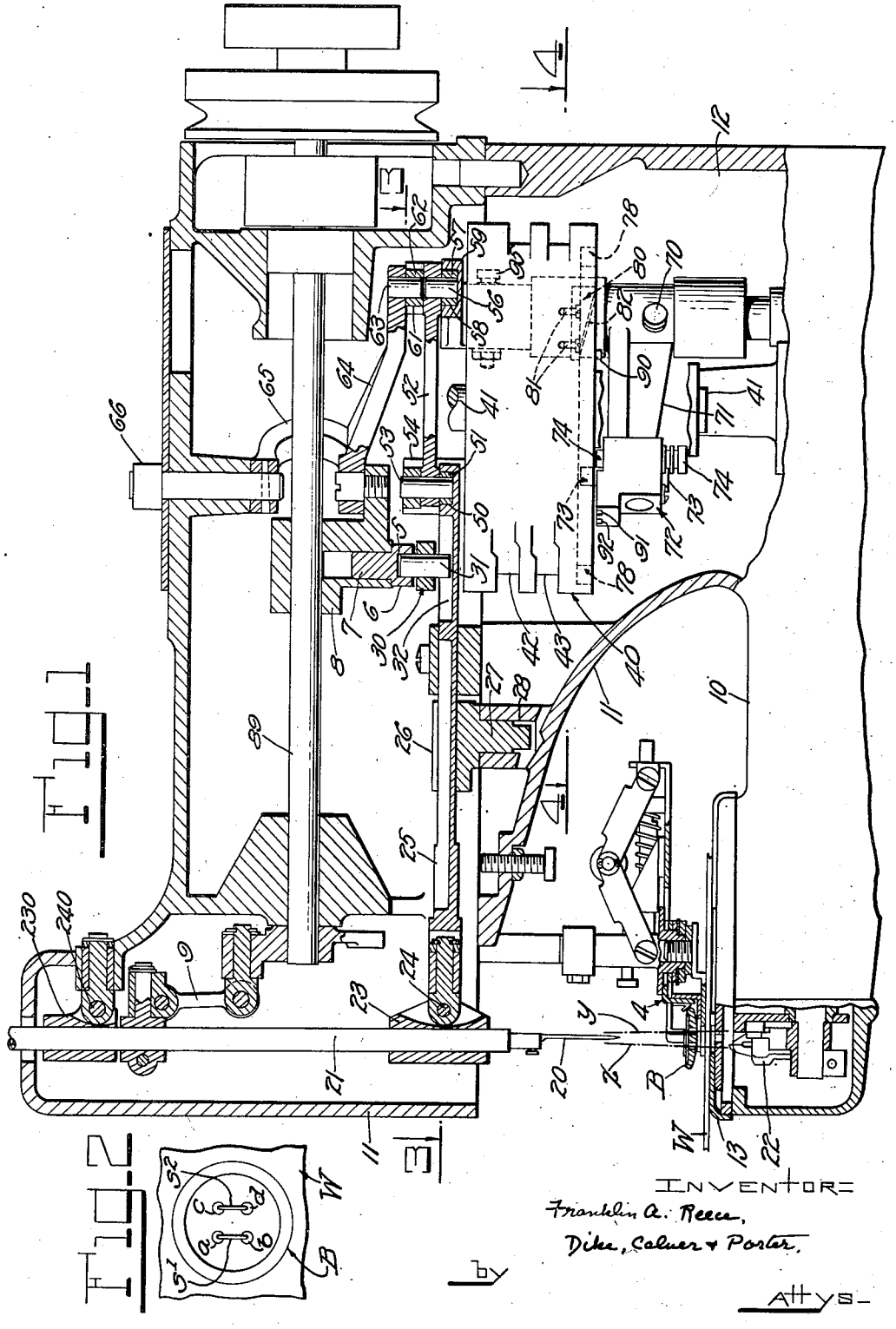
May 29, 1945. F. A. REECE 2,377,293

ARTICLE ATTACHING MACHINE

Filed May 8, 1943 3 Sheets-Sheet 1



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May 29, 1945. F. A. REECE 2,377,293

