

April 18, 1967

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3,314,387

BUTTON STITCHING MACHINE AND METHOD OF STITCHING

Filed April 3, 1964

3 Sheets-Sheet 1

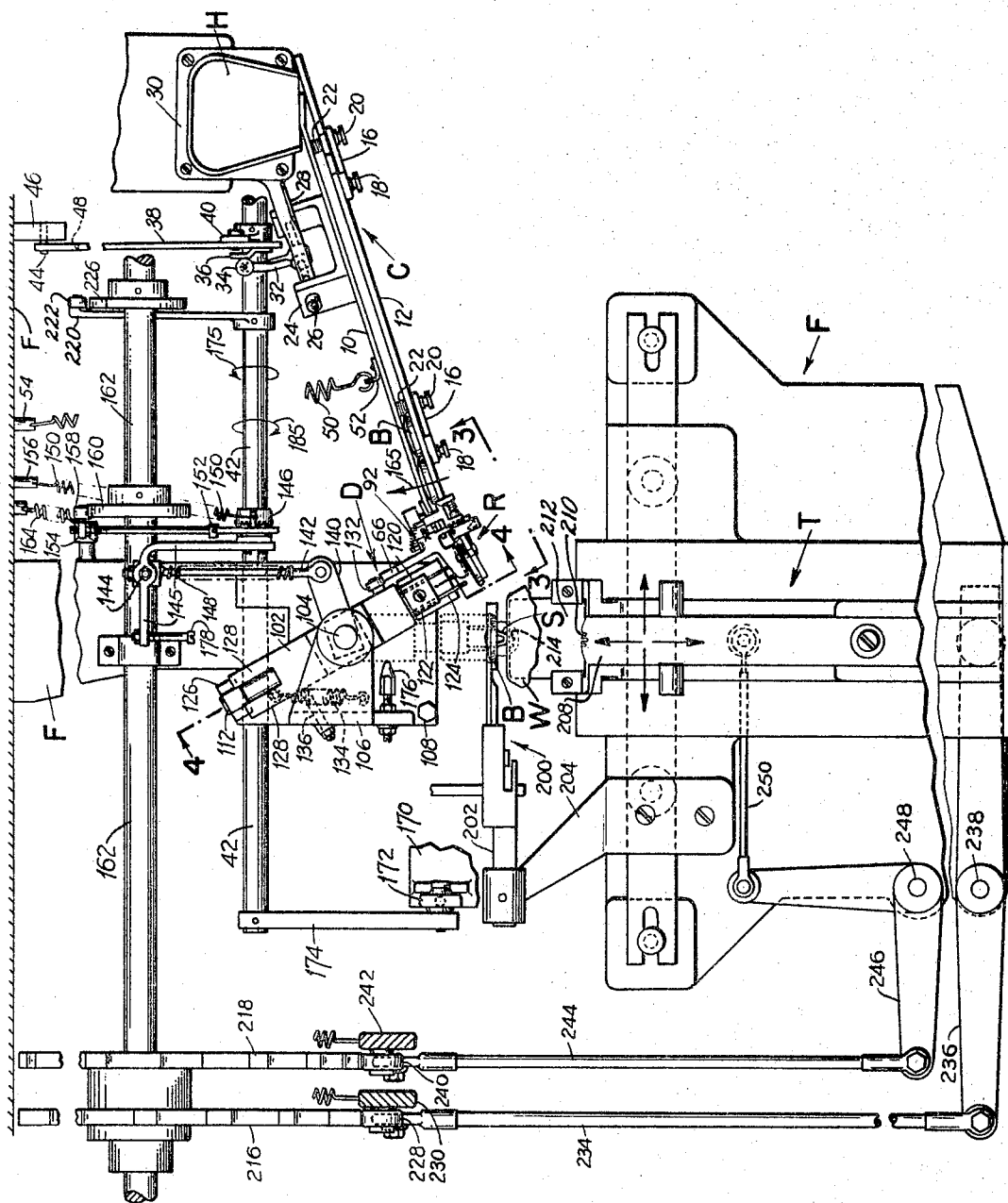


FIG. 1

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April 18, 1967

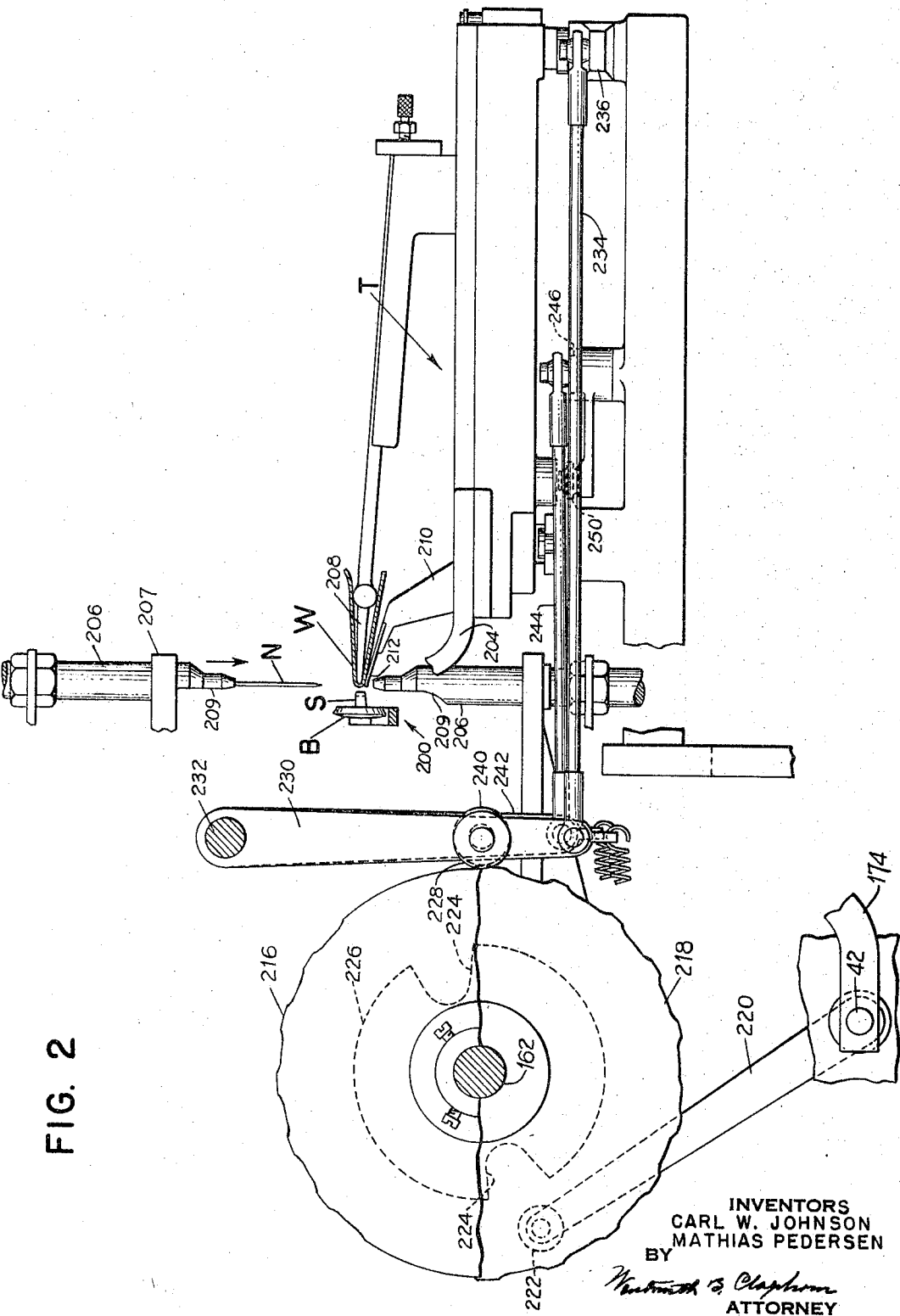
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FIG. 4

