

May 14, 1968

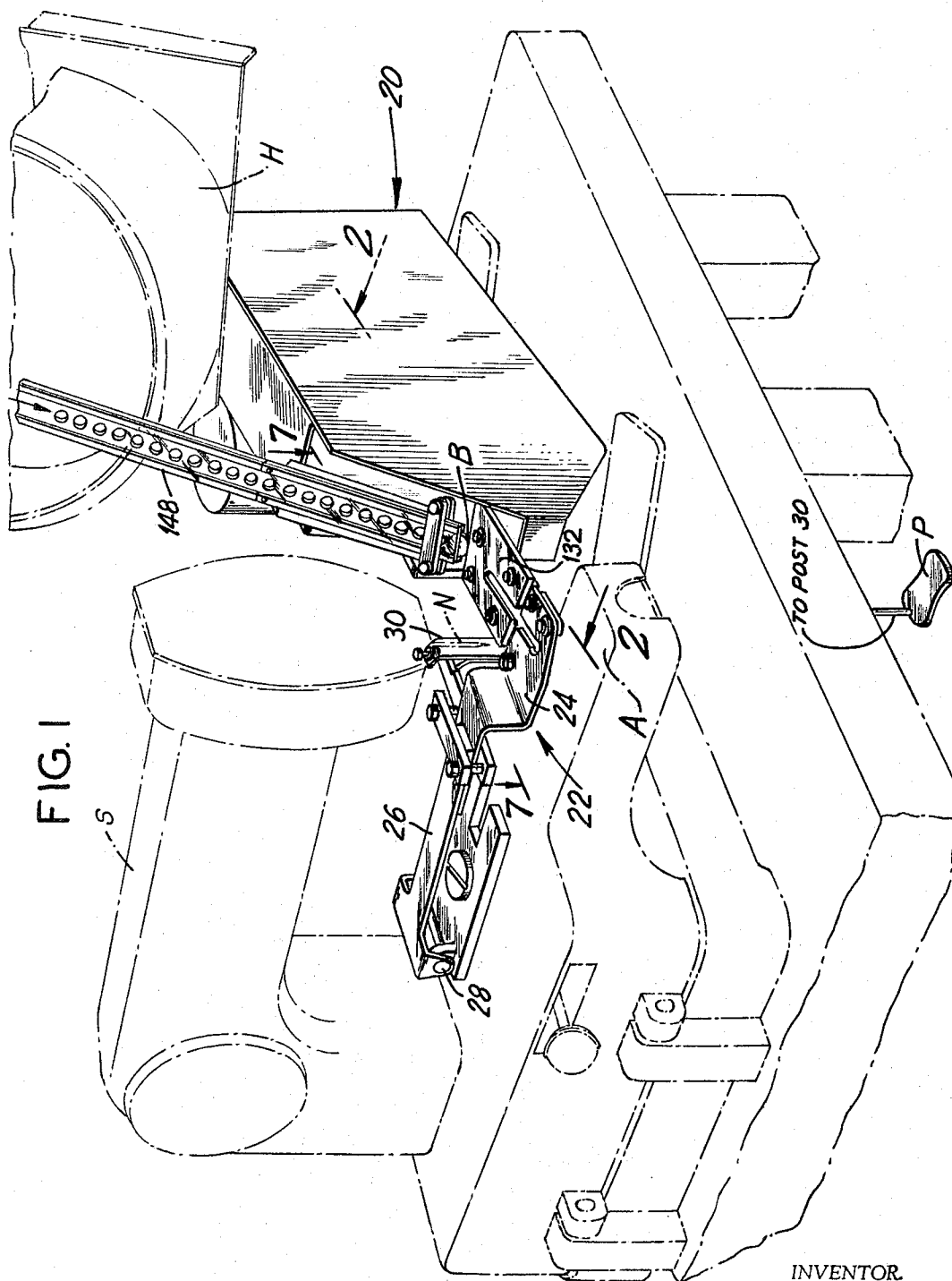
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3,382,824

