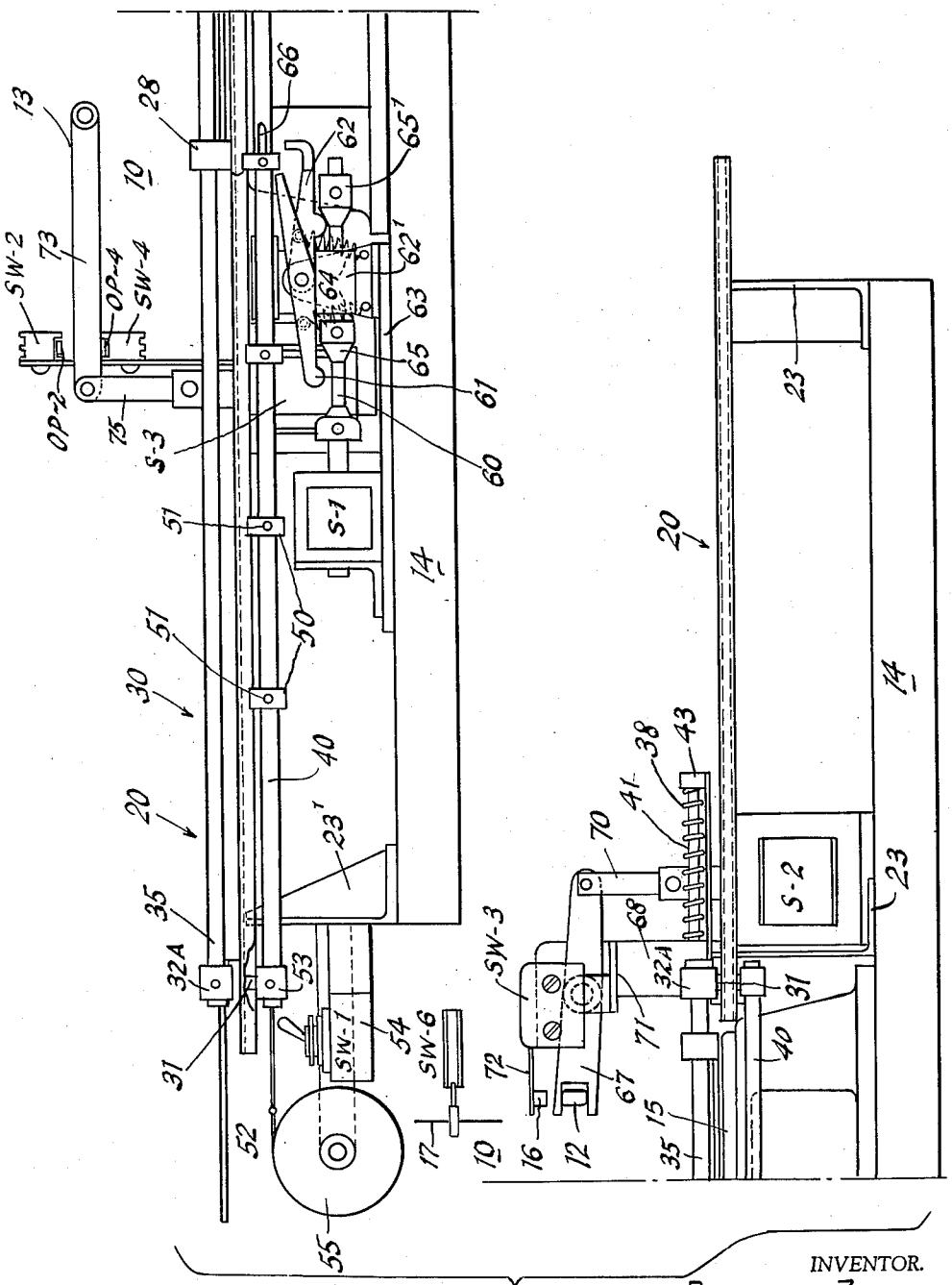


FIG. 4

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AUTOMATIC WORK POSITIONING ATTACHMENT FOR BUTTON HOLE MACHINE

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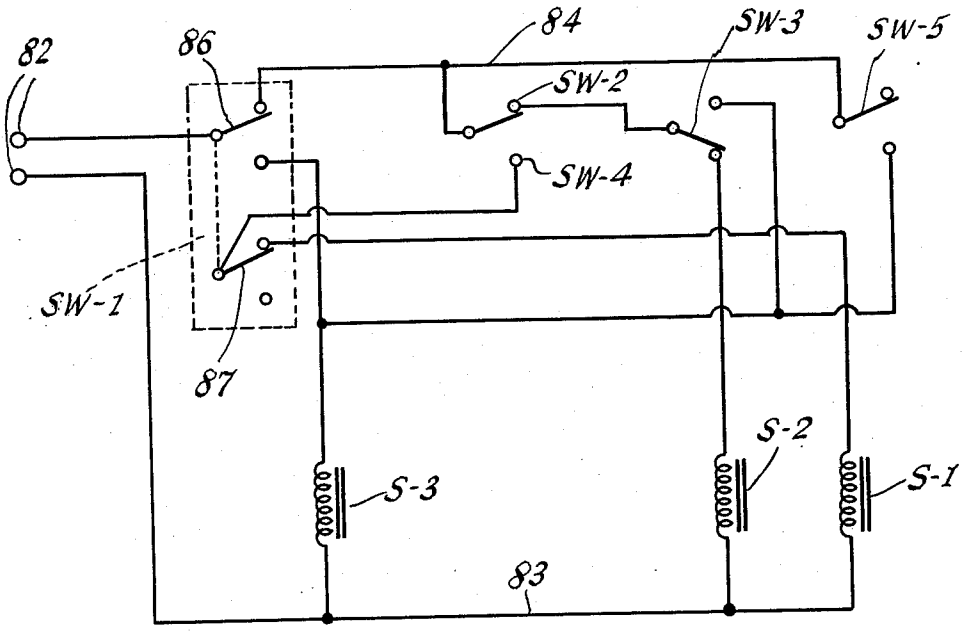