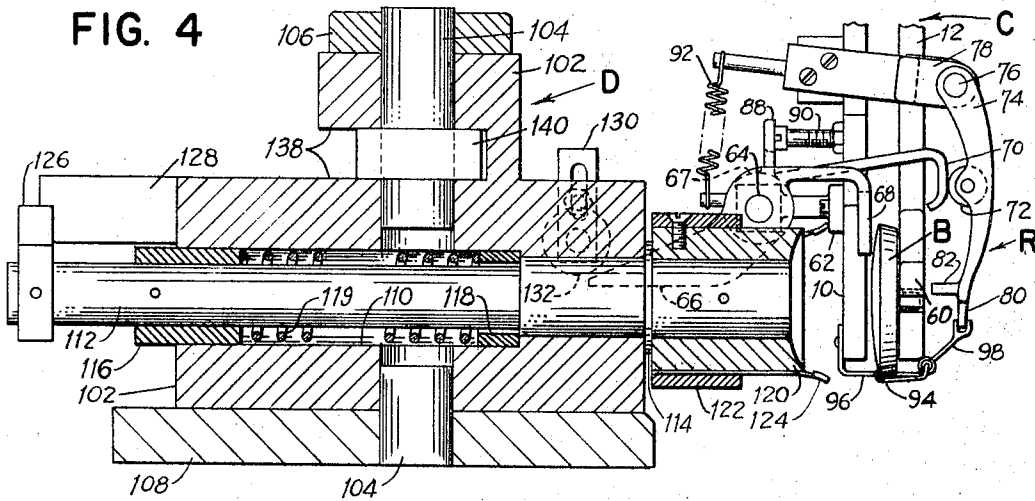


FIG. 3

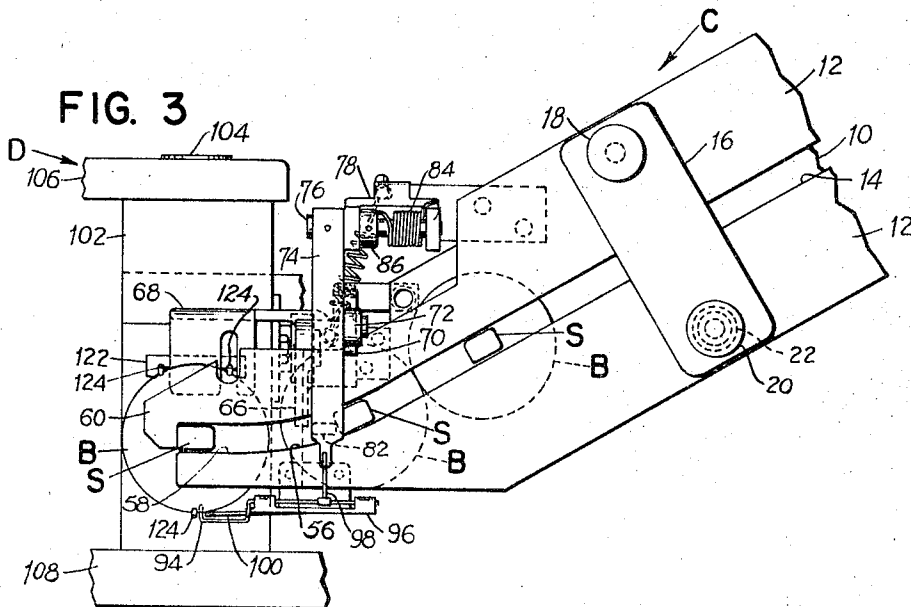
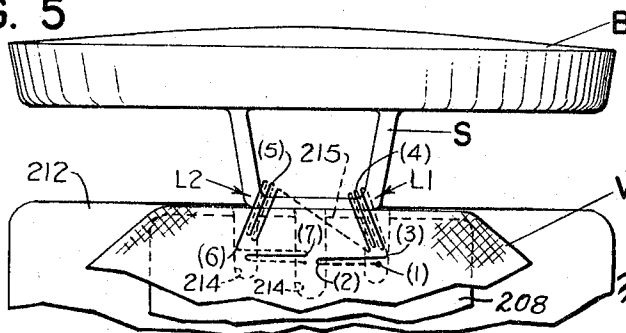


FIG. 5



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3,314,387

BUTTON STITCHING MACHINE AND METHOD OF STITCHING

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Filed Apr. 3, 1964, Ser. No. 357,053
17 Claims. (Cl. 112-108)

This invention relates to the art of stitching, and more particularly to improvements in the method of and apparatus for attaching shank buttons to materials, such as coats, suits and the like in a manner closely simulating hand stitching.

Heretofore in the art, machines have been available for sewing buttons of the shank type. Such buttons are formed with a body portion and a loop of material, such as wire, leather or the material from which the body portion is made extending outwardly at right angles to the body portion.

