March 13, 1951 J. N. GILBREATH 2,544,829

TWO-STEP TUCKING DEVICE FOR KNITTING MACHINES

Filed Feb. 8, 1949 4 Sheets-Sheet 1

Fig. 11.

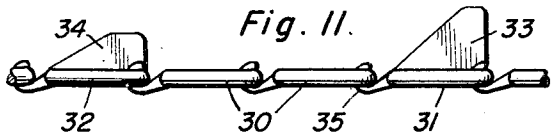


Fig. 12.

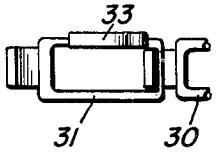


Fig. 1.

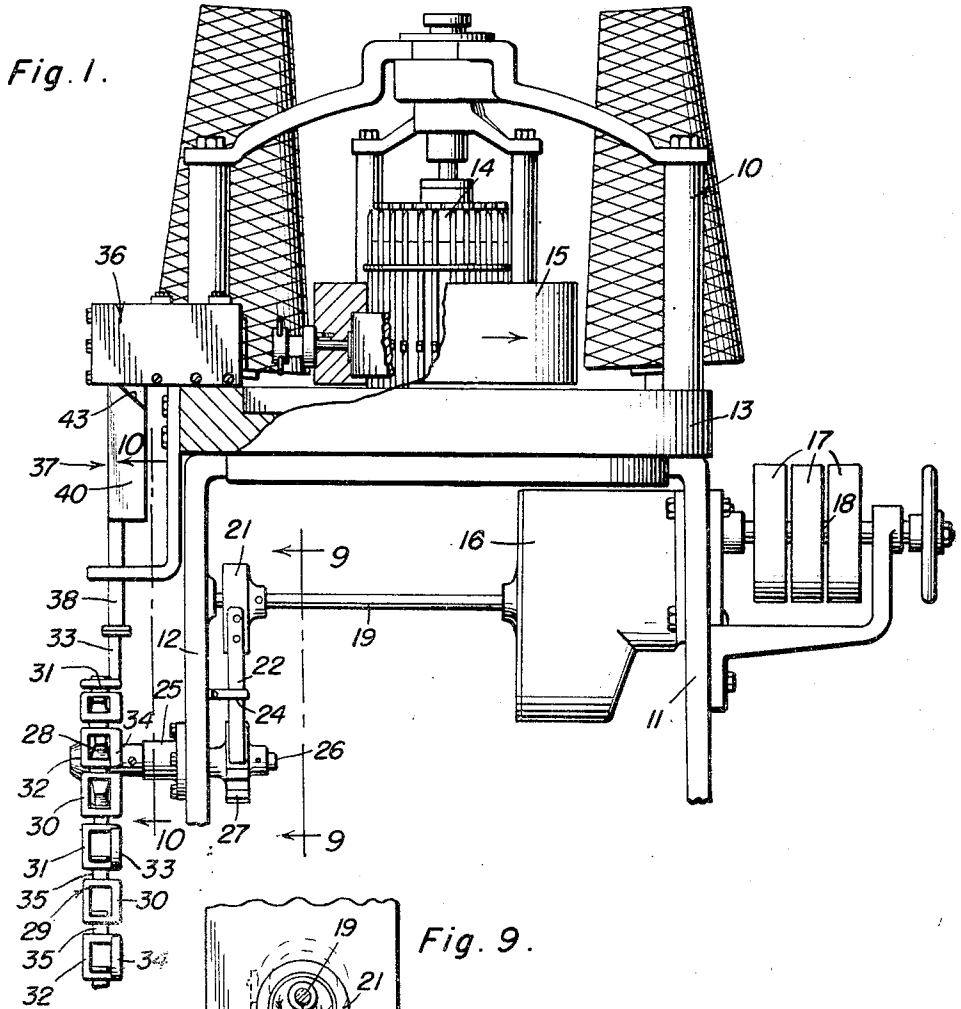
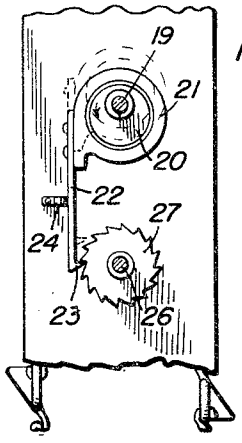


Fig. 9.