FIG. 5

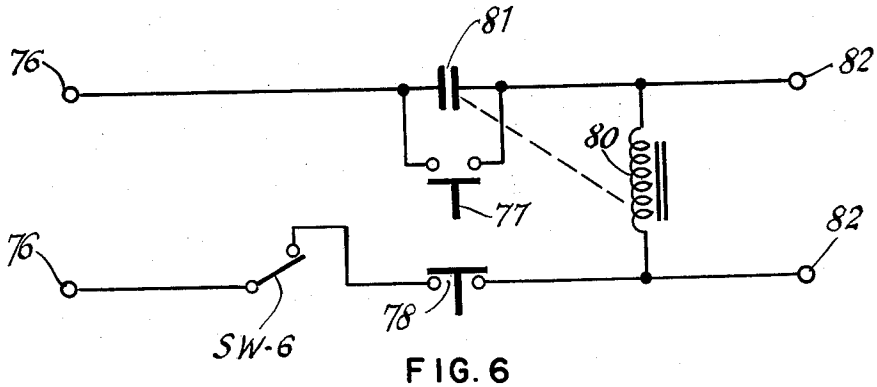


FIG. 6

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AUTOMATIC WORK POSITIONING ATTACHMENT FOR BUTTON HOLE MACHINE

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FIG. 9

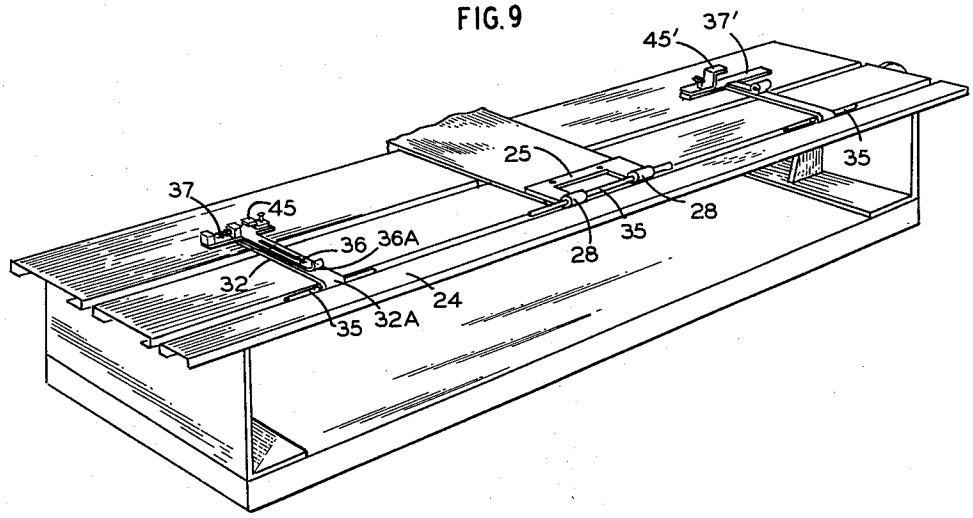


FIG. 7

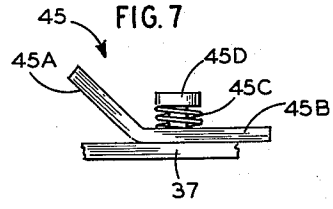
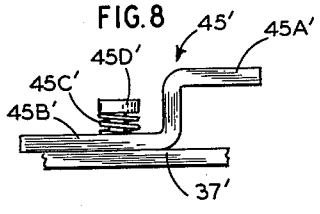


FIG. 8



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United States Patent Office 3,082,719 Patented Mar. 26, 1963

3,082,719

AUTOMATIC WORK POSITIONING ATTACHMENT FOR BUTTON HOLE MACHINE

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Filed Mar. 12, 1958, Ser. No. 720,901
12 Claims. (Cl. 112—65)

This invention relates to the formation of button holes in garments and, more particularly, to a novel combination of a button hole sewing machine with means for automatically positioning successive button hole locations on a garment in operative relation to the sewing head.

In the garment industry, a special sewing machine known as a "button hole" machine is used to stitch the peripheries of button holes. This machine has a cyclic action and involves a constantly running motor and a clutch control for initiating and terminating the button hole forming operation. A relatively movable platen and stitching head are provided and, when the garment is properly positioned on the platen relative to the stitching head, the clutch is engaged by the operator and the machine goes through a cycle, involving such relative movement, wherein the stitching head forms a stitched seam around the periphery of the button hole. The operator then repositions the garment on the platen for formation of the next button hole.

With the button hole machine as presently used, an operator is unable to tend more than about two machines. In doing this, the operator first positions a garment on one machine and starts its button hole forming cycle. The operator then repeats this operation on an adjacent machine. By this time, the first button hole is formed and the operator must re-position the garment on the first machine. Thus, the operator performs the garment position and cycle starting operations alternately on the two machines. The output per operator is thus relatively low, resulting in undue labor expense per garment.