The invention constitutes improvements in the method of stitching buttons and in button stitching machines of the type disclosed in Patterson et al. Patent 2,739,550, granted Mar. 27, 1956; Patterson Patent 2,739,555 granted Mar. 27, 1956; Johnson et al. Patent 3,121,411, granted Feb. 18, 1964; Pedersen Patent 3,125,046 granted Mar. 17, 1964, and copending Johnson et al. application Ser. No. 20,142, filed Apr. 5, 1960 for Button Stitching Machines, now Patent No. 3,132,613.

Machines heretofore available capable of attaching shank buttons have been of the chain stitch or the lock stitch types. In the attachment of a shank button by a chain stitch machine a single thread is stitched over and over the central portion of the shank until the desired number of stitches has been made to secure the button to the selected material or garment. This type of stitching is quite unsatisfactory for many types of garments, especially coats and overcoats because if a break occurs in the thread, the button soon drops off due to the pulling out of the chain stitch. A further disadvantage occurs because of the bulking of thread at the shank as a result of the formation of several overlapping chain stitches.

In the attachment of buttons to the work using a lock stitch type of machine there is a bulking of stitches adjacent the shank which makes the final result unsightly. Hence this type of machine has but a limited use, and is not used in attaching shank buttons to coats or garments, and overcoats.

The present invention overcomes the disadvantages discussed above because it provides a novel method and machine for attaching shank buttons to material or work such as coats, overcoats, jackets and the like in a manner so closely simulating hand stitching that it is difficult for even an expert in the art to tell that the button has not been hand stitched.

The novel results mentioned above are effected by providing an improved stitching machine wherein a double pointed needle having an eye, threaded with a length of single thread, intermediate its ends is passed back and forth through the loop or eye in the shank of the button such that the single thread is actually passed about the shank in the same manner it would be if hand sewing were employed. Thus, instead of bulking thread adjacent the work or material to which the button is being attached and the shank thereof, continuous uniform loops of thread are formed which secure the button to the material.

In accordance with the invention my novel method results in an attached button which at all times will stand above the material to which it is secured with the plane of the bottom face of the body portion substantially parallel

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to the plane of the material. This result is due to my novel stitching method wherein the first step is the securing of an end of the thread in the material after which two sets of diagonally disposed attaching loops of thread are formed passing through separated portions of the material and over laterally spaced sections of the shank of the button being attached. The shank of a button being stitched is so held and positioned to the material that the points of penetration of the needle through the work and the point where the needle passes through the center of the eye in the shank button forms a triangle. This is due to our novel stitching method wherein the portion of the article to which a button is being attached is located to the right and left of the needle as it passes through the center of the button shank eye. The stitches resulting from the above-described needle passes are pulled to the side of the button shank eye by the needle, regardless of eye form, and the stitch pattern now usually forms a generally trapezoid or somewhat similar shape.

This method of attaching a shank button insures great stability as to final button position on the material and also an extremely strong and lasting attachment thereto. Obviously, the movement of the button and material relative to the needle can be so controlled such that the positions of the points mentioned above can be changed in accordance with the type of shank button to be stitched to a garment.

It is an object of the invention to provide a novel method of and machine for stitching shank buttons to materials, such as coats, jackets, overcoats and the like.

It is a further object of the invention to provide a novel method of and apparatus for attaching buttons to material in a manner closely simulating hand stitching.

The invention is further characterized by the novel method of and machine for stitching shank buttons wherein opposing loops of thread are formed which secure spaced portions of a shank button to the work, resulting in an attachment to the work that is not only stabilized but strong.

With these and other objects not specifically mentioned in view, the invention consists in certain combinations and constructions which will be described fully hereinafter, and then set forth in the claims hereunto appended.

In the accompanying drawings which form a part of this specification, and in which like characters of reference indicate the same or like parts,

FIGURE 1 is a plan view of a button stitching machine embodying the invention,

FIGURE 2 is a partial side elevation of a button stitching machine embodying the invention illustrating the work support table and its operating mechanism,

FIGURE 3 is a partial front elevation of the button feeding device, taken on line 3-3 of FIGURE 1,

FIGURE 4 is a side elevation of the button feeding and transfer mechanism, taken on line 4-4 of FIGURE 1, and

FIGURE 5 is an enlarged view illustrating the stitching pattern employed in this invention.

The desired results of the invention are accomplished by folding the work, such as a selected portion of a man's or woman's coat, over a work supporting tongue which is moved into a predetermined stitching position relative to a shank button. The button is held in the button chuck of the machine with the shank thereof so disposed that the needle can be passed through the eye of the shank as it moves in one direction and back through the work as it moves in the opposite direction in order to effect the attachment of the button to the work in such manner that it appears to be hand stitched.

A machine of the type disclosed in the above referred to patents and application, and particularly of the type

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shown in Patents 3,121,421 and 3,125,046 and copending application Ser. No. 20,142, uses a double pointed needle having an eye between its pointed ends. In this type of machine, the needle is threaded with a relatively short thread having a fixed end and a free end. In the course of attaching a button to a selected position on the work, the loose end of the thread is pulled through the eye in the shank of the button and the work and maintained clear of the path of the needle.

In the practice of the present invention it is preferred to use thread handling means of the type disclosed in copending application Ser. No. 20,142 in which the thread pulling and positioning operations are effected by individually operating thread pullers which handle the thread not only above the work, but also below the work so that at all times during the operation of the machine and the practice of our novel method, a positive control is exerted on the thread. There is less danger of breaking or spitting by the points of the needle and each button stitched to the work is more firmly and uniformly secured such that it will remain in a stabilized position, with the plane of the bottom of the button always positioned in substantially parallel relationship with the surface of the work to which it is secured.

In the attachment of a shank button to the work, after the button has been disposed with its shank in proper position relative to the work, the work and button are moved in a predetermined path of travel relative to the needle such that the thread is first tacked to the work and then continuous loops of thread are formed, in accordance with a predetermined stitching pattern, through the work and the eye of a shank of a button to attach the button firmly to the work, after which a final tacking stitch or stitches are made to secure the thread in the work to insure against loosening.