ARTICLE ATTACHING MACHINE

Filed May 8, 1943 3 Sheets-Sheet 2

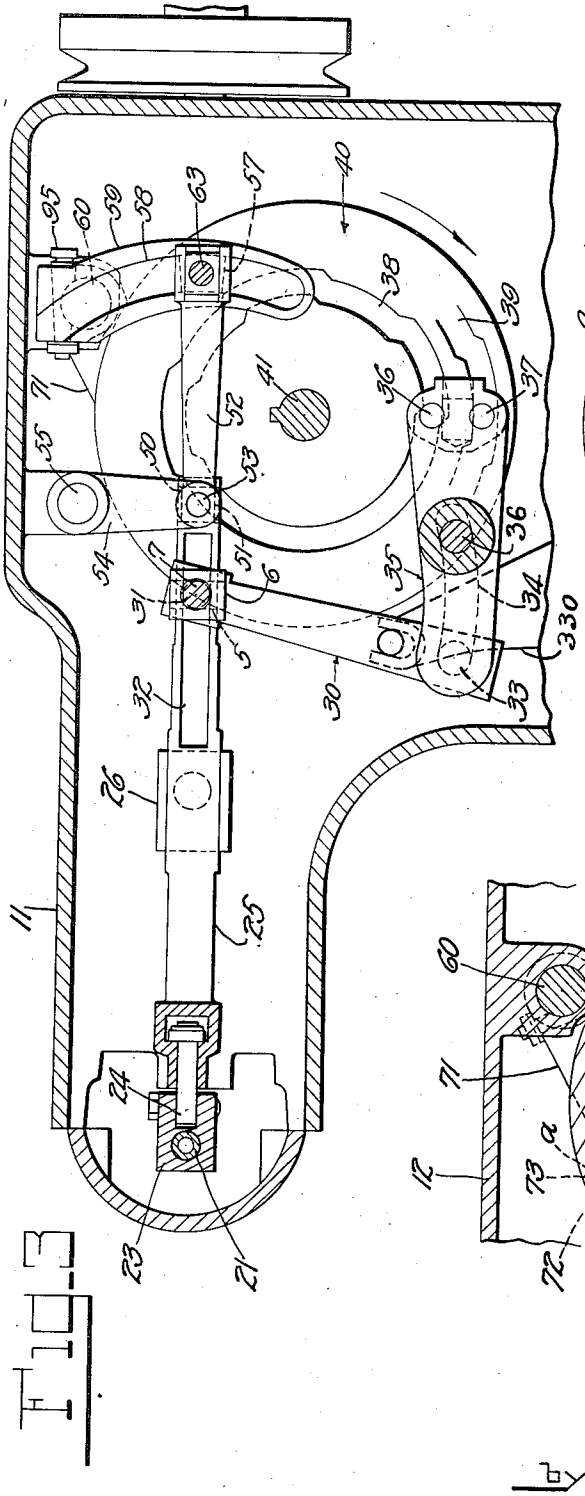


FIG. 3

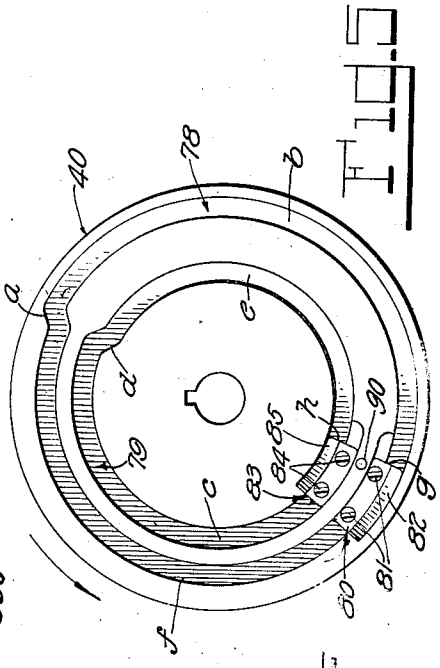


FIG. 5

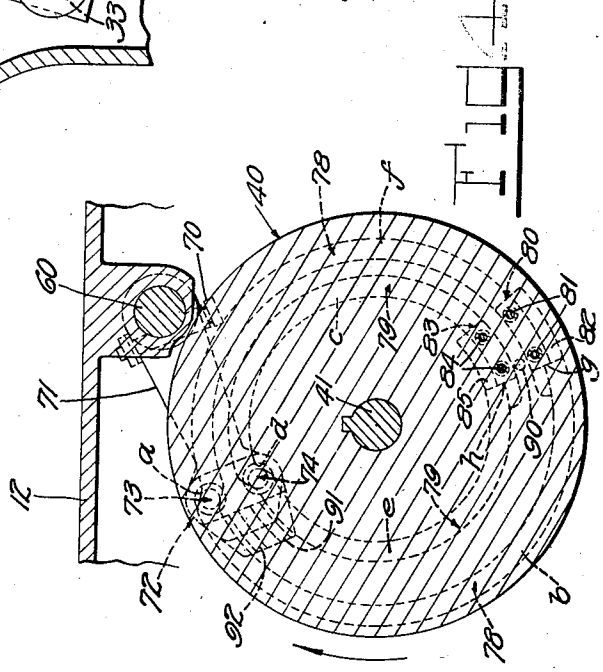


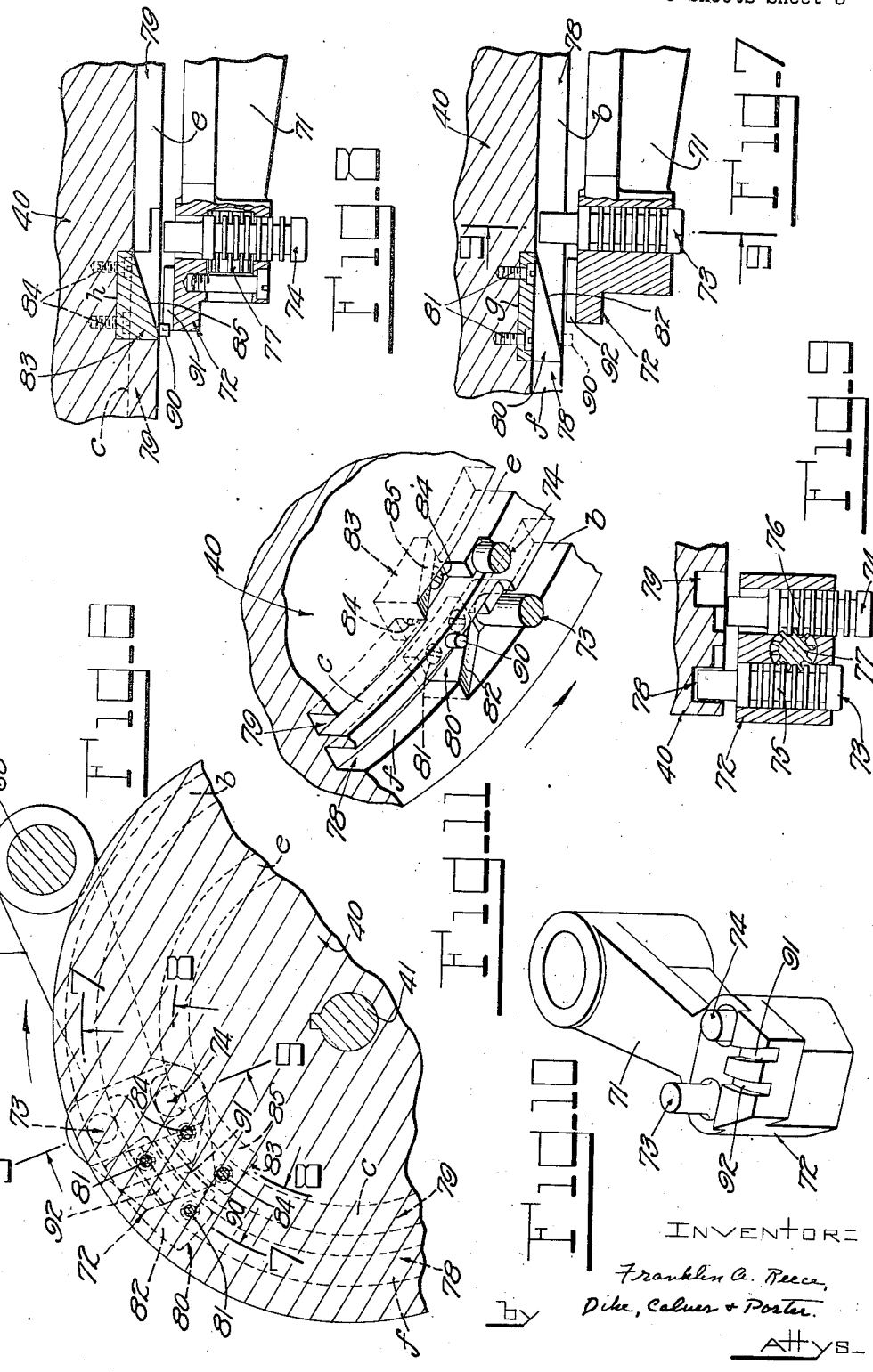
FIG. 4

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ARTICLE ATTACHING MACHINE

Filed May 8, 1943 3 Sheets-Sheet 3



Patented May 29, 1945 2,377,293

UNITED STATES PATENT OFFICE

2,377,293

ARTICLE ATTACHING MACHINE

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Application May 8, 1943, Serial No. 486,187

16 Claims. (Cl. 112—111)

This invention relates to article attaching machines, for example, machines for sewing on buttons, especially substantially flat buttons having perforations or holes through which the attaching thread is passed. A machine of this type is described, for example, in the patents to Avis, No. 2,158,171, and Reece, No. 2,158,199, both dated May 16, 1939.