In view of this, arrangements have been proposed for modifying button hole machines so that they will automatically form a number of button holes in succession without requiring attention from the operator after a garment is properly positioned in the machine for formation of the first button hole. However, these arrangements have had the disadvantage of high initial cost or capital investment, in addition to requiring specialized servicing not capable of being performed by the usual maintenance or service personnel available in the garment manufacturing plant.

In accordance with the present invention, a relatively inexpensive garment clamping and positioning attachment is provided which is easily attachable to either a lock stitch or chain stitch button hole machine, and which incorporates novel automatic positioning controls cooperable with the machine controls to effect automatic movement of the garment to successive button hole positions responsive to completion of the button hole stitching at each preceding button hole position. In addition, the operation of the mechanism is automatically terminated after the last button hole has been completed.

With this attachment, one operator can operate several button hole machines, such as six machines for example. The operator merely positions and clamps the garment in the attachment at one machine and then starts the machine to operate. This procedure is repeated at each of the other machines, and then the operator takes the completed garment from the first machine, re-loads this machine, and repeats these operations at successive machines.

In addition to being usable with any type of automatic button hole sewing machine, the attachment and its automatic controls are simple and easily serviced by the service personnel normally employed at a sewing establishment to service the sewing machines. The attachment is usable with the completed garment and may move a garment from left to right, for men's garments, or from right to left, for women's garments.

More specifically, the attachment comprises a flat platen extending support including a central clamp easily attachable to the platen of the sewing machine and two platen extension sections which project coplanar with the platen from each side edge thereof. Each extension section has a pair of guide slots therein, the slots of one section being aligned with those of the other section.