In accordance with our invention the path of travel of the work supporting platform or table relative to the needle is such that two sets of diagonally opposed loops are formed attaching the button to the work. By means of this novel method of attaching shank buttons an extremely firm attachment is effected. The connecting stitch arrangement is such that the points at which the thread passes through the work form generally the corners of the base of a trapezoid or, in some cases, the corners of the base of a triangle. That is, in the case of a shank button having a long eye extending along the bottom of a button, the points at which the thread passes therethrough in the formation of the diagonally opposed loops are spread apart. On the other hand, if the shank button has a relatively small round eye, the points at which the threads pass through the eye in the formation of the two sets of diagonally opposed connecting loops will be generally centrally located in the eye and thus form the apex of a triangle. While the stitch arrangement above described is preferred, it will be appreciated that the movement of the work supporting platform could be so controlled as to make it possible to stitch a shank button to the work by a series of overlapping continuous loops of thread.

Referring to the drawings, shank buttons B which are to be stitched to the material, such as a man's or woman's coat, are fed from a conventional type of hopper H into an inclined button conveying chute C where they gravitate to button supporting and receiving device designated generally R at the free end of chute C. In the illustrated embodiment chute C comprises a back plate 10, and two parallel spaced front guides or bars 12 spaced vertically one above the other to provide a downwardly inclined guide slot 14 for the shanks of buttons which extend therethrough. The tops of the buttons rest against the back plate 10. The width of slot 14 can be changed as desired within limits by means of a pair of parallel links 16 pivotally connected to bars 12 and thumb screws 18 which secure bars 12 in a selected adjusted relationship. Another pair of thumb screws 20

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protruding through links 16 and one of the front bars 12 threadably engage holes in back plate 10 and thereby form the support means for front bars 12.

Suitable compression springs 22 surrounding thumb screws 20 located in the space between back plate 10 and one of the front bars 12 maintain chute C at the desired button handling width according to the setting of thumb screws 20.

A U-shaped bracket 24 is attached to back plate 10. The two legs of this bracket are mounted on an inclined shaft 26 which in turn is rotatably mounted in a bearing arm 28 which projects from stationary button hopper supporting bracket 30 secured to the frame of the machine (not shown). A control arm 32 is secured to shaft 26. This arm on its free end carries a cam follower 34 which engages a cam lug 36 mounted on a horizontal bar 38. As shown in FIGURE 1, one end of bar 38 is pivotally supported by an upright lever 40 which is mounted on horizontal shaft 42 rotatably supported in suitable bearings in the main frame of the machine (not shown). The other end of bar 38 is slidably carried on a pin 44 which projects from a frame lug 46 into an elongated slot 48 formed in the free end of bar 38. Cam follower 34 of chute control arm 42 is maintained in constant engagement with cam lug 36 by means of spring 50. One end of this spring is attached to a bracket 52 fixed to back plate 10; its other end is secured to a pin 54 in frame F of the machine.

Referring to FIGURE 3, it will be seen that the lower free ends of guide bars 12 coact to form a curved slot 56 which terminates in a short horizontal slot 58, which comprises a part of the button supporting and releasing device R. The lowermost button B is arrested by its shank S when the shank engages the stop nose 60 which in the form shown is formed integrally with the upper front bar 12. A horizontal bracket 62 is suitably attached to the rear face of the lower free end portion of back plate 10 of chute C. Bracket 62 carries a horizontal stud shaft 64 (FIGURE 4) which pivotally supports a rearwardly projecting wedge shaped cam lug 66. Two spaced angularly shaped members 68 and 70 formed integrally with cam lug 66 project forwardly from its hub, as shown in FIGURE 4. Member 68 serves as a button retaining member and is located adjacent the free end of back plate 10. It functions to prevent the lowermost button in chute C from dropping from the free end thereof. Member 70 acts as a cam lug and engages a cam roller 72 carried by a button release arm 74 which is secured at its upper portion to a horizontal shaft 76 mounted in a forked bearing bracket 78 fixed to the rear face of back plate 10 at the bottom of chute C. The lower free end of arm 74 is provided with a latch release finger 80 and a button arresting lug 82 (FIGURE 4).

A tension spring 84 encircles shaft 76. One end of spring 84 is secured to bracket 78, the other end is attached to collar 86 fastened to shaft 76. This construction maintains cam follower 72 on arm 76 in engagement with member 70, as shown in FIGURE 4.

The hub 67 of cam lug 66 is provided with an upright stop lug 88 (FIGURE 4) which normally rests against stop screw 90 under the action of tension spring 92 having its ends attached to a pin in hub 67 and a pin in bracket 78. Stop screw 90 is adjustably threadably mounted in the rear face of back plate 10 of chute C.

The lower free end of chute C which forms a part of button supporting and releasing device R is provided with a hook shaped latch support finger 94 pivotally mounted in bracket 96 (FIGURE 4) secured to back plate 10. Finger 94 is provided with an upright control arm 98. The upper face end of control arm 98 is provided with an open fork which engages the free end of latch release finger 80 on arm 74. It will be seen that when arm 74 is rocked on shaft 76 in a clockwise direction, as viewed in FIGURE 4, latch finger 94 will be moved downwardly to button release position.

An extension or button supporting tab 100 projecting from bracket 96 also serves to support a button during transfer operations.

The button transfer and ejecting mechanism D is best shown in FIGURES 1, 3 and 4. This mechanism in the form selected for purposes of illustration comprises a button transfer support member 102 pivotally mounted on spaced axially aligned stud shafts 104 in bearing bracket 106 fixed to frame member 108 of the machine. As shown in FIGURE 1, and especially in FIGURE 4, member 102 is mounted in such manner that its longitudinal axis lies in a horizontal plane, and passes through the center of a button B held in button supporting and releasing device R. As described hereinabove, each button B positioned in device R at the point of delivery therefrom has its shank S positioned in a horizontal plane. The eye of shank S is located in such position that when it is transferred to button chuck 200 it will be positioned therein for proper movement of needle N therethrough without the necessity of any movement of a button about its longitudinal axis during transferring operations.

Supporting member 102 is provided with a central axial bore 110 which slidably supports an elongated plunger 112. The front end of plunger 112 is provided with a collar 114. A sleeve 116 is attached to its rear end. A spring 119 encircles the central portion of plunger 112 between sleeve 116 and a bushing 118 mounted in bore 110. This spring is operative to maintain plunger 112 in an inoperative or withdrawn position, as shown in FIGURE 4. A button gripping or holding and transferring head 120 is mounted on the front free end of plunger 112. Head 120 supports a plurality of elongated circumferentially spaced resilient rods or fingers 124 which extend outwardly beyond its front face, as shown in FIGURE 4. The spacing of fingers 124 is such that they firmly, yet resiliently, hold or grip each button B transferred from device R until it is ejected into chuck 200. As shown herein, three fingers 124 are provided. Additional fingers could be provided, if desired. The button holding ends of fingers 124 preferably are curved or bent so as to form hooks for holding a button lodged therebetween. The rear portions of fingers 124 are attached to the exterior of head 120 by plates 122.