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TWO-STEP TUCKING DEVICE FOR KNITTING MACHINES

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Fig. 2.

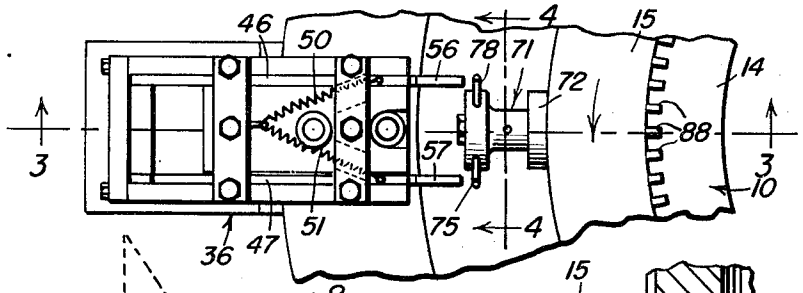


Fig. 3.

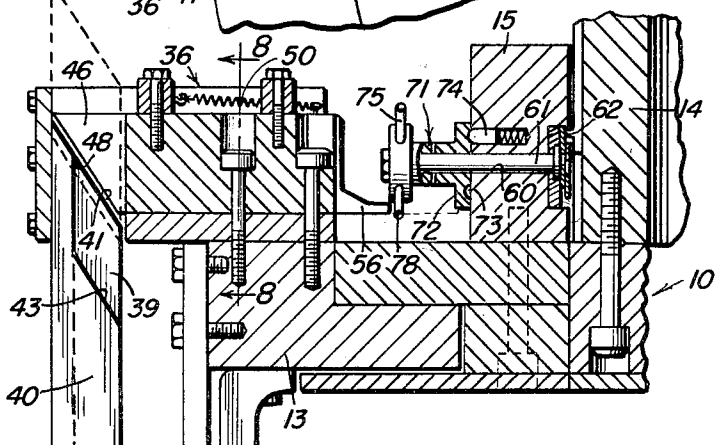


Fig. 4

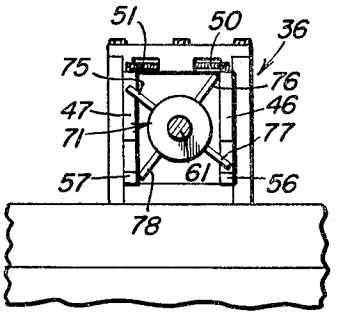
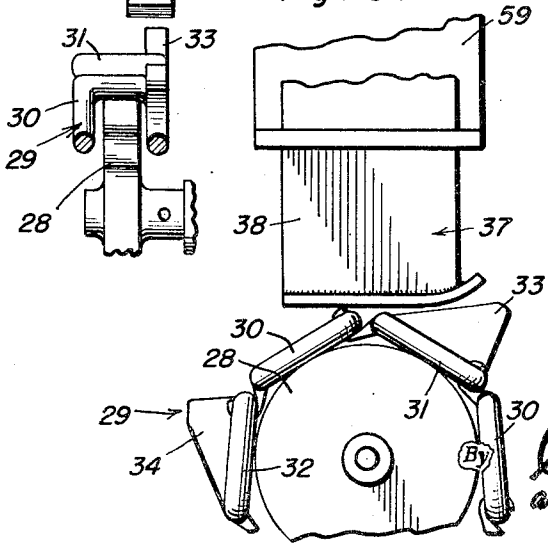


Fig. 10.



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TWO-STEP TUCKING DEVICE FOR KNITTING MACHINES

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Fig. 5.

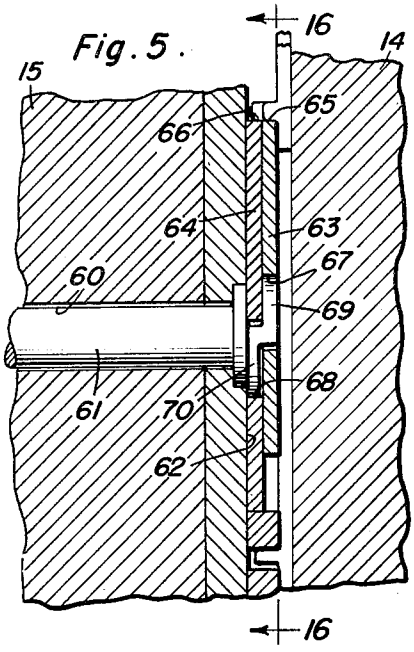


Fig. 6.