In machines for attaching four-hole buttons, means are provided for relatively moving or oscillating the needle and work-holding means laterally of the machine between successive work-penetrating strokes of the needle in order that the needle may alternately pass through each of a pair of holes during one stitching operation to form a group of attaching stitches through said pair of holes. In order to perform the same stitching operation on a second pair of holes in a four-hole button, i. e., to form a group of attaching stitches through said second pair of holes, other means are provided for relatively moving or shifting the needle and work-holding means longitudinally of the machine in order to place the needle in the plane of the second pair of holes, whereupon the relative lateral movements again take place during the formation of the second group of stitches. In machines of this general character, the relative movements referred to have in some cases been imparted to the needle bar, in others to the work-holding means, and in still others to both. In the machine described in the Avis and Reece patents above referred to, all of these movements are imparted to the needle, the work remaining stationary.

In some machines of this general character, a single cam, or its equivalent, has been employed to produce both the lateral and longitudinal movements. Since the longitudinal movements must be alternately in opposite directions after the formation of successive groups of stitches, a cam which would produce such alternately opposite movements must heretofore have been large enough to produce the lateral movements required for the formation of at least two groups of stitches. This has necessitated the use of a cam of inconveniently and objectionably large size. In other machines (for example, that described in the Avis and Reece patents above referred to) entirely separate cams, driven at different speeds, have been employed to produce the respective movements. This necessitates an objectionable duplication of parts and correspondingly cumbersome construction and introduces the possibility of defective relative timing.

In accordance with the present invention mechanism is provided wherein the cam elements for producing both the lateral and longitudinal movements comprise substantially unitary portions of the same cam (preferably grooves in a single integral cam) in that they rotate in unison and at the same speed; wherein the cam is required, during each complete rotation, to produce the lateral movements incidental to the formation of only one group of stitches, thereby permitting the use of a relatively small cam; and wherein is produced a longitudinal movement alternately in opposite directions upon successive rotations of said cam; thereby providing a simpler and more compact mechanism than has heretofore been possible and insuring the accurate relative timing of the two movements.

The invention will best be understood with reference to the illustrative embodiment thereof shown in the accompanying drawings.

In the drawings:

Fig. 1 is a view, partly in side elevation and partly in longitudinal section, of a machine embodying the present invention.

Fig. 2 is a plan view of a four-hole button, showing the grouping of the attaching stitches;

Fig. 3 is a horizontal section on the line 3—3 of Fig. 1;

Fig. 4 is a horizontal section on the line 4—4 of Fig. 1, showing the main cam;

Fig. 5 is a view of the under surface of the cam shown in Fig. 4;

Fig. 6 is a detail fragmentary view of the mechanism of Fig. 4, showing the parts in a different relative position;

Figs. 7 and 8 are vertical sections taken substantially on the lines 7—7 and 8—8 respectively, of Fig. 6;

Fig. 9 is a section along the line 9—9 in Figs. 6 and 7;

Fig. 10 is a perspective view of the cam follower mechanism of the present invention; and

Fig. 11 is a fragmentary view in perspective of a portion of the main cam and cam follower mechanism.

The invention is herein illustrated as embodied in such a machine as is described in the Reece and Avis patents above referred to, although equally applicable to machines of specifically different types.

The frame of the machine comprises a bed 10 and an overhanging head 11 supported therefrom by an upright housing portion 12 enclosing the principal parts of the operating and controlling devices. The bed 10 carries a work plate 13 upon which the fabric W to which the buttons are to be

attached is supported. Work-holding means is generally indicated at 4 in Fig. 1.

The stitch-forming instrumentalities include an eye pointed needle 20 carried by a needle bar 21, mounted for vertical or longitudinal reciprocation in the head 11, and an underneath looper mechanism 22.

Adjacent its lower end the needle bar 21 is guided in a bearing 23 mounted (as in the Avis Patent No. 2,158,171, above referred to) by means of a universal joint 24 on the front end of a carrier member 25 which is itself mounted as hereinafter described for movement in a horizontal plane both laterally and longitudinally of the machine frame. Adjacent its upper end the needle bar is guided in a bearing 230 mounted by means of a similar universal joint 240 in the forward end of the head 11. The needle bar is reciprocated in its bearings 23 and 230 through suitable connections, generally indicated at 9, from a shaft 89 journalled in the head 11 and to which power is applied under the control of suitable stop mechanism, not shown.

In attaching a four-hole button, such as that shown in Fig. 2, the carrier 25 is oscillated laterally during the successive descents of the needle 20 to cause said needle to pass alternately through the holes *a* and *b* in the button B to form a series of attaching stitches *s'* passing through the holes *a* and *b*, after which the carrier 25 is shifted longitudinally, or in a direction fore and aft of the machine, to bring the needle into the plane of the other pair of holes *c* and *d*, and the lateral oscillations are repeated for a second set of attaching stitches *s2* passing through the holes *c* and *d*.