To prevent plunger 112 from rotating, a T-shaped guide member 126 secured to the rear end of said plunger engages with a pair of parallel spaced lugs 128 extending rearwardly from the upper portion of supporting member 102. Mounted at the right side of the forward portion of member 102 is an adjustable bracket 130 (FIGURE 4) which by means of a suitable stud carries a cam roller 132 (FIGURES 1 and 4) so arranged as to be in alignment with wedge shaped cam lug 66. Button transfer and injecting device D normally is held in button receiving position, is illustrated in FIGURE 1, by means of a tension spring 134 which holds the rear portion of member 102 against an adjustable stop screw 136. One end of tension spring 134 is attached to member 102; the other end is anchored to bearing bracket 106 in which stop screw 136 is supported.

The upper center portion of member 102 is provided with a horizontal cut-out or slot 138 into which loosely protrudes one end of a link or arm 140 pivotally mounted on the upper of the two vertical stud shafts 104. The other end of link 140 is pivotally connected to the forward end of a horizontal pusher rod 142 (FIGURE 1). The rear end of rod 142 slidably engages with the lower end of a vertical bearing post 144, the upper end of which is secured to and carried by an L-shaped bracket 145 mounted on the upper free end of an actuating arm 146 secured to shaft 142. A compression spring 148 encircling rod 142 and confined between bearing post 144 and a step in the forward end of rod 142 provides a yielding connection between actuating arm 146 and link 140. Spring 150 having one end connected to arm 146 and its other end attached to stud 156 in frame F maintains arm

146 in engagement with the free end of adjustable stud 152 mounted in and projecting from the upper free end of cam lever 154 pivotally supported on stud 156.

Cam lever 154 carries a cam follower 158 which tracks a cam 160 secured to the main cam shaft 162 of the machine. Cam follower 158 is kept in constant engagement with cam 160 by means of a tension spring 164 which is much stronger than tension spring 150 acting on arm 146 since it must overcome the pressure of arm 146 through stud 152 on cam lever 154.

As cam roller 158 rides up on the high portion of cam 160 it causes cam lever 154 to move backward and since arm 146 through spring 150 is in engagement with stud 152 carried by cam lever 154, arm 146 also moves backward. Since arm 146 is secured to shaft 42 its backward motion causes the latter to turn in the direction of the arrow 175 (FIGURE 1). This movement of shaft 42 also effects backward motion of upright lever 40, the upper end of which is connected to horizontal bar 38 which carries cam lug 36. The backward movement of cam lug 36 causes cam roller 34 on arm 32 to roll from the high portion of lug 36 to its low portion and thereby through arm 32 effects a clockwise turning of the inclined shaft 26 on which button chute C is mounted. As button chute C thus swings backward in the direction of arrow 165 (FIGURE 1) several actions take place simultaneously. First, this movement of chute C engages wedge shaped cam piece 66 with stationary roller 132 carried by member 102 and causes a downward motion of cam piece 66. Since the button retaining member 68 and cam lug 70 are integral with the hub of cam piece 66 these two members 68 and 70 move upwardly. The upward motion of member 70 causes button release arm 74 under the action of spring 84 to swing clockwise, as viewed in FIGURE 4 and through latch release finger 80 effect the unlatching of the latch finger 94 from the bottom portion of a button B held up thereby in the lower free end of button chute C.

This same movement of arm 74 also brings its button arresting lug 82 into contact with the shank of the button B which is next to the button to be released from chute C and transferred, and pushes this button slightly sideways and away from the button to be transferred to avoid any possible and undesirable friction.

As mentioned above, button retaining member 68 moves upwardly simultaneously with member 70 and thus frees the button being released from the end of the chute, and this button by means of the fairly powerful spring 50 (FIGURE 1) is forced towards the front face of the transfer and injecting device D causing the now free button to be pressed into engagement with the three button fingers 124 on the button gripping or holding and transfer head 120.

After a button is transferred from chute C to transfer and injecting device D, cam follower 158 rides from the high portion of the cam 160 to its low portion and causes shaft 42 to turn in the direction of the arrow 185 in FIGURE 1 thereby, through lever 40 effecting a forward motion of bar 38 and cam lug 36 compelling roller 34 on arm 32 to ride from the low portion of cam lug 36 back on its high portion and thus turning the inclined shaft 26 in a counterclockwise direction, as viewed in FIGURE 1. This movement of shaft 26 causes chute C to swing in a counterclockwise direction, as viewed in FIGURE 1. This causes a disengagement of wedge shaped cam lug 66 from follower 132 in member 102 after which, due to the action of tension spring 92, cam lug 66 swings upwardly again. The upward motion of cam lug 66 results in a downward movement of members 68 and 70. This movement of member 68 causes the rear end of chute C to be closed. The downward travel of member 70 causes arm 74 to move forward and away from chute C, and thereby through its latch release finger 80 and yoke 98 swings latch finger 94 to its closed or button supporting position. The forward motion of arm 74 also

causes the withdrawal of button arresting lug 82 from the shank of the button which is now the first in line or next to be released, so that it can slide down to the free end of chute C. In the meantime the rear end of chute C is also closed when the button retaining member 68 moves down again.