The front slots on the sections receive pins or the like interconnecting upper and lower rods for movement as a unit. The upper rod is guided through bushings on the clamp and has secured thereto a pair of rearwardly extending arms carrying pins received in slots in a second arm overlapped with each pin carrying arm. Each such second arm carries, at its rear end a simple spring clamp for securing the garment to the attachment. The pin and slot connections provided for reciprocation of the garment by the sewing machine clamp during stitching of the button hole.

The lower rod has adjustably secured therealong a plurality of abutments which may be positioned in accordance with the button hole locations. A biasing means is secured to the slide structure, comprising the two rods, to pull the slide in one direction laterally of the sewing machine. The attachment carries solenoid operated stops, such as levers, to releasably engage the abutments in succession to hold the slide fixed during stitching of a button hole.

In using the attachment, the operator first positions the abutments to correspond with the button hole positions. The operator then clamps a garment to the attachment with the button hole line extending beneath the sewing machine clamp, and pulls the clamp down. This operates a switch to energize a solenoid moving the clutch lever to engage the clutch and start the stitching cycle. At the end of the cycle, the clutch is automatically disengaged by the usual sewing machine controls, and the resulting movement of the clutch lever operates a switch which energizes a solenoid to lift the clamp. Lifting of the clamp closes a switch which operates the stop control solenoid. The stop means releases an abutment and the biasing means pulls the slide laterally of the machine until the next abutment is engaged by the stop means. This action operates a switch to deenergize the clamp lifting solenoid, the clamp drops, the stop control solenoid is deenergized, and the stitch cycle is again initiated.

The operation is cyclically repeated until the last button hole is formed. At the end of the last stitching cycle, the slide operates a limit switch to stop operation of the attachment.

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

FIG. 1 is a front elevation view, partly broken away, of the attachment and associated parts of the machine as disposed to form button holes in a man's garment;

FIGS. 2 and 2A conjointly provide a plan view, partly broken away, corresponding to FIG. 1;

FIG. 3 is a side elevation view;

FIG. 4 is a view corresponding to FIG. 1 and illustrating the attachment arranged for operation on a lady's garment;

FIGS. 5 and 6 are schematic wiring diagrams of the control circuits;

FIGS. 7 and 8 are enlarged side elevation views of garment clamps used in the attachment; and

FIG. 9 is a perspective view of the attachment shown in FIGS. 1, 2, 2A and 3.

Referring to FIGS. 1, 2 and 3, a button hole sewing machine, generally designated at **10**, is illustrated, in part, as including a movable platen **15**, a needle **11**, a clutch operating lever **12** controlling a clutch schematically illustrated at **12A** in FIG. 3, and a clamp operating lever **13**. Machine **10** is mounted on a support surface or table **14**.

As is well-known in the art, this machine has a constantly running motor which may be selectively coupled to the button hole forming components by engaging the clutch **12A** 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 clamp 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, during the stitching, platen **15** is moved relative to the needle so that the needle stitches around the outline of the button hole. 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 hole, automatically forms each of a series of button holes in succession, and then automatically shuts off after formation of the last button hole.

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. These wings or extensions are supported on arms extending laterally from platen **15**. 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 **5** 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 eyelets or bearings **28**.

Rod **35** has secured thereto straps **32**, **32'** extending rearwardly from the rod and carrying headed pins **33**, **33'** engaged in slots **34**, **34'** in straps **36**, **36'** overlying and slidable longitudinally of straps **32**, **32'**, respectively. Straps **32**, **32'** have downturned outer ends **32A** looped around and anchored to rod **35**, and straps **36**, **36'** have upturned operating loops **36A** on their outer ends. Pins **127** extend downwardly from loops **32A**. The inner end of strap **36** has a slotted strap **37** slidably secured at right angles thereto and biased to the left by a spring **38** surrounding a rod **41**. Rod **41** extends through a block **42** secured to strap **36** and spring **38** is engaged between this block and a block **43** on the rear end of rod **41** and secured to strap **37**. A spring biased garment clamp **45** is secured on the right end of strap **37**. Clamp **45** comprises a bar bent intermediate its ends to provide an upwardly sloping operating end **45A** and a clamping end **45B**, as best seen in FIG. 7. End **45B** is biased towards strap **37** by a coil spring **45C** surrounding the stem of a headed pin or bolt **45D** secured in strap **37** and extending loosely through an aperture in clamping end **45B**.