BUTTON FEEDING MECHANISM FOR SEWING MACHINES

Filed June 29, 1965

7 Sheets-Sheet 1



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BUTTON FEEDING MECHANISM FOR SEWING MACHINES

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7 Sheets-Sheet 2

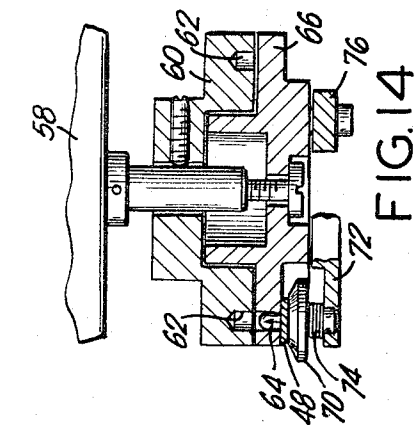


FIG. 14

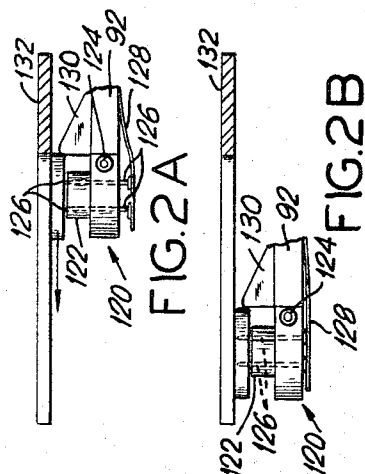


FIG. 2A

FIG. 2B

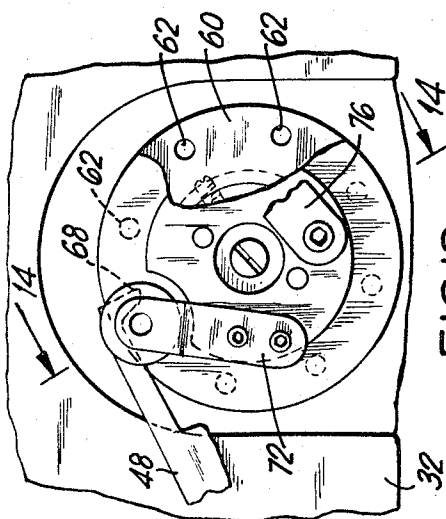


FIG. 13

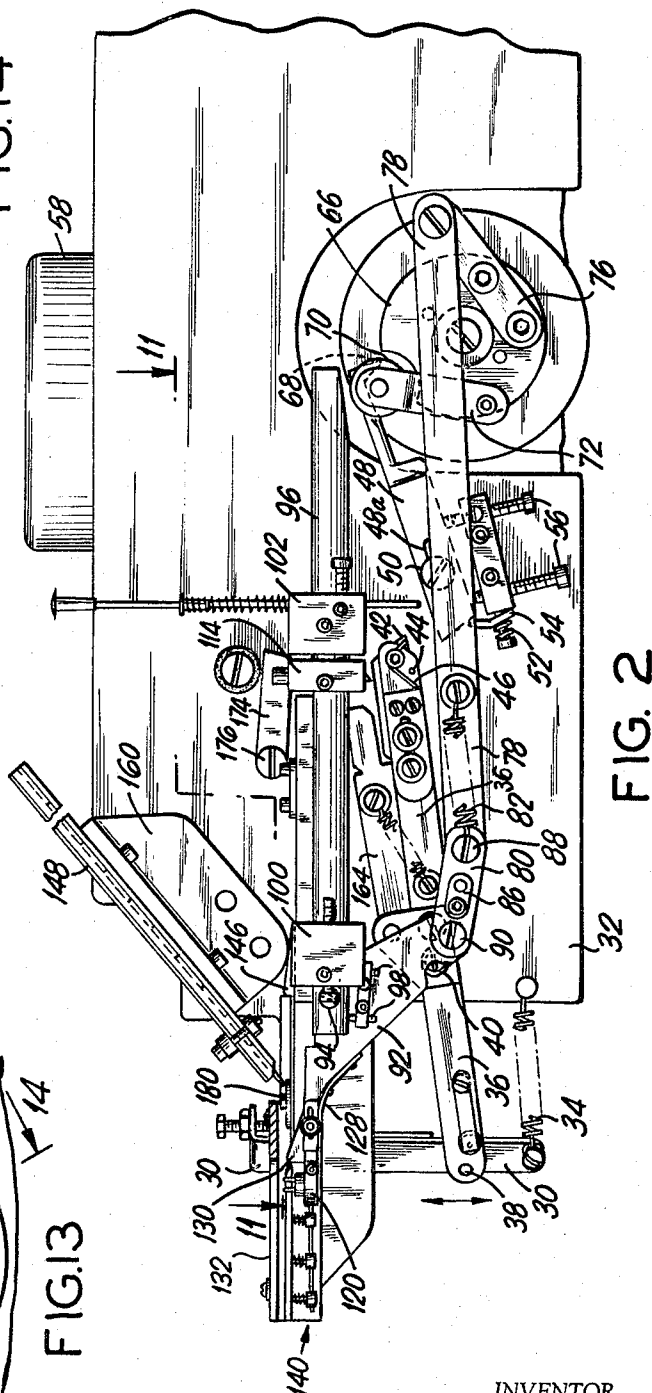


FIG. 2

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BUTTON FEEDING MECHANISM FOR SEWING MACHINES

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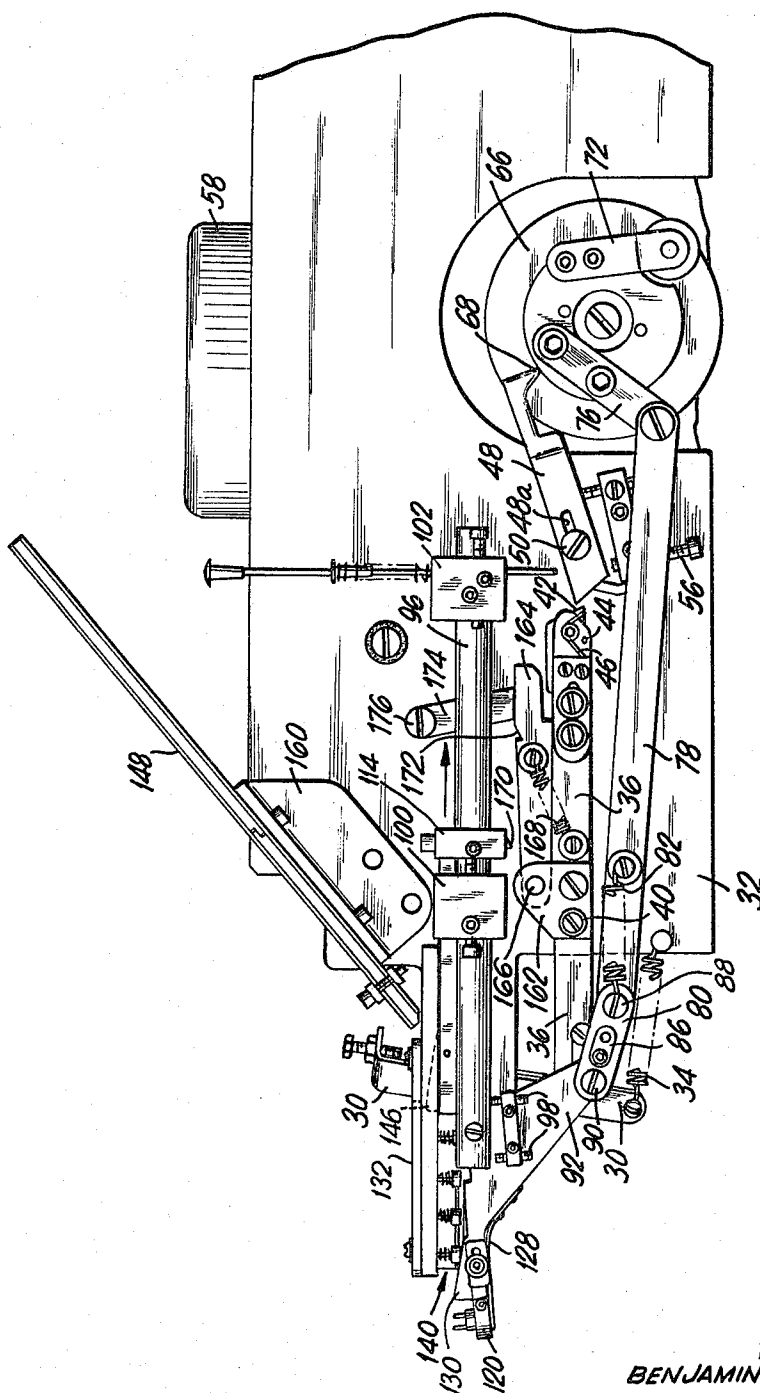


FIG. 3

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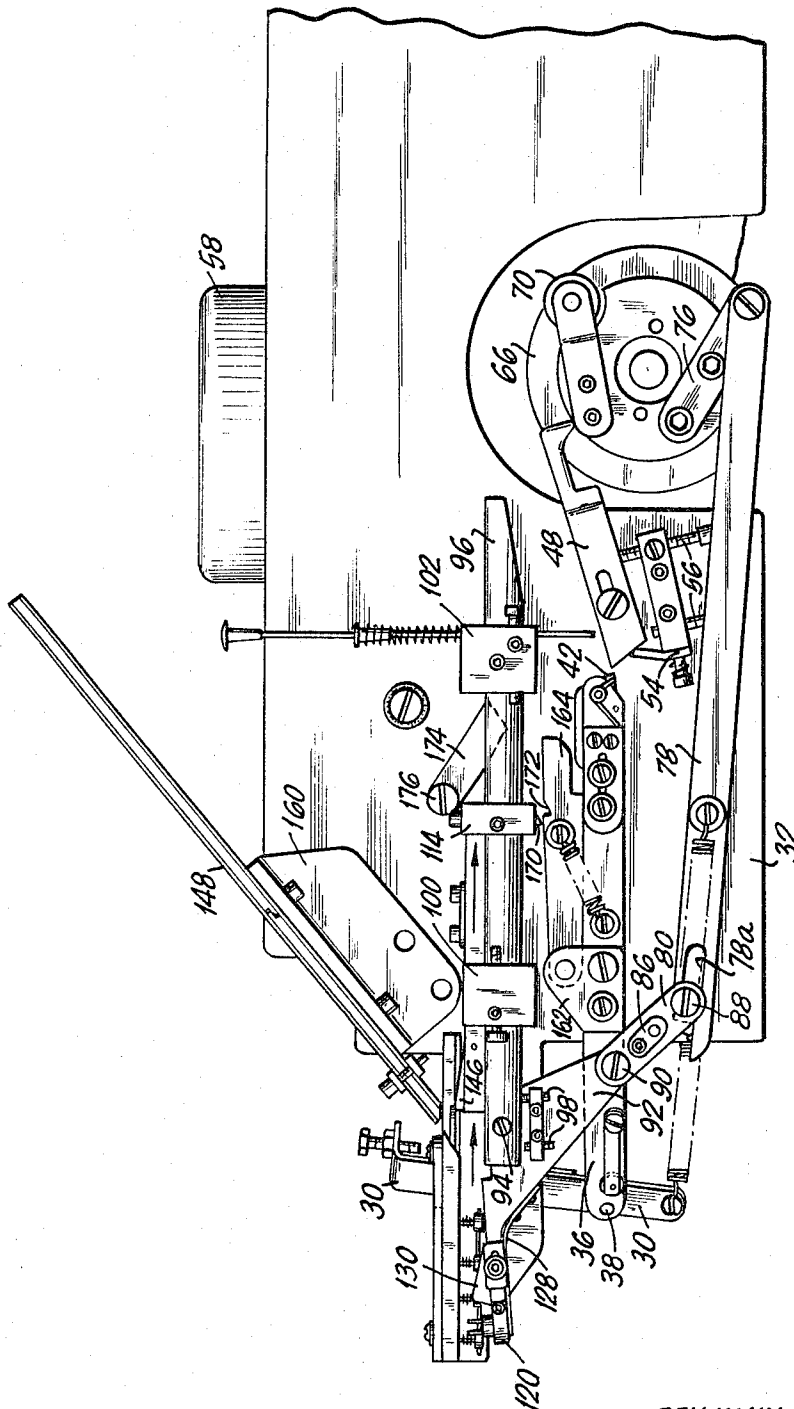
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BUTTON FEEDING MECHANISM FOR SEWING MACHINES