With a button now held in transfer and injecting device D the operator depresses a foot pedal 170 (FIGURE 1) which is linked by connecting rod 172 to the free end of lever 174 mounted on shaft 42. A depressing of foot pedal 170 causes shaft 42 to turn in the direction of the arrow 185 in FIGURE 1 and effect the forward movement of upright lever 146 and L-shaped bracket 145 carried thereby. This forward motion of bracket 145 is transferred to pusher rod 142 by means of compression spring 143, and, since rod 142 is pivotally connected to arm 140 and the latter is pivotally mounted on one of the stud shafts 104, and 140 is moved in a clockwise direction, as viewed in FIGURE 1. As arm 140 starts to turn it engages the end of the slot 138 in member 102, which constitutes the main body of the button transfer and injecting device D, and thereby causes device D to turn in clockwise direction about its pivot shafts 104 until member 102 engages an adjustable stop 176 (FIGURE 1) which is held by and projects from a vertical wall of bracket 106, whereupon further movement of member 102 is arrested. A continued depression of pedal 170 permits, due to the compression spring 143, a continued forward motion of upright lever 146 and L-shaped bracket 145 after the arrest of member 102 together with arm 140 and rod 142. During this continued forward movement of bracket 145 a stud 178 carried by the same engages with the rear end of the spring mounted plunger 112 and presses the same forward until the button carried by the button carrying and gripping head 120 at the front end of plunger 112 enters the button holding chuck 200 which immediately thereafter closes its jaws and securely holds the button while the foot pedal is released and member 102 and upright arm 146 return to their original positions due to their respective tension springs 134 and 150 respectively. The construction and operation of chuck 200 is the same as that shown and described in the above referred to Johnson et al. Patent 3,121,411, with the exception that support bar 202 of chuck 200 is fixedly attached to table bracket 204 due to the fact that chuck 200 always remains in an upright position. The mechanism for opening and closing the jaws of chuck 200 is the same as that disclosed in Patent 3,121,411 and, therefore, further detailed description is omitted in the interest of brevity.

The mechanism which supports the material, such as a man's or woman's coat or garment to which a shank button is to be stitched and illustrated herein, is generally the same as that disclosed in Pedersen Patent 3,125,046. Therefore, further detailed showing and description are omitted except as to modifications which have been made in adapting this mechanism to satisfactory use in the stitching of shank buttons.

Table T, as disclosed in Patent 3,125,046, is mounted for movement in a longitudinal path of travel and also a lateral path of travel relative to needle N which is reciprocated by needle bars 206 back and forth to project needle N having an eye between its ends and threaded with a length of thread back and forth through the material W and edge of a shank button B. The means for reciprocating needle bars 206 are the same as shown in Patent 3,125,046 and also Patterson et al. Patent 2,739,550. Since this mechanism forms no specific part of the invention, further showing and description thereof is considered to be unnecessary.

As shown in FIGURES 1 and 3, material or work W to which a shank button is to be attached is placed over the free end of work supporting tongue 208 on table T and may be secured thereon in position to be stitched in the same manner as disclosed in Patent 3,125,046. When work W has thus been disposed tongue 208 is pressed for-

ward to be locked in position adjacent the shank S of a button B to be attached thereto.

Referring to FIGURE 5 it will be seen that the novel method of attachment of a shank button B to work W in accordance with the invention produces a markedly improved type of attachment. The attaching loops of thread are so disposed that the ends of the loops in the work are relatively widely separated, as are the corresponding ends of the loops of thread passing over shank S. This novel disposition of the connecting thread is brought about by imparting a generally triangular path of travel to table T during stitching operations.

In FIGURE 5, the first stitch is made beginning at point 1 where threaded needle N is passed downwardly completely through the work which, due to the controlled movement of table T, causes the next upward pass of needle N to occur at point 2. Table T is then moved laterally such that the next pass of needle N through work W occurs at point 3. This completes the formation of a complete locking stitch and insures against loosening of the thread in work W. The table next is moved along a diagonal path of travel to complete the formation of three connecting loops of thread L1 extending from work W to a point designated generally 4. It will be appreciated that needle N actually moves through approximately the center of the eye of shank S of the button as it is moved by needle bars 206. However, as the result of this upward movement of the needle, there is a tendency on the part of the thread to slide along shank S to the position shown at point 4.

The last stitch of the series of loops extending between points 3 and 4 having been made, the table motion is such that the next upward pass through the eye of shank S results in the disposal of thread at the left hand portion of the eye of the shank or at a position designated generally 5. Subsequent connecting loops L2 of thread joining the button to the work at point 6 lie along a diagonal path of travel of table T which is opposed to the first connecting loops L. As in the case of loops L1 three loops L2 also are formed. Table is then moved laterally to effect the formation of two locking stitches connecting points 6 and 7, which completes the attachment of the button.

Although three loops of thread L1 and L2 have been shown connecting button B to work W have given very satisfactory results, it will be appreciated that the number of loops can be varied in accordance with the demands placed upon a button. In other words, more or fewer loops could be made, if desired.

Referring to FIGURES 1 and 5, it will be seen that throat plate 208 is provided with three cut-out portions or recesses 210. These recesses function to allow for the passage of needle N and a thread therethrough, and also control the depth of the stitch in the work folded over the edge of throat plate 208 as shown in FIGURE 2. Mounted on the top of carriage 96 is a pucker plate 212 which is formed with a plurality of recesses 214 corresponding in width to recesses 210 in throat plate 208. As in the case of recesses 210, recesses 214 in pucker plate 212 provide for the passage of needle N and the thread passing through its eye completely through work W during the formation of the locking stitches. The forward or front edge of pucker plate 212 extends a short distance beyond the end of work W, as will be seen in FIGURE 2. The provision of pucker plate 212 and recesses 214 insures that when work W to which a button B is attached is removed from tongue 208 and unfolded, button B will stand firmly thereabove and there will be no puckering in the work. That is, the comb portions 215 between recesses 214 provide slack forming means such that when locking stitches are made slack is provided because the thread passes over combs 215 and, therefore, excess tension of thread which would cause puckering is prevented.

The desired lateral, and diagonal paths of travel of table T are obtained by means of cams 216 and 218

mounted on machine cam shaft **162**. This shaft is driven by a suitable source of power, such as an electric motor (not shown) constructed and operated in the same manner as disclosed in Pedersen Patent 3,125,046. The machine embodying the invention may be started and stopped by mechanism similar to that shown and described in Patterson et al. Patent 2,789,550. Since this mechanism does not form a specific part of the invention further description and showing thereof is considered to be unnecessary. In the machine shown herein, however, shaft **162** is driven through one-half revolution instead of one revolution for each complete stitching operation. This is due to the fact that fewer stitches are required to be made in attaching a shank button than in the case of a normal 2- or 4-hole flat button.

The high and low surface designs of cams **216** and **218** are such that the stitch pattern shown in FIGURE 5 is followed in attaching a shank button to the work. In order to prevent damage to the machine by an accidental depressing of treadle **170** (FIGURES 1 and 2) during operation of the machine, shaft **42** is provided with a safety lever **220** which carries on its free end a cam follower **222**. Lever **220** can swing forwardly, or clockwise as viewed in FIGURE 2, only when cam follower **222** is in alignment with one of the two slots **224** in disc **226** which is fixed to cam shaft **162**. As mentioned hereinabove shaft **162** makes one-half a revolution during each complete stitching operation. Therefore, follower **222** and a slot **224** in disc **226** are aligned after each complete stitching operation. When this occurs treadle **170** can be pressed home to effect the delivery of a button **B** from chute **C** to transfer head **120** to chuck **200** ready for attachment to the work.