Strap **36'** has a slotted strap **37'** secured at right angles to its inner end, and a spring biased garment clamp **45'** is adjustable along strap **37'**. Pins **44** project from straps **32**, **32'** through slots **26**, **26'** (FIG. 3) and carry washers **46** limiting upward movement of straps **32**, **32'** and **36**, **36'**. Clamp **45'** is a Z-shape strap having an elevated operating end **45A'** and a clamping end **45B'** pressed towards strap **37'** by a coil spring **45C'** embracing the stem of a headed pin or bolt **45D'** secured in strap **37'**, as best seen in FIG. 8.

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 button holes. Slide **30** is biased to the right, in FIG. 1, and to the left in FIG. 4, 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 button hole.

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 FIGS. 1 and 3. 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** counter clockwise to disengage stop **50**, and cam **65'** swings lever **62** clockwise into the path of the next abutment **50**, all with reference to FIG. 1. Device **55** pulls slide **30** to the right until the next abutment **50** engages lever **62**. When solenoid S–**1** is de-energized, as described hereinafter, plunger **60** is retracted. 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**.

A switch SW–**5** is mounted on across member **23'** adjacent slide **30**, and has an operator **66** 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 operator **66** to close switch SW–**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 fixed bracket **68**. The other end of this lever is secured to the plunger **70** of solenoid S–**2**. A bracket **71** on bracket **68** supports a switch SW–**3** having an operator **72** engageable with lever **16** which operates the sewing machine knife. In the known button hole machine which is partly schematically illustrated in the drawings this knife, after completion of the stitching cycle, operates to cut the button hole slit and to cut the thread. When lever **16** is raised as the knife pierces the fabric, the lever operates switch SW–**3** to open the circuit of clutch solenoid S–**2** as described hereinafter.

Lever **13**, for the clamp of sewing machine **10**, has an extension arm **73** rigidly secured to its free end and connected to the plunger **75** of a solenoid S–**3** mounted on table **14**. Arm **73** extends between the operators OP–**2** and OP–**4** of switches SW–**2** and SW–**4** mounted on a bracket **74** on the base of solenoid S–**3**. The free end of arm **73** moves down when the clamps are raised and up when the clamps are pressed against the fabric. 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 FIGS. 5 and 6, single phase alternating current is supplied to terminals **76**. When start button **77** is depressed, it energizes the coil of contactor **80** which closes contacts **81** closing a contactor holding circuit which may be broken by pressing stop button **78**. A switch SW–**6** is associated with thread **17** in such a man-

ner that, if the thread breaks, switch SW–6 opens to deenergize contactor 80.

Closure of contactor 80 provides operating potential to the control circuit at terminals 82. One terminal 82 is connected to line 83 directly, and the other terminal 82 is connected to switch SW–1 which, when thrown to the "on" position (FIG. 5), connects line 84 to the other terminal 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 a terminal 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 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 hole location is aligned with needle 11. Abutments 50 are then adjusted along rod 30 at the desired button hole spacings. A basket 85 may be hung from device 20 to contain the overhang of the garment, as schematically illustrated in FIG. 3.

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 drop the clamp of sewing machine 10 against the work to hold the latter fixed to platen 15. Clamp lever 13 opens switch SW–4 and closes switch SW–2. As arm 86 engages its upper contact, clutch solenoid S–2 is energized through line 84, switch SW–2, switch SW–3, and line 83.

The machine 10 starts its button hole forming cycle, during which platen 15 is reciprocated back and forth. As the platen is reciprocated, clamps 45, 45' may be reciprocated due to the longitudinally slidable connection of straps 36, 36' with the straps 32, 32'.

When the button hole forming cycle is complete, the knife descends to pierce the fabric and cut the thread. Lever 16 moves operator 72 of switch SW–3 to engage its upper contact, thus deenergizing clutch solenoid S–2 and energizing clamp lift solenoid S–3. As the 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. Plunger 60 moves into the solenoid, swinging lever 61 counterclockwise (FIG. 1) and lever 62 clockwise (FIG. 1). This releases the first abutment 50, and slide 30 is drawn to the right until the next abutment strikes lever 62. During such abutment release, switch SW–5 is closed to maintain the clamps lifted but, as such next abutment engages lever 62, switch SW–5 is reopened to drop the clamps.