The carrier member 25 for the lower needle bar guide 23 is guided for longitudinal movement in a groove in the top of a head 26 having a shank or trunnion 27 received in a socket 28 in the bottom wall of the head 11 of the machine, whereby said head 26 is pivoted for oscillation about the axis of said shank. Said carrier is therefore free to move longitudinally in the head 26 or to oscillate laterally with said head about the pivotal axis of the latter.

The carrier 25 is oscillated laterally about the axis of the pivot 27 to cause the needle to pass alternately through the holes *a* and *b* or the holes *c* and *d* by mechanism comprising a link 30 (see particularly Fig. 3) having a pin or stud 31 projecting downwardly into a longitudinally disposed way 32 in the upper face of the carrier 25. An upwardly projecting portion of the pin 31 is received in a way 5 in a head 6 having a shank 7 pivoted in a bracket 8 in the machine head 11. The opposite end of the link 30 is provided with a stud 33 adjustably positioned (as by a forked slide 330 such as is more fully described in the Avis Patent No. 2,158,171, above referred to) in an arcuate slot 34 in one arm of a lever 35 secured to an upright shaft 36 suitably journalled in the frame. Adjustment of the stud 33 in the slot 34 determines the amplitude of the lateral movements or oscillations of the needle in accordance with the spacing of the holes *a* and *b* or *c* and *d*. At its opposite end the lever 35 carries a pair of pins 36 and 37 adapted respectively for alternative engagement with cam grooves 38 and 39 in the upper face of a main cam 40 fast on the vertical cam shaft 41. When either of the pins 36 or 37 is received in its groove 38 or 39, rotation of the cam 40 will cause the lever 35 to swing about the axis of the shaft 36 and this movement will be transmitted from said lever to the carrier 25 through the link 30.

The grooves 38 and 39 are so formed that one of them is adapted to provide for a greater number of lateral oscillations of the needle, during each complete rotation of the cam 40, than the other, so that engagement of the pin 36 with the groove 38 will provide for a different number of oscillations and, consequently, a different number of stitches, than will engagement of the pin 37 with the groove 39. In either case, however, the shape of the grooves is such that each complete rotation of the cam will produce one, and only one, group of stitches. Manually operated means (not shown) are provided for the selective use of either pin in its cooperating groove. The main cam 40 is also provided with cam grooves 42 and 43 which, through suitable linkage (not shown), control the operation of the loopers 22 so that they operate in timed relation with the needle 20 both with respect to stitch-forming and with respect to lateral movements during a sewing operation.

All of the aforesaid mechanism for operating the sewing instrumentalities, for giving said needle bar its lateral movement, and for controlling the loopers are, or may be, substantially like the mechanism described in said Avis and Reece patents.

In the construction herein shown, the rear end of the carrier 25 is provided with a transverse slot 50 in which is slidably mounted a block 51. A link 52 carries a pin 53 which projects downwardly and is rotatably received in an opening in said block 51 and also projects upwardly into rotatable engagement with an arm 54 on a vertical rock shaft 55 journalled in suitable bearings on the interior of the main casing, said connection serving to retain the pin 53 in the block 51. This construction permits the carrier 25 to be swung laterally by the link 30 as above described independently of the link 52 and pin 53. At its rear end, the link 52 carries a pin 56 which projects downwardly into rotatable engagement with a block 57 adjustably secured in a groove 58 in a curved arm 59 secured by a tapered key 95 to a second vertical rock shaft 60 mounted in suitable bearings on the inner side of the machine frame.

The link 52 is also formed with a groove 61 adapted to receive a block 62 pivotally connected by a pin 63 to an arm 64 of a yoke 65 operatively connected to manually operable adjusting means generally indicated at 66. The length of the groove 58 is such as to permit adjustment of the link 52 by said means 66 into a position coaxial with the shaft 60, in which case there will be no longitudinal movement of the carrier 25. This adjustment of the machine is used when attaching a two-hole button, no movement of the needle bar fore-and-aft of the machine being then required. Other adjusted positions intermediate the two ends of said groove 58 determine the extent of longitudinal movement of the carrier member 25 and the needle bar 21, an appropriate setting being chosen in accordance with the distance between the paired holes *a*, *b* and the paired holes *c*, *d* of a four hole button.

The mechanism above described is somewhat similar to that shown in said Avis and Reece patents, but is better adapted to prevent unequal wear of the engaging surfaces of the moving parts. Also, as shown in said prior patents, means (not shown herein but operated from the

rock shaft 55) may be provided for moving the loopers 22 longitudinally of the machine when the carrier 25 is so moved in order to preserve the cooperative relationship of said loopers with the needle.