Cam **216** is tracked by a follower **228** mounted on lever **230** pivotally mounted on a support shaft **232** suitably supported in the frame of the machine. The free end of lever **230** is connected to a link **234** which in turn is connected to one arm of lever **236** pivotally mounted at **238** on frame **F** of the machine. The other arm of lever **236** is pivotally connected to table **T**. By means of this operating mechanism table **T** is given a longitudinal movement relative to needle **N** during the operations of the machine.

Lateral movement of table **T** is effected by cam **218** acting on cam follower **240** carried by lever **242** pivotally mounted on shaft **232**. The free end of lever **242** is connected to one end of link **244**. The other end of link **244** is connected to one arm of a bell crank lever **246** swingably mounted on stud shaft **248** in frame **F** of the machine. The other arm of bell crank lever is connected by link **250** to table **T**.

Due to the design of cams **216** and **218** their conjoint operation moves table **T** through the paths of travel described above and shown in FIGURE 5 in attaching a button **B** to work **W**. It will be appreciated that during the formation of each stitch, the loose end of the thread is pulled through the work or the eye of the button. This is done by thread pullers or handling means (not shown) which may be the same type as shown in our copending patent application Ser. No. 20,142, filed Apr. 5, 1960, by Johnson and Pedersen. Since these thread handling means form no specific part of the invention further showing or description thereof is omitted as not being necessary to an understanding of the invention.

Referring to FIGURE 2, needle bars **206** are mounted for reciprocation to and from table **T** in operating brackets **207**. In order to provide for the proper movement of each needle bar relative to shank buttons the rear portion of each bar is reduced, as at **209**. This construction prevents damage to the button being stitched, and the machine elements adjacent thereto.

As noted hereinabove the starting and stopping of the machine can be effected by mechanism similar to that disclosed in Patterson et al., Patent 2,739,550. In the present machine, however, since cam shaft **162** makes one-

half of a revolution for each complete stitching operation and cams **216** and **218** are symmetrical for each 180°, the machine is stopped after the 180° travel of these cams. This can also be effected by mounting on cam shaft **162** two sets of triggers (not shown) with means for making or breaking a circuit (not shown) through an electromagnetic brake (not shown) and actuating a clutch (not shown) to drive or interrupt the drive of the machine.

What is claimed is:

1. The mechanical method of sewing shank buttons to articles of clothing or the like in a manner closely simulating hand stitching which comprises positioning said article on a support with the folded edge to which a button is to be attached extending beyond said support, moving said support to present a selected portion of said folded edge to which said button is to be attached in the path of movement of a needle threaded with a predetermined length of thread, supporting a shank button with its shank lying in a plane locating its eye in a position for the passage of a needle therethrough and adjacent said work, passing said needle and thread downwardly through said folded edge of said work and then upwardly therethrough at a point spaced laterally from the point of penetration of said needle on its first downward movement and then downwardly through said folded edge of said work at a point adjacent said point of penetration to form a locking stitch, forming a plurality of stitches in the form of continuous loops of thread passing completely through a selected portion of said folded edge of said work and the edge of said shank, then forming an additional plurality of stitches corresponding to the first-named plurality of stitches and spaced laterally therefrom, and then forming a locking stitch in said folded edge portion of said work adjacent the points of penetration of said second-named plurality of stitches against loosening.

2. The method defined in claim 1 including forming loose locking stitches in said folded edge portion of said work whereby when said folded edge portion is unfolded said work will be free from puckering.

3. The mechanical method of sewing shank buttons to articles of clothing or the like in a manner closely simulating hand stitching which comprises positioning said article on a support with the folded edge to which a button is to be attached extending beyond said support, moving said support to present a selected portion of said folded edge to which said button is to be attached in the path of movement of a needle threaded with a predetermined length of thread, supporting a shank button with its shank lying in a plane locating its eye in a position for the passage of a needle therethrough and adjacent said work, passing said needle and thread downwardly through said folded edge of said work and then upwardly therethrough at a point spaced laterally from the point of penetration of said needle on its first downward movement and then downwardly through said folded edge of said work at a point adjacent said point of penetration to form a locking stitch, forming a plurality of stitches in the form of continuous loops of thread passing completely through a selected portion of said folded edge of said work and the edge of said shank and disposing a portion of each loop of thread to one side of said eye of said shank, then forming an additional plurality of stitches corresponding to the first-named plurality of stitches and disposing a portion of each loop of thread to the other side of the eye of said shank, and then forming a locking stitch in said folded edge portion of said work adjacent the points of penetration of said second-named plurality of stitches in said folded edge of said work to secure said stitches against loosening.

4. The method defined in claim 3 including moving said article and said button along opposed different diagonal paths of travel relative to said needle during the formation of each plurality of continuous thread connecting said button to said article whereby said plurality of loops

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of thread are disposed in diagonally opposed relationship relative to each other.

5 The mechanical method of sewing buttons to an article comprising folding an article on a support which comprises positioning an article of clothing on a support with a folded portion to which a shank button is to be attached extending therebeyond, supporting a shank button with its shank located in a predetermined position relative to said folded portion and with the eye of the shank positioned for passage of a needle threaded with a short length of thread completely therethrough, passing said needle and thread back and forth completely through said folded portion of said article and the eye of said shank and displacing said support and said button diagonally along one path of movement relative to said needle to form a predetermined number of continuous loops of thread attaching said button to said article, then displacing said support and said button diagonally along another path opposed to said first-named path of movement of said support and button and passing said needle and thread completely through said portion of said article and the eye of said shank and forming a predetermined number of continuous loops of thread connecting said button to said article with the ends of the last-formed loops of thread in said portion of said article spaced laterally from the ends of the first-formed loops, and forming locking stitches adjacent said ends of said loops of thread in said portion of said article to lock said thread against loosening.

6. The method defined in claim 5 including the steps of effecting a lateral movement of thread first to one side and then to the other side of said eye of said shank during the formation of each loop connecting said button to said work, and providing slack in each locking stitch whereby said article will be free of puckering when it is unfolded.