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7 Sheets-Sheet 4



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BUTTON FEEDING MECHANISM FOR SEWING MACHINES

Filed June 29, 1965

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FIG. 5

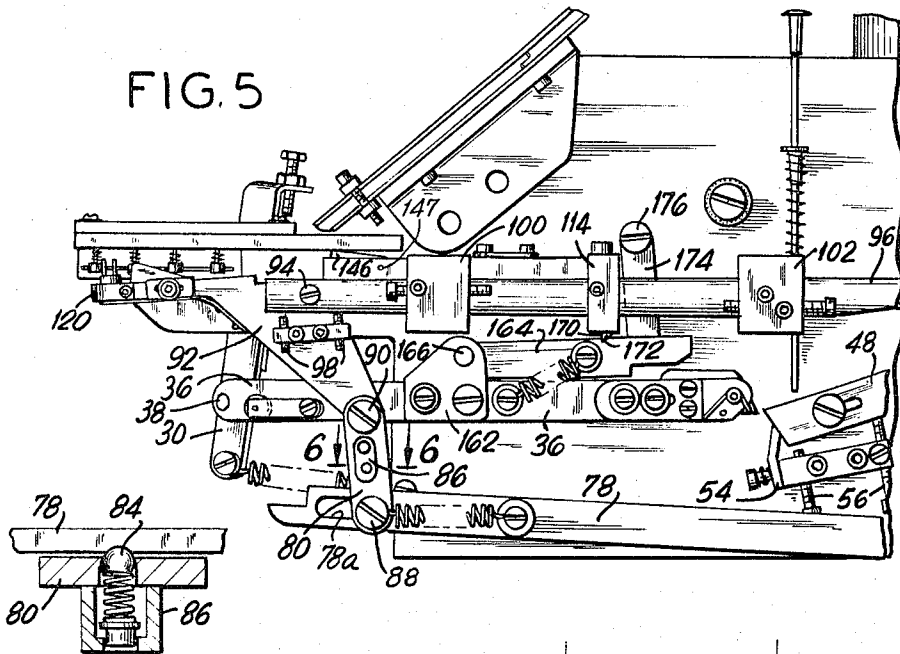


FIG. 6

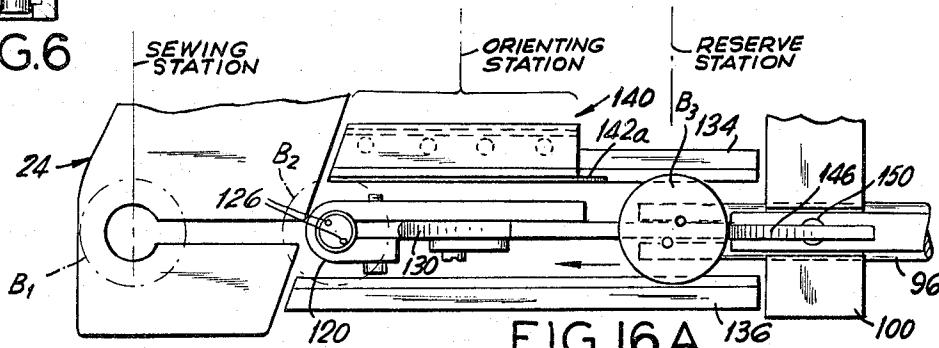


FIG. 16A

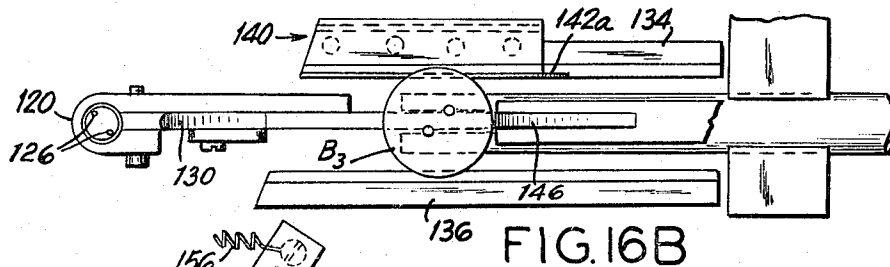


FIG. 16B

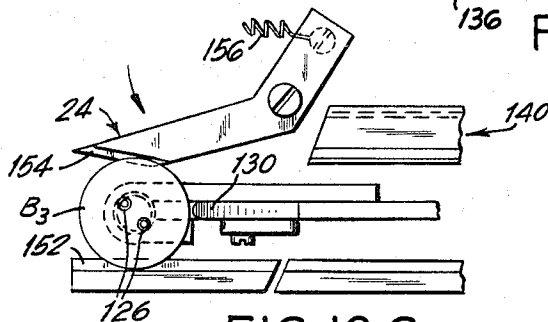


FIG. 16C

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BUTTON FEEDING MECHANISM FOR SEWING MACHINES

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7 Sheets-Sheet 7

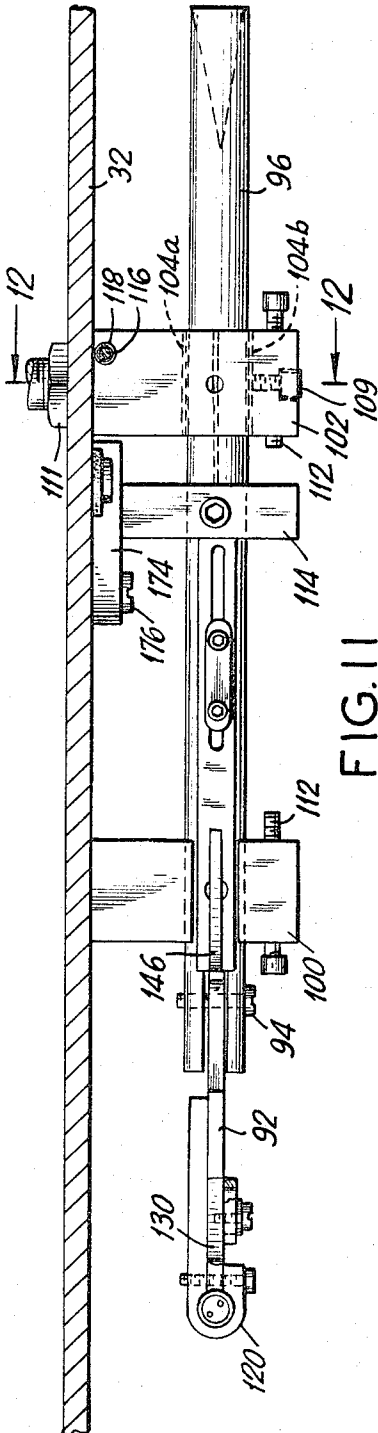


FIG. 11

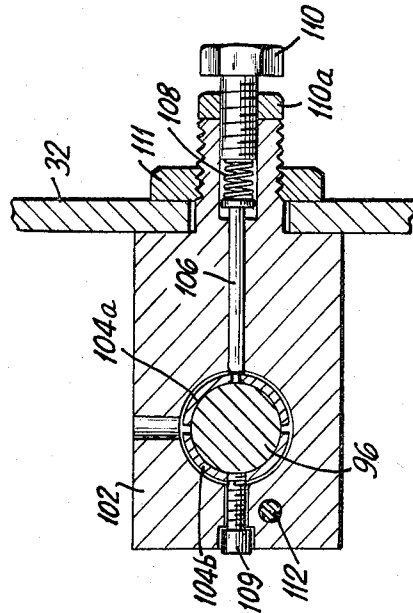


FIG. 12

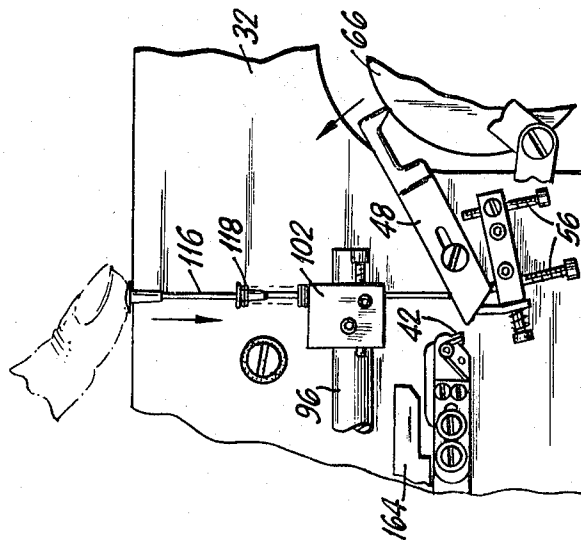


FIG. 15

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BUTTON FEEDING MECHANISM FOR SEWING MACHINES

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Filed June 29, 1965, Ser. No. 468,059
49 Claims. (Cl. 112-113)

ABSTRACT OF THE DISCLOSURE

An attachment for a high speed sewing machine automatically feeds properly oriented buttons by applying a perpendicular gripping force to the top and bottom button surfaces near the edges thereof while at the same time applying a pushing force to the button edge that is perpendicular to the button surfaces. The pushing force overcomes the gripping force so that the combination of both produces a linear advance of the button as well as a rotation of the button about its own vertical axis until the button holes are accurately aligned with suitably positioned hole-finder pins. As one button is moved through the orienting station wherein it is rotated to the sewing station, the next succeeding button is simultaneously moved from a reserve station to the orienting station and still another button is delivered to the reserve station.

This invention relates to apparatus for feeding buttons to the sewing point of a sewing machine and more particularly, to improved automatic means for concurrently aligning the holes of a "sewthrough" button with respect to the sewing needle and advancing the button to the sewing point.

For many years the solution to the problems involved in automatically feeding buttons to a sewing machine has escaped those working in the art. Prior attempts to provide reliable automatic feeding apparatus have not been completely successful. One reason for this is the almost total lack of standardization in the button manufacturing industry. Buttons are generally molded or fabricated. Fabricated buttons generally vary dimensionally because of the machining techniques employed. Mold buttons are produced in multi-cavity molds. Such molds will vary dimensionally from cavity to cavity resulting in a batch of buttons of differing sizes. While this is no great problem for the sewing machine itself, it has proven extremely difficult for feeder attachments to reliably deliver the buttons at high speed when the buttons vary dimensionally in any one shipment from any one manufacturer.

The prior art, of course, has many examples of means to align the buttons prior to sewing. In substantially all of the art, however, the button itself is not angularly displaced. Instead, a pair of finder pins are rotated until they engage the buttonholes. The pins and the button must then be re-aligned as a unit with respect to the needle path. The components required to accomplish this must be very complex when consideration is taken of the high speed and precision at which the device must operate. Accordingly, much of the prior art is excessively costly to manufacture, assemble, and operate. The elimination of the curved feed track generally employed in the prior art is a good example of the type of costly and potentially troublesome construction avoided by the instant design.