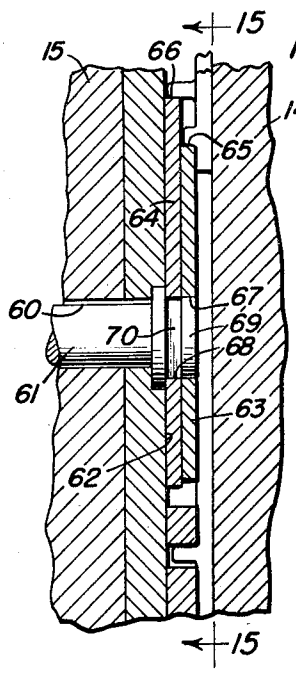


Fig. 7.

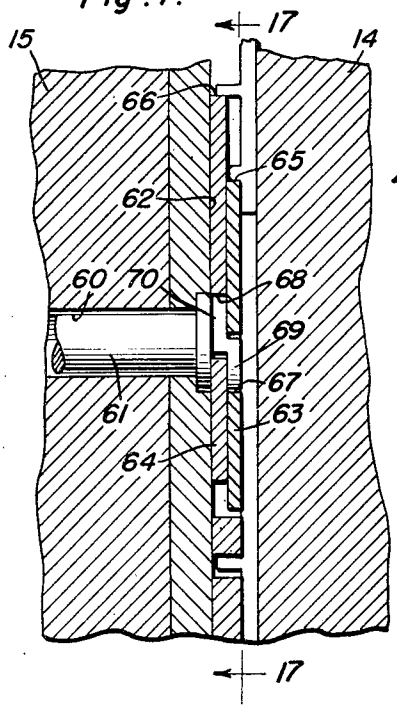


Fig. 8.

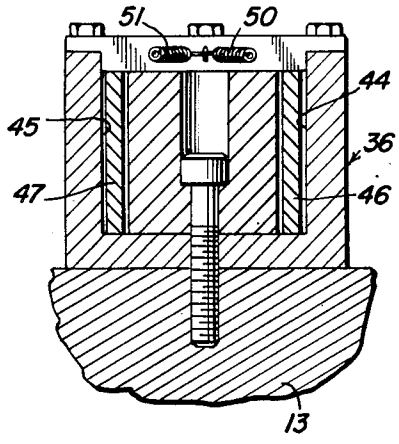
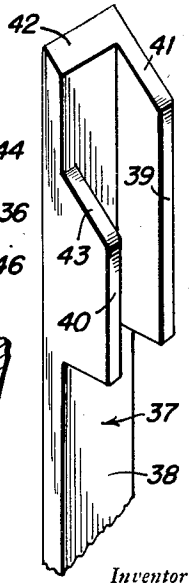


Fig. 20.



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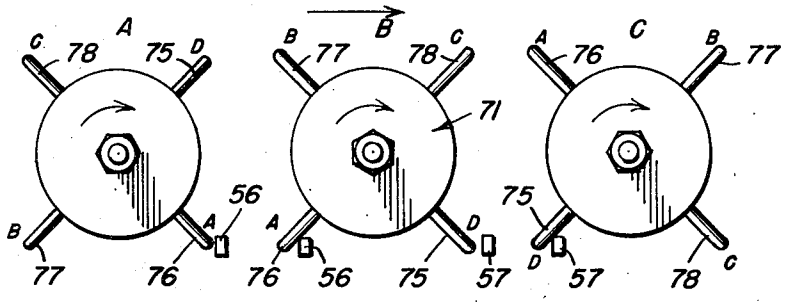
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March 13, 1951 J. N. GILBREATH 2,544,829

TWO-STEP TUCKING DEVICE FOR KNITTING MACHINES

Filed Feb. 8, 1949 4 Sheets-Sheet 4

Fig. 19.