7. A button stitching machine for sewing buttons to material in a manner simulating hand sewing of the type having a work support table, an upper and a lower needle bar located on opposite sides of said support table adapted to alternately project a needle having an eye between its ends threaded with a length of thread with a loose end back and forth through said material and a button, means for pulling said loose end of said thread through said material and said button and a button chuck mounted on said table; comprising a button hopper, a button chute having a button holding and releasing device station for conveying buttons from said hopper to said device, a button transfer, means mounting said chute for movement from an inoperative position to a delivery station adjacent said transfer, button holding means in said transfer, means operative in response to the movement of said chute to said delivery station to effect the release of a button from said device and the delivery of said button to said holding means, means for moving said transfer with a button held therein into position to deliver a button to said button chuck, and means for ejecting said button from said holding means into said chuck.

8. The invention defined in claim 7 wherein said chute conveys shank buttons, and including means for moving said work table in timed relation to the movement of said needle bars to effect the formation sequentially of: at least one tacking stitch in said material; a plurality of continuous loops of thread along one path of movement diagonal to the longitudinal axis of said work table connecting said shank of said button to said material; a plurality of continuous loops of thread along a second diagonal path of travel opposed to said first-named plurality of continuous loops of thread, and at least one locking stitch in said material securing said second-formed plurality of loops against loosening.

9. The invention defined in claim 8 wherein said material is folded over a free end of said table adjacent the path of travel of said needle, and material spacing comb means between which said needle passes during the for-

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mation of said locking stitches on said free end of said table operative to provide slack thread in said material when it is unfolded after a button has been secured thereto such that said material lies flat and is free from puckering.

10. Button handling mechanism for a button stitching machine comprising a button hopper, a gravity button chute attached to said hopper, a button receiving station, a button delivery station, means mounting said chute for movement between said button receiving station and said button delivery station, a button transfer located at said button delivery station, button holding means on said transfer, a button chuck having opposed gripping jaws for supporting a button for attachment to an article of wearing apparel, means for moving said chute to said button delivery station to deliver a button to said holding means of said transfer, means for releasing a button from said chute for delivery to said holding means, means for moving said transfer with a button in said holding means into position to deliver said button to said chuck, and means for moving said button out of said holding means into said chuck.

11. The invention defined in claim 10 wherein said chute comprises a button supporting and release device at its button delivery end, said device including a button support having a latch arm, a latch arm operating member, a button gate, an operating cam for said gate, a cam follower engaged by said cam when said chute is moved to button delivery position for effecting the movement of said gate to button release position, and means also operative during said movement of said chute to engage said operating member with said latch arm and move said support out of engagement with said button.

12. The invention defined in claim 11 wherein said transfer comprises a plurality of arcuately spaced resilient button gripping fingers operative to hold a button released and delivered from said supporting and release device, and wherein said means for moving a button from between said fingers into said button chuck include an axially movable discharging plunger carried by said transfer, and treadle operated means engaging said plunger when said transfer is positioned in button discharge position to move said plunger into engagement with said button and force it from between said fingers into the jaws of said chuck.

13. The invention defined in claim 11 wherein said button handling mechanism is designed to handle shank buttons and said chute comprises vertically adjustably spaced elongated rails between which shanks of button extend for free gravity sliding movement to said supporting and release device, means at said device for maintaining said shanks of said buttons arranged with the eye of each shank located in a predetermined position for delivery to said chuck, and controlled release means for releasing only a single button at a time for delivery to said transfer.

14. In a button sewing machine having a work supporting table and a button chuck, a common movable support for said table and said chuck, said support being adapted to dispose said table with material supported thereon and said chuck holding a button in the path of travel of a needle threaded with a thread having a loose and a fixed end, said need being adapted to be passed back and forth through said button and said material in accordance with a predetermined stitching pattern, and means for pulling the loose end of said thread through said work and button during the stitching operation incident to attaching a button to said work; means for moving said table laterally relative to said needle to form at least one stitch initially locking a portion of said thread in said work, means operative upon completion of said locking stitch to move said table and button diagonally along a diagonal path of travel relative to said needle to form a predetermined number of diagonally disposed

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loops of thread attaching the shank of a shank button to said work, means for moving said work and button along another diagonal path of movement to form a predetermined number of loops of thread joining said button to said work opposed to said first-named loops and with the ends of the first-named and said second-named loops spaced laterally apart, and means for moving said table and button to form at least one final locking stitch in said work adjacent the zone of penetration of said second-named loops of thread in said work.

15. The invention defined in claim 14 wherein said table comprises a movable throat plate over which a portion of said work to which a shank button is folded in such manner to dispose the folded edge of said work adjacent the shank of a button held vertically in said chuck, a platform forming a part of said table and coacting with said throat plate, a plurality of recesses formed in the free end of said throat plate over which said work is folded, a pucker plate mounted on said platform and having a portion adjacent said shank of said button, a plurality of recesses formed in said portion of said pucker plate corresponding to said recesses in said throat plate, whereby when said throat plate is positioned above said platform and pucker plate said needle passes through both sets of recesses, comb members separating said recesses in said throat plate and pucker plate, said comb members of said pucker plate being constructed and arranged to support additional thread in the formation of said locking stitches whereby, when said work with a button attached thereto is removed from said throat plate said work when unfolded is free from puckering.

16. The invention defined in claim 15 including means for conveying a shank button to a delivery station with the eye of said shank lying in a horizontal plane, a transfer device provided with a plurality of button holding fingers, means for releasing a button from said station and delivering it to said fingers with the eye of said shank maintained in said horizontal plane, means for moving

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said transfer device to position said button held by said fingers for delivery to said chuck, and means for ejecting said button from said device into said chuck.

17. The mechanical method of attaching shank buttons to articles of clothing and the like in a manner simulating hand sewing which comprises: supporting a shank button in spaced relationship with the selected portion of the work to which it is to be attached with the shank of said button lying in a plane substantially parallel to the plane of said portion of said work, passing a needle threaded with a predetermined length of thread completely through said work in one direction of movement of said needle, passing said needle and said thread in the opposite direction through the eye in said shank on the next movement of said needle, continuing the movement of said needle back and forth through said work and said eye in said shank of said button to form a predetermined number of continuous loops of thread joining said button to said work, moving said work and button diagonally along one path of movement relative to said needle during the formation of said predetermined number of continuous loops of thread connecting said button to said work, then moving said work and button diagonally along another path of movement opposed to said first named path of movement during the formation of said predetermined number of continuous loops, and then forming a locking stitch in said work to secure against loosening.

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