An exception to the above-mentioned prior art construction is disclosed in U.S. Patent No. 2,646,014, issued on July 21, 1953, to Roy E. Fowler. Therein means are disclosed to push the button past a roughened, fixedly positioned resilient rubber strip which frictionally applies a drag to the side rim of the button. Finder pins are placed against the button and engage the buttonholes

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when they have been sufficiently rotated and are properly aligned. The disadvantages of this system are that the frictional force cannot be varied, the frictional force cannot be accurately set at a particular level and the frictional force will steadily be reduced as the rubber strip wears. Moreover, the rubber strip is readily susceptible to contamination from lubricating oil that is always present on the moving parts of the machine as well as lint and other dirt that may be in the air. In other words, the Fowler device lacks reliability over a long time span.

The present invention, which is an attachment for a commercial sewing machine, is adapted to receive "sew-through" buttons from a supply source and deliver them one-by-one along a short, linear feed track to the sewing station. In order to properly align the buttonholes with respect to the needle, spring biased, non-deformable clamping means having a rigid edge are provided to grasp only a very small portion of the upper and lower faces of the outer border area of the button while the button is concurrently advanced along a track by an axially moving driver rod. In effect, the button is spun or rolled in a plane parallel to its opposed faces by means of the combination of forces derived from the spring biased edge grasping means and the driver rod.

In the embodiment of the present invention shown in the drawing, means are provided to apply opposed vertical forces to the edge of the upper and lower button surfaces while a horizontal force is concurrently applied to the rim of the button. By way of example, if the vertical forces are applied to the nine o'clock position of the button faces, the horizontal force is applied 90° away or at the 12 o'clock position. Since the vertical forces are applied by a rigid, spring biased gripping means, the button is advanced and aligned by sliding and rotating, respectively.

As will be brought out in greater detail hereinafter, various linkages are provided to suitably time the button alignment and advance. In the event that the proper mode of operation is not adhered to, several safety features are included to prevent damage to both the sewing machine and the attachment.

Accordingly, it is an object of the present invention to provide an improved, high speed attachment for automatically delivering properly aligned buttons to the sewing station of a sewing machine.

Another object is to provide means, as aforementioned, for feeding two or four hole "sewthrough" buttons.

An additional object is to provide means, as aforementioned, for accommodating a range of button sizes.

Still another object is to provide improved aligning means for the button being fed to the sewing station which comprises means to apply vertical forces on the upper and lower button edge surfaces and means to concurrently apply a horizontal force on the button rim.

Yet another object is to provide improved button-advancing means that utilizes and cooperates with the button-aligning means.

Another object is to include safety features which prevent completion of the operating cycle if there is a malfunction in the sewing machine.