As the clamps drop, lever 13 moves up to open switch SW–4 and re-close switch SW–3. This deenergizes solenoid S–1 and energizes clutch solenoid S–2. Lever 62 releases such next abutment to engage lever 61, and the cycle repeats. When the last button hole is completed, release of slide 30 causes stop 53 to move switch SW–1 to the "off" position. Arm 86 energizes clamp lift solenoid S–3 and opens the circuit of clutch solenoid S–2. Arm 87 opens the circuit of solenoid S–1. 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 reloading after automatic completion of a series of button holes.

FIG. 4 is identical with FIG. 1 except that slide 30 is arranged for leftward movement by tension device 55 for making button holes in a ladies' garment.

While specific embodiments of the invention have 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. For use with a button hole sewing machine of the type including a sewing needle and a work supporting platen movable relative to each other during stitching of a button hole, a clamp movable relative to the platen to clamp the work thereagainst and having a clamp operating lever, a releasable clutch which, when engaged, connects the machine to driving means for operation of the machine through a button-hole stitching cycle, a clutch operating lever for initiation of the button-hole stitching cycle, and a knife movable toward and away from the platen at the end of the cycle to pierce the work to form the button hole and having an arm operable therewith, the button hole stitching cycle being initiated by operation of said clutch lever to engage said clutch and terminated by operation of said knife; mechanism for automatically and successively positioning spaced areas of a workpiece in operative relation to the needle for formation of button holes at each of said areas, said mechanism comprising a support adapted to be clamped to the platen; a relatively elongated slide adapted to be mounted for longitudinal reciprocation in said support relative to the needle and platen; work clamping means carried by said slide in spaced relation longitudinally thereof and beyond the platen in each direction of movement of said slide; abutments adjustably positionable along said slide in spaced relation conforming to the spacing of said areas; means biasing said slide to move in one direction relative to the platen; stop means normally engaged with one of said abutments when one of said spaced areas is in operative relation to the needle; operating means effective, when actuated, to disengage said stop means from one abutment and position said stop means to engage the next abutment as said biasing means moves said slide in said one direction; means adapted to be operated, responsive to work piercing operation of the knife to operate the clutch operating lever in a disengaging direction to retract the clamp from the work on the platen, and to actuate said operating means; and means operable, responsive to engagement of said stop means with the next abutment, to re-engage said clamp with the work on the platen and to operate the clutch operating lever in an engaging direction to restart the button hole forming cycle.

2. For use with a button hole sewing machine of the type including a sewing needle and a work supporting platen movable relative to each other during stitching of a button hole, a clamp movable relative to the platen to clamp the work thereagainst and having a clamp operating lever, a releasable clutch which, when engaged, connects the machine to driving means for operation of the machine through a button-hole stitching cycle, a clutch operating lever for initiation of the button-hole stitching cycle, and a knife movable toward and away from the platen at the end of the cycle to pierce the work to form the button hole and having an arm operable therewith, the button hole stitching cycle being initiated by operation of said clutch lever to engage said clutch and terminated by operation of said knife; mechanism for automatically and successively positioning spaced areas of a workpiece in operative relation to the needle for formation of button holes at each of said areas, said mechanism comprising a support adapted to be clamped to the platen; a relatively elongated slide adapted to be mounted for longitudinal reciprocation in said support relative to the needle and platen; work clamping means carried by said slide in spaced relation longitudinally thereof and beyond said platen in each direction of movement of the slide; abutments adjustably positionable along said slide in spaced relation conforming to the spacing of said areas; means biasing said slide to move in one direction relative to the platen; stop means normally engaged with one of said abutments when one of said spaced areas is in operative relation to the needle; operating means effective, when actuated, to disengage said stop means from one abutment

and position said stop means to engage the next abutment as said biasing means move said slide in said one direction; means adapted to be operated, responsive to work piercing operation of the knife to operate the clutch operating lever in a disengaging direction, to retract the clamp from the work on the platen, and to actuate said operating means; means operable, responsive to engagement of said stop means with said next abutment, to re-engage the clamp with the work on the platen to operate the clutch operating lever in an engaging direction to re-start the buttonhole forming cycle; and limit means operable by said slide at its limit of movement in said one direction to render said mechanism ineffective to re-start the button hole forming cycle.