In accordance with the present invention, the lower end of the rock shaft 60 has secured thereto, as by a tapered key or tightening bolt 70, an arm 71 of a cam follower mechanism or means 72 held adjacent the under surface of the cam 40. The arm 71 carries two pins 73 and 74 slidably mounted therein for vertical movement. The pins 73 and 74 are formed with rack portions 75 and 76, respectively (see Fig. 9), which are interconnected by a pinion 77 in such manner that the pin 73 is in its extended or uppermost position when the pin 74 is in its retracted or lowermost position, and vice versa. When the pin 73 is in its extended position, it is received in a cam groove 78 formed in the under surface of the cam 40, and when the pin 73 is retracted, the pin 74 is extended into a second cam groove 79 also formed in the under surface of the cam 40. Thus, one or the other of said pins 73 or 74 may be extended into its proper cam groove, but both pins cannot engage their respective cam grooves at the same time. Also, retraction of one pin from its cam groove will cause extension of the other pin into the other cam groove.

Fixed to the bottom surface of the cam 40 (see particularly Figs. 1, 5 and 11) is a cam insert 80 secured to the cam 40 as by screws 81 and having an inclined surface 82 adapted to cause the retraction of pin 73. A second cam insert 83 secured to the under surface of said cam 40 as by screws 84 is provided with an inclined surface 85 adapted to retract pin 74.

The cam groove 78 (see particularly Fig. 5) comprises an inclined or offset portion *a* communicating at its opposite ends with outer and inner concentric portions *b* and *f* which are connected (preferably substantially diametrically opposite the inclined portion *a*) by a widened portion *g*. Similarly, the cam groove 79 comprises an inclined or offset portion *d* communicating at its opposite ends with outer and inner concentric portions *c* and *e* connected by a widened portion *h*. The portions *a* and *d*, which are oppositely inclined, are disposed radially opposite one another as are the widened portions *g* and *h*. The inserts 80 and 83 are located at the widened portions *g* and *h*, being attached to the cam 40 at the bottoms of the respective grooves, and the inclined surfaces 82 and 85 being in circumferential alignment with the groove portions *b* and *e*, respectively, and rising from the bottoms of the grooves to approximately the face of the cam.

A pin 90 extends from the surface of the main cam 40, between the inserts 80 and 83, into the path of the cam follower arm 71 and is adapted to be received in either of two grooves 91 or 92 formed in the top surface of said arm according to the position of the latter. This pin and groove connection serves to control the lateral position of the arm 71 when the pins 73 and 74 are opposite the widened groove portions *g* and *h* and when said pins are being shifted into and out of their respective grooves by the cam inserts 80 and 83, as hereinafter explained.

The main cam 40 makes one complete rotation for each group of stitches s' or s^2 (Fig. 2) the number of stitches formed in a group depending on whether the groove 38 or the groove 39 (Fig. 3) is selected prior to operation of the machine. At the beginning of the sewing operation, the pin 73 is engaged with the inclined portion *a* of its cam groove 78, as shown in Fig. 4, and the needle 20 occupies the intermediate position shown in Fig. 1. As the cam 40 starts to rotate in the direction of the arrows on Figs. 4 and 5, the pin 73 moves into the outer concentric portion *b* of the groove 78, so that the cam follower 72 is shifted outwardly toward the edge of the cam 40. This movement is transmitted through the arm 71, shaft 60, arm 59 and link 52 to the rear end of the carrier 25, moving it longitudinally in a forward direction to swing the needle into the position indicated by *x* in Fig. 1. The pin 73 then follows the concentric portion *b* of groove 78 until it reaches the widened portion *g* and is acted upon by the inclined surface 82 of the cam insert 80. The inclined surface 82 causes the retraction of the pin 73, which acts, through the pinion 77, to extend the pin 74 into its cam groove 79. At this time, the pin 90 is in engagement with the groove 91 in the cam follower arm 71 and holds said arm against lateral displacement. Continued rotation of the cam 40 causes pin 74 to follow the outer concentric portion *c* of cam groove 79 until it reaches the inclined portion *d* thereof. By this time the cam 40 has made one complete rotation, and one group of stitches s' has been completed. The inclined portion *d* of cam groove 79 then causes the cam follower 72 to swing inwardly toward the center of the cam 40. This movement is transmitted through the linkage above described to move the carrier 25 longitudinally in backward direction, thus swinging the needle into the position indicated at *y* in Fig. 1. The pin 74 then follows the inner concentric portion *e* of cam groove 79 until it reaches the widened portion *h* and is acted upon by the inclined surface 85 of the cam insert 83, whereupon pin 74 is retracted and pin 73 is extended to follow cam groove 78. At this time the lateral position of the cam follower is controlled by engagement of the pin 90 with the groove 92 in the arm 71. As the cam 40 continues to rotate, pin 73 follows the inner concentric portion *f* of groove 78 until it comes again to the inclined portion *a* of said groove. By this time the cam 40 has made a second complete rotation and a second group of stitches $s2$ has been completed. This ends one complete operative cycle of the machine, and further movement of the cam 40 during the next sewing operation causes a repetition of the movements above described.