An additional object is to provide improved apparatus that utilizes straight feed tracks for the delivery of the buttons from the supply source to the sewing station.

A particular object of the present invention is the provision of means to bring a button from the supply source to the reserve position concurrently with the movement of the preceding button from the reserve station past the aligning station.

Yet another object is to provide an improved high speed button feeder attachment capable of reliably functioning with buttons having a wide range of dimensional tolerances.

These and other features, objects and advantages of the invention will, in part, be pointed out with particularity and will, in part, become obvious from the following more detailed description of the invention taken in conjunction with the accompanying drawing which forms an integral part thereof.

In the various figures of the drawing like reference characters designate like parts.

In the drawing:

FIG. 1 is a pictorial view illustrating the physical relationship of the button feeding attachment comprising the present invention, a button supply source and a sewing machine;

FIG. 2 is a sectional side elevation view taken along line 2—2 of FIG. 1 illustrating the mechanism employed to align and advance buttons to the sewing station of the sewing machine;

FIGS. 2A and 2B are fragmentary side elevation views of the position of the buttonhole finder pins at different stages of the cycle;

FIGS. 3—5 are elevation views similar to FIG. 2 illustrating the button feeding mechanism at various stages of the cycle;

FIG. 6 is a transverse sectional view taken along line 6—6 of FIG. 5;

FIG. 7 is a fragmentary plan view of the button-orienting area of the present invention;

FIG. 8 is a fragmentary sectional side elevation view taken along line 8—8 of FIG. 7;

FIG. 9 is a fragmentary transverse sectional view taken along line 9—9 of FIG. 7;

FIG. 10 is a fragmentary, transverse view taken along line 10—10 of FIG. 7 illustrating the button-clamping feature of the present invention;

FIG. 11 is a plan view taken along line 11—11 of FIG. 2 showing the driver rod assembly used in conjunction with the button-clamping means of FIG. 10 to align and advance the buttons;

FIG. 12 is a transverse section taken along line 12—12 of FIG. 11;

FIG. 13 is a fragmentary elevation view of the clutch mechanism with a portion broken away;

FIG. 14 is a sectional view taken along line 14—14 of FIG. 13;

FIG. 15 is a fragmentary side elevation view illustrating manual clutch release means; and

FIGS. 16A—16C are sequential plan views of the button aligning station at various stages of the cycle.

Referring now to the drawing, FIG. 1 shows the button feeding mechanism 20, the present invention, attached to a sewing machine S. Buttons B are delivered from a suitable supply source, such as a rotating hopper H, to the sewing station, above which is disposed needle N. The sewing machine is powered in a conventional manner, the sewing cycle being initiated and controlled by a foot pedal P. The present invention may be used with either a one or two pedal sewing machine, although for simplicity of description, only a one pedal machine will be described. Presser foot 22, comprised of a clamp 24 to be described in more detail hereinafter, and a clamp arm 26, is hingedly mounted at 28 above the work support anvil A of the sewing machine.

Before describing the construction of feed mechanism 20, a brief outline of the sewing and feeding cycle would be in order. In the sewing position, clamp 24 of the presser foot rests on the fabric disposed on anvil A and is removably connected to post 30. In a one pedal sewing machine, the pedal is depressed by the operator to start the cycle. At the end of the cycle the button clamp raises and is automatically aligned at the level of the button feeder output end. At the moment of alignment, a mechanism causes a clutch to engage, thus permitting a button to be delivered to the clamp.

Referring now to FIGS. 2—5, it will be seen that post 30 is resiliently biased with respect to fixed support wall 32 by means of spring 34. A tripper bar 36 is pivotally

mounted on post 30 at 38 and is also pivotally mounted on wall 32 at 40. At the end of the sewing cycle, bar 36 pivots in a clockwise direction. Finger 42, which is adjustably positioned on the righthand end of bar 36, is pivotally mounted at 44 and is biased by means of torsion spring 46.

The clockwise travel of bar 36 causes finger 42 to move downwardly and strike the lefthand end of a clutch release lever 48 pivotally mounted on wall 32 at 50. Compression spring 52 and a plate 54 bias clutch lever 48 while set screws 56 serve to determine and limit its arcuate motion in either direction. At this time it should be noted that motor 58 is driving a clutch plate 60 which is rigidly secured to the motor shaft (FIG. 14).

Plate 60 is provided, for example, with eight equally spaced apertures 62 (FIG. 13) adapted to receive a pin 64 carried by driven clutch plate 66. When the clutch is disengaged, as during the sewing portion of the cycle, a single, beveled tooth 68, formed on the righthand end of lever 48, is interposed between a beveled flange 70 formed proximate the base of pin 64 and the face of driven clutch plate 66. The pin is rigidly mounted on an arm 72 secured to clutch plate 66 and is provided with a compression spring 74 between flange 70 and arm 72, which tends to urge the pin towards the apertured driver plate 60. Thus, when the button feeding portion of the cycle is started, post 30 pivots clutch lever 48 counterclockwise, such that tooth 68 is lifted out of engagement with the flange of the pin. The clutch lever is also urged to the right by spring 52 and plate 54 because pivot point 50 acts in a slot 48a. The use of a slot prevents accidental continuous contact between finger 42 and lever 48 which would cause steady feeding of buttons. The slot and spring arrangement also provides that the single tooth 68 is properly positioned to cause clutch disengagement after each button is fed. Therefore, a safety feature is provided which assures both positive clutch engagement and only a single revolution of the driven clutch plate. The aforementioned movement of clutch lever 48 permits the coupling of the two clutch plates by means of pin 64 whereby motor 58 drives the button feeding components now to be described.

A second arm 76, also secured to driven clutch plate 66, pivotally supports connecting rod 78 at its righthand end. A connecting link 80 is pivotally carried by the lefthand end of rod 78 and is spring biased with respect thereto by means of spring member 82. A spring loaded ball 84 contained within a plate 86 mounted on link 80 (FIG. 6) acts as a release latch. If there is any misalignment between the clamp 24 and the discharge end of the button feed while the clutch is engaged, members 78 and 80 will "break" at pivot 88 (FIG. 5). Motor 58 can then continue to drive rod 78 without advancing the button feeding mechanism. Pivot 88 is contained within slot 78a and spring 82 serves to reset the rod and link when the "no-feed" condition is corrected.

The opposite end of link 80 is pivotally connected at 90 to the lower end of feed plate 92. The upper, righthand end of feed plate 92 is, in turn, pivotally connected at 94 to the left hand end of linearly movable drive rod 96. For reasons which will be made apparent hereinafter, a pair of set screws 98 are provided to determine and limit the degree of angular movement of plate 92.

Drive rod 96 is slidably mounted for reciprocating horizontal movement in a pair of guide blocks 100 and 102 (FIG. 11 and FIG. 12) together with feed plate 92. As noted hereinabove, feed plate 92 is pivotally mounted and would, because of its own weight, tend to rotate counterclockwise or hang down when it is driven to the left. It is essential, however, that while the buttons are being aligned and advanced, the lefthand end of the plate is in its upward position. To assure that the plate is in the proper position, an intentional frictional force is applied to the drive rod. Since the drive rod and feed plate are both actuated by the same source, the intentionally induced drag will tend to hold the drive rod back slightly

and thus pull the plate upward or in a clockwise direction.