3. For use with a button hole sewing machine of the type including a sewing needle and a work supporting platen movable relative to each other during stitching of a button hole, a clamp movable relative to the platen to clamp the work thereagainst and having a clamp operating lever, a releasable clutch which, when engaged, connects the machine to driving means for operation of the machine through a button-hole stitching cycle, a clutch operating lever for initiation of the buttonhole stitching cycle, and a knife movable toward and away from the platen at the end of the cycle to pierce the work to form the button hole and having an arm operable therewith, the button hole stitching cycle being initiated by operation of said clutch lever to engage said clutch and terminated by operation of said knife; mechanism for automatically and successively positioning spaced areas of a work piece in operative relation to the needle for formation of button holes at each of said areas, said mechanism comprising a support adapted to be clamped to the platen; a relatively elongated slide adapted to be mounted for longitudinal reciprocation in said support relative to the needle and platen; work clamping means carried by said slide in spaced relation longitudinally thereof and beyond the platen in each direction of movement of said slide; abutments adjustably positionable along said slide in spaced relation conforming to the spacing of said areas; means biasing said slide to move in one direction relative to the platen; stop means normally engaged with one of said abutments when one of said spaced areas is in operative relation to the needle; first operating means adapted to be associated with the clamp operating lever and effective, when actuated, to retract the clamp from the work on the platen; means operable responsive to work piercing operation of the knife, to actuate said first operating means; second operating means effective, when actuated, to disengage said stop means from one abutment and position said stop means to engage the next abutment as said biasing means moves said slide in said one direction; means adapted to be operated by the clamp lever, in retracting said clamp to operate the clutch operating lever in a disengaging direction and to actuate said second operating means; and means operable, responsive to engagement of said stop means with said next abutment, to re-engage the clamp with the work on the platen and to operate the clutch operating lever in an engaging direction to restart the button hole forming cycle.

4. For use with a button hole sewing machine of the type including a sewing needle and a work supporting platen movable relative to each other during stitching of a button hole, a clamp movable relative to the platen to clamp the work thereagainst and having a clamp operating lever, a releasable clutch which, when engaged, connects the machine to driving means for operation of the machine through a button-hole stitching cycle a clutch operating lever for initiation of the button hole stitching cycle, and a knife movable toward and away from the platen at the end of the cycle to pierce the work to form the button hole and having an arm operable therewith, the button hole stitching cycle being initiated by operation of said clutch lever to engage said clutch and terminated by operation of said knife; mechanism for automatically and successively positioning spaced areas of a work piece in operative relation to the needle for formation of button holes at each of said areas, said mechanism comprising a support adapted to be clamped to the platen; a relatively elongated slide adapted to be mounted for longitudinal reciprocation in said support relative to the needle and platen; work clamping means carried by said slide in spaced relation longitudinally thereof and beyond the platen in each direction of movement of said slide; abutments adjustably positionable along said slide in spaced relation conforming to the spacing of said areas; means biasing said slide to move in one direction relative to the platen; stop means normally engaged with one of said abutments when one of said spaced areas is in operative relation to said needle; first operating means adapted to be associated with the clamp operating lever and effective, when actuated, to retract the clamp from the work on the platen; means adapted to be operated, responsive to work piercing operation of said knife, to actuate said first operating means; second operating means effective, when actuated, to disengage said stop means from one abutment and position said stop means to engage the next abutment as said biasing means moves said slide in said one direction; means adapted to be operated by the clamp lever, in retracting the clamp, to operate the clutch operating lever in a disengaging direction and to actuate said second operating means; means operable, responsive to engagement of the stop means with said next abutment, to re-engage the clamp with the work on the platen and to operate the clutch operating lever in an engaging direction to restart the button hole forming cycle; and limit means operable by said slide at its limit of movement in said one direction to render said mechanism ineffective to re-start the button hole forming cycle.