The automatic shifting of the cam follower from one group to the other makes it possible for one group of stitches to be formed during one revolution of the main cam, and also makes it possible to use a relatively small main cam and so have a lighter and more compact machine.

When either of the pins 73 or 74 is retracted, as above described, by engagement with the incline 82 or 85, it is held retracted throughout a substantially complete rotation of the cam 40 by engagement of its end with the face of the cam, except for the very brief intervals when the inclined portions *a* and *d* of the cam grooves 78 and 79 are crossed, during which very brief intervals the inertia and friction of the parts, particularly that of the rack and pinion gearing 75, 76, 77, is sufficient to prevent accidental displacement in view of the total absence of any force or influence tending to cause such displacement. If desired, any well known mechanical expedient (such as positioning plungers or friction springs or washers) may be used to increase resistance to dis-

placement, but this, in practice, has been found unnecessary.

I claim:

1. In an article attaching machine, stitch-forming mechanism including a reciprocating needle, work-holding means, means including a cam for relatively moving said needle and work-holding means between successive work penetratting strokes of said needle to form a single group of attaching stitches during each complete rotation of said cam, and means including cam elements rotating in unison with and at the same speed as said cam for relatively moving said needle and work-holding means transversely of said first named movement alternately in opposite directions upon successive rotations of said cam.

2. In an article attaching machine, stitch-forming mechanism including a reciprocating needle, work-holding means, means including a cam for relatively moving said needle and work-holding means between successive work penetrating strokes of said needle to form attaching stitches, and means for relatively moving said needle and work-holding means transversely of said first named movement, said last named means including a pair of cam elements formed to produce movements in opposite directions respectively, cam follower means, and means for automatically placing said cam follower means under the alternate control of said cam elements respectively upon successive rotations of said cam.

3. In an article attaching machine, stitch-forming mechanism including a reciprocating needle, work-holding means, means including a cam for relatively moving said needle and work-holding means between successive work penetrating strokes of said needle to form attaching stitches, and means for relatively moving said needle and work-holding means transversely of said first named movement, said last named means including a pair of cam elements constituting substantially unitary portions of said cam and formed to produce movements in opposite directions respectively, cam follower means, and means for automatically placing said cam follower means under the alternate control of said cam elements respectively upon successive rotations of said cam.

4. In an article attaching machine, stitch-forming mechanism including a reciprocating needle, work-holding means, means including a cam for relatively moving said needle and work-holding means between successive work penetrating strokes of said needle to form attaching stitches, and means for relatively moving said needle and work-holding means transversely of said first named movement, said last named means including a pair of cam elements constituting substantially unitary portions of said cam and formed to produce movements in opposite directions respectively, cam follower means, and means for automatically placing said cam follower means under the alternate control of said cam elements respectively upon successive rotations of said cam, said cam having additional means for controlling said cam follower means during the automatic change of control from one cam element to the other.

5. In an article attaching machine, stitch-forming mechanism including a reciprocating needle, working-holding means, means including a cam for relatively moving said needle and work-holding means between successive work penetrating strokes of said needle to form attaching stitches, and means for relatively moving said needle and work-holding means transversely of said first named movement, said last named means including a pair of cam elements constituting substantially unitary portions of said cam and formed to produce movements in opposite directions respectively, cam follower means, and means for automatically placing said cam follower means under the alternate control of said cam elements respectively upon successive rotations of said cam, said cam follower means and cam having interengaging portions for controlling said cam follower means during the automatic change of control from one cam element to the other.

6. In a sewing machine for attaching buttons and the like, stitch-forming instrumentalities including a reciprocating needle, work holding means, means for relatively moving said needle and work-holding means between successive work penetrating strokes of said needle, and means for relatively moving said needle and work holding means transversely of said first named movement and comprising a cam having a pair of cam grooves, cam follower means alternatively engageable with the several cam grooves, and means for automatically and alternately engaging said cam follower means with said cam grooves respectively.

7. In a sewing machine for attaching buttons and the like, stitch-forming instrumentalities including a reciprocating needle, means for moving said needle transversely to its direction of reciprocation between successive strokes thereof a cam having a pair of cam grooves, cam follower means alternatively engageable with the several cam grooves, means for automatically and alternately engaging said cam follower means with said cam grooves respectively, and connecting means linking said cam follower means and said needle to transmit to said needle the movements of said cam follower means as it follows a cam groove and thereby move said needle transversely to said first named movement.

8. In a sewing machine for attaching buttons and the like, stitch-forming instrumentalities including a reciprocating needle, work-holding means and automatic means for relatively moving said needle and work-holding means transversely to the direction of reciprocation of the needle and comprising a single rotary controlling element and connections, said automatic means being operative during one rotation of said controlling element to relatively oscillate said needle and work-holding means in one plane to form one group of stitches and during a second rotation to relatively oscillate said needle and work-holding means in a second plane to form a second group of stitches.