One method for retarding the drive rod in relation to the plate is illustrated in FIG. 12. Guide block 102 is provided with a split bearing 104a, 104b. Pin 106 is forced against bearing half 104a and the bearing half is pressed against drive rod 96 by compression spring 108. Screw 109 prevents bearing half 104b from rotating. Threaded stud 110 and lock nut 110a adjustably captures the spring within an extension of block 102 and nut 111 secures the block to the rear of support wall 32. The frictional force applied to the drive rod may readily be varied by axial displacing threaded stud 110.

Guide blocks 100 and 102 serve two other purposes. First, the stroke length is determined by the position of a set screw 112 mounted in each block. Lock member 114, the function of which will be explained hereinbelow, is rigidly attached to the drive rod intermediate the two blocks. The lock member abuts the screws 112 at each end of the drive rod stroke thus providing precise means to adjust the length of stroke. Second, a manual clutch release in the form of a plunger 116 is slidably captured in block 102, the plunger being normally biased to an upward position by compression spring 118. By manually depressing the plunger, as shown in FIG. 15, the clutch release lever 48 is deflected, permitting engagement of the clutch plates as previously described. The manual control system is used when unloading the feed track, for example, to change button colors, or to eject a faulty button.

The drive rod and linkage system previously described is utilized to advance the button from a reserve station, through an aligning station and then to a sewing station. FIG. 2 shows the relative position of the aforementioned components at the moment the button starts to move from the aligning station to the sewing station. FIGS. 2A and 2B show various stages of button orientation while it is enroute to the sewing station. In FIG. 3 the button has been left at the sewing station and the drive rod is about to return to its starting position. FIG. 4 illustrates the drive rod and associated components in the process of returning to their original position wherein the cycle repeats.

One aspect of button orientation is shown exaggerated in FIG. 2A and FIG. 2B. Button locating assembly 120 is comprised of a plug 122 rigidly clamped to the leading or lefthand end of plate 92 by means of screw 124. A pair of buttonhole finder pins 126 are slidably retained in plug 122 and are biased upwardly by leaf spring 128 secured to plate 92. A first button pusher bar 130 is adjustably secured to plate 92 proximate finder pins 126 and is arranged to abut the rim of the button. The location of bar 130 is a function of button size and is variable. As shown in FIG. 2A the button is misaligned with respect to the pins so that the pins are depressed against the upward force of spring 128. As the button moves to the left (FIG. 2B) it is rotated about an axis perpendicular to its upper and lower surfaces until pins 126 find the buttonholes. The pins rise into the buttonholes by the urging of spring 128 and the button rests on plug 122 with button pusher 130 abutting the button rim. Since the plug and the pins are always properly aligned with the needle path at the sewing station and since the pins cannot change alignment, the button is carried to the sewing station in the proper position for sewing.

Acting in cooperation with the finder pins is a button clamping mechanism illustrated in FIGS. 7-10 extending along the button aligning station. Upper plate 132 has guide tracks 134 and 136 secured therebelow (FIG. 9). The lateral spacing between the track sections is adjusted to a dimension only slightly larger than the button by means of screw 138 so that the button may slide on inwardly extending ledges 134a and 136a, respectively.

At the button aligning station, in lieu of ledge 134a there is provided a clamp assembly 140 comprised of an L-shaped metal bar 142 and biasing means 144 urging

leg 142a of bar 142 to an upward position. The leading end of leg 142a is tapered at 142b to accept one edge of the button as it is pushed from the reserve station. Thus the upper and lower button surfaces are gently clamped between the underside of plate 132 and the top edge of leg 142a. When the rim of the button is pushed by the drive rod, at a point 90° away from where it is clamped, the button will advance the length of the clamp and will rotate within the track.

To summarize, member 146 which is secured to axially movable drive rod 96 pushes a button in a randomly oriented position from the reserve station (FIG. 16A) to the orienting station (FIG. 16B). At that time the edge of the button is resiliently clamped between members 132 and 142a. The drive rod is moved back to the right after it has delivered the previously oriented button to the sewing station and in so doing, member 130 occupies the position previously held by member 146. Subsequent movement of the drive rod to the left causes member 130 to exert a force on the edge of the button with this force being greater than the clamping force, thus causing the button to rotate while at the same time linearly advancing. In so doing the finder pins ultimately engage the aligned buttonholes, as shown in FIG. 2B, and deliver the properly aligned button to the sewing station.

At any one time there are three buttons being operated on by the button feeder. One button is at the sewing station being fastened to the fabric. The second button is about to be aligned and moved to the sewing station and the third is at the reserve station. During the time that the second button is being aligned, as described hereinabove, the third button is concurrently being pushed from the reserve station to take its place at the entrance of the aligning station. Actually there is a fourth button involved and that one is at the bottom of the feed track communicating with the supply source. The edge of the fourth button rests on the edge of the button in the reserve station (FIGS. 1, 2 and 7).

A second pusher bar 146 is pivotally mounted on pin 147 positioned on the drive rod in axially spaced relation to the first pusher 130. This physical relationship of the pusher bars can be clearly seen in FIG. 11. Referring now to FIG. 16A, bar 146 is shown in abutment with the rim of the button B₃, and is about to push it into the aligning station where it will be rotated on the next cycle. At this time the finder pins and linkages are in the position shown in FIG. 3, and, as shown in phantom, button B₂ is properly aligned and button B₁ is in clamp 24 and ready to be sewn. At the next feeding cycle the finder pins will pick up button B₃ at the aligning station (FIG. 16B) to deliver it to the sewing station and concurrently, bar 146 will advance button B₄ from the reserve station to the aligning station.

The lowermost button B₄ in delivery track 148 falls through cutout 148a at the lower end of the track into a horizontal position at the righthand end of guide tracks 134 and 136 when button B₃ is advanced as described above. In order to smoothly slide underneath button B₄ the second pusher bar 146 is resiliently biased by a compression spring 150 located therebelow. Thus, in going from the position shown in FIG. 4 to the position shown in FIG. 2 bar 146 may be temporarily depressed.

FIG. 16C shows the underside of clamp 24 having received button B₃ of FIG. 16B. The clamp is comprised of a fixedly positioned, stepped track half 152 and a pivotally positioned, mating track half 154 which is spring loaded at 156. The tracks, in combination, define an auxiliary button track which grasp the aligned button and hold it firmly for sewing. When the finder pins drop to the position shown in FIG. 3 at the left hand end of travel, the forward travel of the following button ejects the button just sewn. It will be seen then that not only is a button aligned concurrently with its being fed but the next

button is also brought into aligning position at the same time.

Inclined feed track 148 feeds the buttons from hopper H to the righthand end of guide tracks 134 and 136 at the reserve station. A pair of pivotal rails 158 are provided at the bottom of track 148 so that a range of buttons may be accommodated. The rails are set just slightly wider apart than the diameter of the buttons being sewn so that the buttons may be directed accurately and smoothly to the reserve station. Clamp means 159 are utilized to secure rack 158 in place once their location is determined by the size of the buttons being fed. Bracket 160 is secured to the fixed wall 32 and supports feed track 148. To avoid the possibility of a cycle being started before clamp 24 is in the proper position, that is with bar 36 still in the upward position, a mounting plate 162 is secured to bar 36 and a lever 164 is pivotally mounted at 166 on the plate. Spring 168 extends between lever 164 and bar 36 to hold the lever in a normally downward position. A beveled surface 170 on the underside of lock member 114 will either abut the right hand end of lever 164 or will engage a notch 172 on the upper surface of lever 164, thus preventing further leftward movement of the drive rod (FIG. 5). The linkages will then "break" as hereinbefore noted. To provide clearance between beveled surface 170 and the top of lever 164, a slight taper is given to the top of the lever starting at notch 172 and extending to the left so that locking member may freely pass over the lever.