5. For use with a button hole sewing machine of the type including a sewing needle and a work supporting platen movable relative to each other during stitching of a button hole, a clamp movable relative to the platen to clamp the work thereagainst and having a clamp operating lever, a releasable clutch which, when engaged, connects the machine to driving means for operation of the machine through a button-hole stitching cycle, a clutch operating lever for initiation of the button hole stitching cycle, and a knife movable toward and away from the platen at the end of the cycle to pierce the work to form the button hole and having an arm operable therewith, the button hole stitching cycle being initiated by operation of said clutch lever to engage said clutch and terminated by operation of said knife; mechanism for automatically and successively positioning spaced areas of a work piece in operative relation to the needle for formation of button holes at each of said areas, said mechanism comprising a support adapted to be clamped to the platen; a relatively elongated slide adapted to be mounted for longitudinal reciprocation in said support relative to the needle and platen; work clamping means carried by said slide in spaced relation longitudinally thereof and beyond the platen in each direction of movement of said slide; abutments adjustably positionable along said slide in spaced relation conforming to the spacing of said areas; means biasing said slide to move in one direction relative to the platen; stop means normally engaged with one of said abutments when one of said spaced areas is in operative relation to the needle; first operating means associated with the clamp operating lever and effective, when actuated, to retract the clamp from the work on the platen; means adapted to be operated, responsive to work piercing operation of the knife to actuate said first operating means; second operating means effective, when actuated, to disengage said stop means from one abutment and position said stop means to engage the next abutment as said biasing means moves said slide in said one direction; third operating means adapted to be con-

nected to the clutch operating lever and effective, when actuated, to operate the clutch operating lever in a disengaging direction; means adapted to be operated by the clamp lever, in retracting the clamp, to actuate said second and third operating means; and means operable, responsive to engagement of said stop means with said next abutment, to reengage said clamp with the work on the platen and to operate the clutch operating lever in an engaging direction to restart the buttonhole forming cycle.

6. For use with a button hole sewing machine of the type including a sewing needle and a work supporting platen movable relative to each other during stitching of a button hole, a clamp movable relative to the platen to clamp the work thereagainst and having a clamp operating lever, a releasable clutch which, when engaged, connects the machine to driving means for operation of the machine through a button-hole stitching cycle, a clutch operating lever for initiation of the buttonhole stitching cycle, and a knife movable toward and away from the platen at the end of the cycle to pierce the work to form the button hole and having an arm operable therewith, the button hole stitching cycle being initiated by operation of said clutch lever to engage said clutch and terminated by operation of said knife; mechanism for automatically and successively positioning spaced areas of a work piece in operative relation to the needle for formation of button holes at each of said areas, said mechanism comprising a support adapted to be clamped to the platen; a relatively elongated slide adapted to be mounted for longitudinal reciprocation in said support relative to the needle and platen; work clamping means carried by the slide in spaced relation longitudinally thereof and beyond the platen in each direction of movement of the slide; abutments adjustably positionable along said slide in spaced relation conforming to the spacing of said areas; means biasing said slide to move in one direction relative to the platen; stop means normally engaged with one of said abutments when one of said spaced areas is in operative relation to the needle; first operating means adapted to be associated with the clamp operating lever and effective, when actuated, to retract the clamp from the work on the platen; means adapted to be operated, responsive to work piercing operation of the knife to actuate said first operating means; second operating means effective, when actuated, to disengage said stop means from one abutment and position said stop means to engage the next abutment as said biasing means moves said slide in said one direction; third operating means adapted to be connected to the clutch operating lever and effective, when actuated, to operate the clutch operating lever in a disengaging direction; means operable by the clamp lever, in retracting the clamp, to actuate said second and third operating means; means operable, responsive to engagement of said stop means with said next abutment, to re-engage the clamp with the work on the platen and to operate the clutch operating lever in an engaging direction to restart the button hole forming cycle; and limit means operable by said slide at its limit of movement in said one direction to render said mechanism ineffective to restart the button hole forming cycle.

7. Mechanism as claimed in claim 5 in which said operating means comprise normally de-energized solenoids.

8. Mechanism as claimed in claim 5 in which said stop means comprises a pair of conjointly operable levers, the first normally biased to engage an abutment and the second moving into the path of the abutments upon disengaging movement of the first lever.

9. Mechanism as claimed in claim 5 including a bracket adapted to be secured to said platen and slidably supporting said slide.

10. Mechanism as claimed in claim 9 in which said slide comprises parallel upper and lower rods rigidly secured to each other, the upper rod being engaged in said bracket and positioned above the surface of the platen, and carrying said work clamping means; the lower rod having said abutments adjustably mounted therealong.

11. Mechanism as claimed in claim 10 in which said work clamping means comprises arms extending normal to said upper rod and releasable work grips adjustable along said arms.

12. Mechanism as claimed in claim 1 in which said slide is movable parallel to the front edge of the platen.

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