9. In a sewing machine for attaching buttons and the like, stitch-forming instrumentalities including a reciprocating needle, and means, comprising; a single rotary controlling element and connections, for moving said needle transversely to its direction of reciprocation and operative during one rotation of said controlling element to automatically oscillate said needle in one plane to form one group of stitches and during a second rotation to automatically oscillate said needle in a second plane to form a second group of stitches.

10. In a sewing machine for attaching buttons and the like, said machine having work-holding means and stitch-forming instrumentalities which include a reciprocating needle, in combination, means including a cam for relatively oscillating

said needle and work-holding means, said cam having a pair of cam grooves adapted to regulate the relative shifting of said needle and work-holding means from one plane of oscillation to another, cam follower means adapted to follow one of said grooves during one period of rotation of the cam and to follow the other of said grooves during another period of rotation of said cam, and means associated with said cam for automatically causing said cam follower means to shift from one of said grooves to the other.

11. In a sewing machine for attaching buttons and the like, work-holding means, stitch-forming instrumentalities which include a reciprocating needle, and means for relatively shifting said work-holding means and the plane of reciprocation of said needle including a cam having a pair of cam grooves, and a cam follower having two pins interconnected for alternative engagement with said grooves respectively, said grooves having associated therewith inclined surfaces adapted to retract said pins from their respective grooves alternately.

12. In a sewing machine for attaching buttons and the like, stitch-forming instrumentalities including a reciprocating needle, and means for moving said needle from one stitch-forming plane to another comprising a cam having a pair of cam grooves, a cam follower having one pin engageable with one of said grooves and a second pin engageable with the other of said grooves, elements associated with said grooves having inclined surfaces adapted to retract said pins out of engagement with its corresponding groove, pinion and rack mechanism for extending one of said pins from said cam follower as the other pin is retracted on contact with an inclined surface, and linkage connecting said cam follower to said needle whereby a movement of said cam follower in response to the course taken by either pin in its corresponding groove results in a shifting of said needle from one operative plane to another.

13. In a sewing machine for attaching buttons and the like, stitch-forming instrumentalities including a reciprocating needle, work-holding means and means for relatively moving said needle and work-holding means back and forth between two stitch-forming planes, said last named means including a cam having a pair of cam grooves, each of said grooves comprising inner and outer concentric portions connected at one end by an inclined portion and at the other by a widened portion, a cam follower having two pins engageable with said grooves respectively, means interconnecting said pins for causing each pin to be engaged with its groove when the other is disengaged, and means located substantially at the widened portion of each groove for disengaging the corresponding pin from said groove.

14. In a sewing machine for attaching buttons and the like, stitch-forming instrumentalities including a reciprocating needle, work-holding means and means for relatively moving said needle and work-holding means back and forth between two stitch-forming planes, said last named means including a cam having a pair of cam grooves, each of said grooves comprising inner and outer concentric portions connected at one end by an inclined portion and at the other by a widened portion, a cam follower having two pins engageable with said grooves respectively, means interconnecting said pins for causing each pin to be engaged with its groove when the other is disengaged, and means comprising an element having an inclined surface located substantially at the widened portion of each groove for disengaging the corresponding pin from said groove.

15. In a sewing machine for attaching buttons and the like, stitch-forming instrumentalities including a reciprocating needle, work-holding means and means for relatively moving said needle and work-holding means back and forth between two stitch-forming planes, said last named means including a cam having a pair of cam grooves, each of said grooves comprising inner and outer concentric portions connected at one end by an inclined portion and at the other by a widened portion, a cam follower having two pins engageable with said grooves respectively, means interconnecting said pins for causing each pin to be engaged with its groove when the other is disengaged, and means located substantially at the widened portion of each groove for disengaging the corresponding pin from said groove, said cam and cam follower having additional interengaging means for controlling said cam follower when said pins are at the widened portions of said grooves.

16. In a sewing machine for attaching buttons and the like, stitch-forming instrumentalities including a reciprocating needle, work-holding means and means for relatively moving said needle and work-holding means back and forth between two stitch-forming planes, said last named means including a cam having a pair of cam grooves, each of said grooves comprising inner and outer concentric portions connected at one end by an inclined portion and at the other by a widened portion, a cam follower having two pins engageable with said grooves respectively, means interconnecting said pins for causing each pin to be engaged with its groove when the other is disengaged, and means located substantially at the widened portion of each groove for disengaging the corresponding pin from said groove, said cam having a projecting pin and said cam follower having a pair of grooves alternatively engaged by said pin when said cam follower pins are at the widened portions of said cam grooves.

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