A second safety lever 174 is also pivotally mounted at 176 on wall 32. When the cycling is in order, lever 174 drops to a near vertical position and rests on the top of lever 164 to prevent its chattering and accidental locking with member 114. The return stroke to the right of the drive rod causes locking member 114 to pivot lever 174 out of the way (FIG. 4).

Still one other safety feature is included. A freely rotatable plug 180 is captured in a wall of track member 134 at the reserve station. Spring 182 urges the plug into the path of the button to keep it from inadvertently entering the aligning station. When the drive rod is advanced to the left, the moving button overcomes the spring to displace the plug and permit passage of the button.

The apparatus described hereinabove and shown in the drawings provides rapid and automatic feed of buttons to a sewing station. The mechanism is rugged and accurate, thus assuring a long and useful life. In a very compact arrangement, which readily lends itself to attachment to many different sewing machines, buttons are fed as fast as the fastest standard button sewer can operate. Each button is perfectly aligned so that neither the sewing machine nor the attachment is damaged. Automatic feeding is achieved with parts that are fabricated by well known techniques and to relatively standard tolerances. Complex cams and gearing arrangements which are costly to manufacture and adjust are avoided.

A wide range of button sizes and dimensional variations can be accommodated and with each size the button is aligned by clamping a portion of the upper and lower surfaces at the edge thereof while concurrently pushing against the rim. As one button is fed to the sewing station the next succeeding button is brought from the reserve station to the aligning station and a button is brought from the supply source to the reserve station. The present invention is simpler than much of the prior art for the reasons just mentioned and because straight feed tracks are used between the supply source and the button feeder as well as within the button feeder itself.

There has been disclosed heretofore the best embodiment of the invention presently contemplated and it is to be understood that various changes and modifications may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. Button aligning apparatus for use in conjunction with a sewing machine having a sewing station and a needle reciprocated at the sewing station, a double rail button guide track interposed between the sewing station and a button supply source, the track being arranged to receive buttons and guide them to the sewing station, a pair of button hole finder pins having axes parallel to and in registry with the needle path at the sewing station, the finder pins being movable in two opposite horizontal directions along a path below and substantially parallel to the track by means of a reciprocating and suitably timed drive rod, said apparatus comprising:

(a) button gripping means positioned adjacent the track and arranged to concurrently apply a downward force to the upper button surface and an upward force to the lower button surface of the first button in the track, said forces being substantially perpendicular to the aforementioned button surfaces and applied only along a portion of the button perimeter; and

(b) button drive means adapted to apply a pushing force against the rim of the button, said pushing force being exerted concurrently with the force applied by said gripping means and at point approximately 90° away from the gripped portion of the button, said pushing force being in a direction to advance the button along the track towards the sewing station whereby the button is simultaneously rotated and linearly displaced by the combined forces until it is aligned and in mating registry with the finder pins.

2. The apparatus in accordance with claim 1 wherein said gripping means comprises a spring biased clamp having a rigid gripping leg.

3. The apparatus in accordance with claim 1 wherein said gripping means comprises an upper plate, a lower plate spaced from said upper plate, a rigid, elongated gripping leg secured to one of said plates and extending therebetween in a plane substantially perpendicular to said plates and parallel to the track and biasing means urging said gripping edge towards the other one of said plates.

4. The apparatus in accordance with claim 3 including means to vary the force applied by said biasing means.

5. The apparatus in accordance with claim 4 wherein said means to vary the force of said biasing means comprises at least one screw in engagement with said biasing means whereby axial displacement of said screw in one direction relaxes said biasing means and axial displacement of said screw in the opposite direction compresses said biasing means.

6. The apparatus in accordance with claim 3 wherein the end of said gripping leg furthest away from the sewing station is beveled.

7. The apparatus in accordance with claim 3 wherein one of the rails of the button guide track is shorter than the other, said guide means being positioned intermediate the end of the shorter rail and the sewing station, said guide means being parallel to and contiguous with the shorter rail.

8. The apparatus in accordance with claim 1 wherein said drive means comprises a rod having first and second ends disposed in a plane parallel to the track, the finder pins being pivotally supported by the first end of said rod, means to move said rod towards and away from the sewing station along a path parallel to the track, the finder pins being hingedly connected to the first end of said rod, and means to maintain the finder pins in engagement with the button surface while the button is being aligned and moved to the sewing station.

9. The apparatus in accordance with claim 8 wherein said means to maintain engagement between the finder pins and the button comprises a spring secured to said

drive means proximate the first end of said rod, said spring being arranged to bias the finder pins in the direction of the button whereby the pins enter the button holes when the button holes are aligned therewith.

10. The apparatus in accordance with claim 8 wherein said means to maintain engagement between the finder pins and the button comprises friction applying means acting on said rod intermediate the first and second ends thereof whereby said rod is retarded during its travel to pull the finder pins in the direction of the button.

11. The apparatus in accordance with claim 10 wherein said friction applying means comprises a split bushing having two semi-cylindrical halves and means to urge one of said bushing halves against said rod.

12. The apparatus in accordance with claim 11 including spring means acting on one of said bushing halves and means to vary the force of said spring means against said bushing half.

13. The apparatus in accordance with claim 8 wherein said means to move said rod comprises a motor having an output shaft, a clutch assembly having a driving plate secured to the motor shaft, a driven plate and means to intermittently couple said two plates and a crank arm pivotally connected at one end to the driven clutch plate and pivotally connected at its opposite end to the first end of said rod.

14. The apparatus in accordance with claim 13 wherein said crank arm is comprised of a first section pivotally secured to said clutch assembly and a second section pivotally secured to the first end of said rod, said first and second crank arm sections being hingedly connected to each other intermediate the extreme ends of said crank arm and wherein there is further included means to maintain said crank arm rigid when a button is being fed properly and to permit only said first section of said crank arm to be actuated when a button is being fed improperly.

15. The apparatus in accordance with claim 8 including button sizing means secured to the first end of said rod, said sizing means being adjustably mounted relative to the finder pins.

16. The apparatus in accordance with claim 15 wherein said rod includes a spring biased block pivotally and adjustably mounted proximate the first end of said rod and in tandem relation to said button sizing means, said block having a vertical face positioned to abut the rim of the button and a top surface sloping downwardly towards the second end of said rod, said block moving in unison with the finder pins and said button sizing means, said sloping surface being adapted to slide beneath a button disposed in the track when said rod moves away from the sewing station.

17. The apparatus in accordance with claim 8 including locking means arranged to prevent movement of said rod if the last sewn button is not removed from the sewing station.

18. An automatic button feeding apparatus for use in conjunction with a sewing machine having a needle reciprocated at a sewing station and means to alternately start a sewing cycle and a button feeding cycle, said apparatus being arranged to receive buttons from a supply source, said apparatus comprising:

- (a) a support member;
- (b) a drive rod having first and second ends, said drive rod being journaled in said support member;
- (c) means to move said drive rod both towards and away from the sewing station;
- (d) a button guide track disposed parallel to and on either side of the path of said drive rod first end, said track being arranged to receive the buttons from the supply source, said track having a button receiving end, an intermediate button aligning portion and a button discharge end;
- (e) a pair of button hole finder pins connected to the first end of said drive rod, the longitudinal axes of said pins being parallel to the needle path at the

sewing station, said finder pins being movable from a position intermediate the ends of said track to the sewing station whereby said pins are maintained in alignment with the needle path at all times;

(f) button gripping means positioned adjacent the track and arranged to concurrently apply a downward force to the upper button surface and an upward force to the lower button surface of the first button in the track, said forces being substantially perpendicular to the aforementioned button surfaces and applied only along a portion of the button perimeter; and

(g) button pushing means integral with and actuated by said drive rod, said pushing means being arranged to apply a force to the button rim concurrently with the force applied by said gripping means and at a point approximately 90° away from the gripped portion of the button, said pushing force being in a direction to advance the button along the track towards the sewing station whereby the button is simultaneously rotated and linearly displaced by the combined forces until it is aligned and in mating registry with said finder pins.

19. The apparatus in accordance with claim 18 wherein said gripping means comprises a spring biased clamp having a rigid gripping leg.

20. The apparatus in accordance with claim 18 wherein said gripping means comprises an upper plate, a lower plate spaced from said upper plate, a rigid, elongated gripping leg secured to one of said plates and extending therebetween in a plane substantially perpendicular to said plates and parallel to said track, and biasing means urging said gripping edge towards the other one of said plates.

21. The apparatus in accordance with claim 20 including means to vary the force applied by said biasing means.

22. The apparatus in accordance with claim 21 wherein said means to vary the force of said biasing means comprises at least one screw in engagement with said biasing means whereby axial displacement of said screw in one direction relaxes said biasing means and axial displacement of said screw in the opposite direction compresses said biasing means.

23. The apparatus in accordance with claim 20 wherein the end of said gripping leg furthest away from the sewing station is beveled.

24. The apparatus in accordance with claim 20 wherein one of the rails of said button guide track is shorter than the other, said guide means being positioned intermediate the end of said shorter rail and the sewing station, said guide means being parallel to and contiguous with said shorter rail.

25. The apparatus in accordance with claim 18 including a plate supporting said finder pins, said plate being hingedly connected to the first end of said drive rod and means to maintain said finder pins in engagement with the button surface while the button is being aligned and moved to the sewing station.

26. The apparatus in accordance with claim 25 wherein said means to maintain engagement between said finder pins and the button comprises a spring secured to said plate, said spring being arranged to bias said finder pins in the direction of the button whereby the pins enter the button holes when the button holes are aligned therewith.

27. The apparatus in accordance with claim 25 wherein said means to maintain engagement between said finder pins and the button comprises friction applying means acting on said rod intermediate the first and second ends thereof whereby said rod is retarded during its travel to pull said finder pins in the direction of the button.

28. The apparatus in accordance with claim 27 wherein said friction applying means comprises a split bushing having two semi-cylindrical halves and means to urge one of said bushing halves against said rod.

29. The apparatus in accordance with claim 28 including spring means acting on one of said bushing halves and

means to vary the force of said spring means against said bushing half.

30. The apparatus in accordance with claim 25 wherein said means to move said rod comprises a motor having an output shaft, a clutch assembly having a driving plate secured to the motor shaft, a driven plate and means to intermittently couple said two plates and a crank arm pivotally connected at one to the driven clutch plate and pivotally connected at its opposite end to said plate.

31. The apparatus in accordance with claim 30 wherein said crank arm is comprised of a first section pivotally secured to said clutch assembly and a second section pivotally secured to said plate, said first and second crank arm sections being hingedly connected to each other intermediate the extreme ends of said crank arm and wherein there is further included means to maintain said crank arm rigid when a button is being fed properly and to permit only said first section of said crank arm to be actuated when a button is being fed improperly.

32. The apparatus in accordance with claim 18 wherein said button pushing means comprises a first bar adjustably secured to said plate proximate to and in spaced, tandem relation to said finder pins.

33. The apparatus in accordance with claim 32 wherein said button pushing means comprises a second bar resiliently mounted on said rod proximate the first end thereof and in spaced tandem relation to said first bar, said second bar being movable in unison with said first bar, said second bar having a vertical face positioned to abut the rim of a button in the receiving end of said track whereby at the time said first bar pushes the button from the discharge end of the aligning portion of said track to the sewing station, said second bar will concurrently push the button in the receiving portion of said track to the beginning of the aligning portion of said track.

34. The apparatus in accordance with claim 25 including locking means arranged to prevent movement of said rod if the last sewn button is not removed from the sewing station.

35. The apparatus in accordance with claim 25 including a plug rigidly secured to said plate, said plug having a pair of apertures slidably supporting said finder pins, the apertures of said plug being in alignment with the path of the needle at the sewing station.

36. The apparatus in accordance with claim 30 including clutch actuating means automatically operable by the means to start the button feeding cycle immediately after the button is sewn and the needle stops, said clutch actuating means being arranged to cause said clutch plates to engage and to start the button feeding cycle, the button being fed thereby ejecting the button just sewn.

37. The apparatus in accordance with claim 36 wherein said clutch actuating means is pivotally and resiliently mounted on said support member, said clutch actuating means being slidable relative to said means to intermittently couple said two clutch plates.

38. The apparatus in accordance with claim 30 including manual clutch actuating means.

39. The apparatus in accordance with claim 18 including button-clamping means hingedly secured to the sewing machine and positioned over the sewing station thereof, said button-clamping means including an auxiliary button track positioned to receive buttons from the discharge end of said button guide track, said button clamping means being movable to a first position on the sewing station by the means to start the sewing cycle and movable to a second position by the means to start the button feeding cycle, said auxiliary track and said button guide track being contiguous and in a common plane in the second position of said button clamp.

40. The apparatus in accordance with claim 39 wherein

said auxiliary track is comprised of a fixed portion and a second pivotally mounted, spring biased portion.

41. The apparatus in accordance with claim 39 including locking means to prevent the feeding of buttons when said button clamping means is not in said second position.

42. In combination with a sewing machine, an automatic button feeding attachment having a horizontal track for feeding buttons to the sewing machine and a button supply source positioned above the button feeding attachment, means for directing the button from the supply source to the track of the button feeding attachment, said means comprising an inclined linear feed track including spacedly opposed side rails to guide the buttons, the upper end of said track being in communication with the button supply source, the lower end of said track terminating at the horizontal track of the button feeding attachment whereby the buttons from the supply source are gravity fed along said inclined feed track to the horizontal track so that the rim of the lower most button in said inclined track rests on the upper surface of a button in the horizontal track and whereby the lowermost button in said inclined track is adapted to drop into the horizontal track when the button on which it was resting is removed.

43. The apparatus in accordance with claim 42 wherein the spacing between the lower end of said side rails is variable.

44. The apparatus in accordance with claim 43 wherein the lower end of each of said side rails is pivotally connected to the upper end of said side rails respectively and wherein there is also included clamp means bearing on the lower end of each side rail.

45. A method for orienting buttons fed from a supply source to the sewing station of a sewing machine comprising the steps of:

- (a) simultaneously rotating and pushing a button along a guide track towards the sewing station;
- (b) arresting the rotational movement of the button when the button is aligned for sewing; and
- (c) advancing the aligned button to the sewing station.

46. The method in accordance with claim 45 wherein step (a) includes applying a force to the top and bottom surfaces proximate the edge thereof, said force being substantially perpendicular to the button surfaces and in a plane substantially perpendicular to the plane of the pushing force.

47. The method in accordance with claim 45 wherein step (a) includes resiliently clamping the edge of the button while pushing the edge of the button in a direction substantially perpendicular to the direction of the clamping force.

48. The method in accordance with claim 45 including the step of advancing a second button from a reserve position towards the sewing station simultaneously with step (a).

49. The method in accordance with claim 45 including the step of moving an oriented button to the sewing station simultaneously with step (a).

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