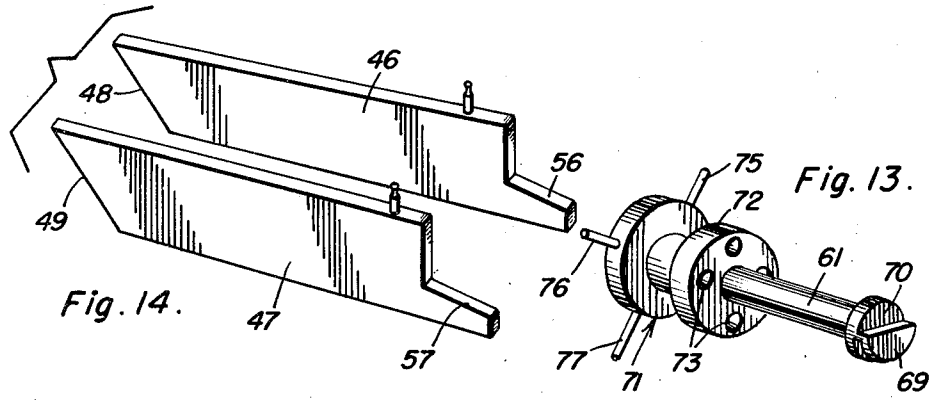


Fig. 14.

Fig. 13.

Fig. 15.

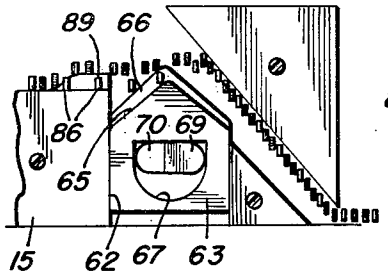


Fig. 18.

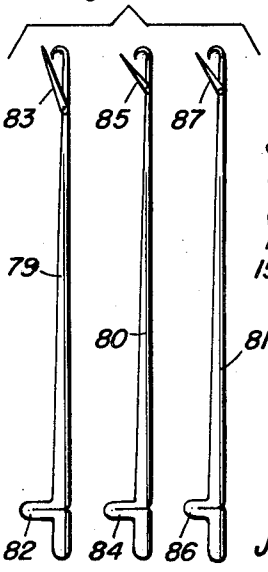


Fig. 16.

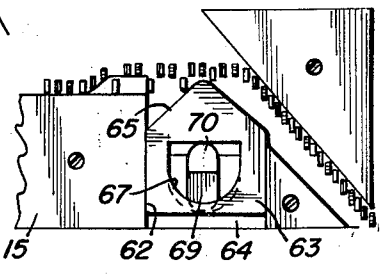
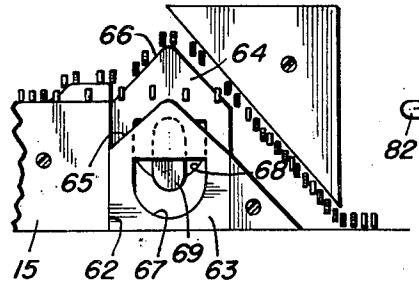


Fig. 17.



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Patented Mar. 13, 1951 2,544,829

UNITED STATES PATENT OFFICE

2,544,829

TWO-STEP TUCKING DEVICE FOR KNITTING MACHINES

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Application February 8, 1949, Serial No. 75,114

14 Claims. (Cl. 66—44)

1

This invention relates to a two-step tucking device for a knitting machine and has for its primary object to control the knitting needles so that one group of needles may be made to hold loops or stitches while two other groups of needles are knitting in a conventional manner.

Another object is automatically to select the group of needles to be used for tucking so that different patterns may be produced in the knitted goods.

A further object is to enable the patterns automatically produced to be varied according to the desires of the user.

The above and other objects may be attained by employing this invention which embodies among its features a needle bank containing a group of short latch long butt needles, a group of long latch long butt needles, and a group of short butt short latch needles, means selectively to throw out of operation the group of long latch long butt needles, or the group of short butt short latch needles, and means to select the group of needles to be thrown out of operation, said last named means being connected to the machine drive, automatically to regulate the tucking operation.

Other features include a cam member mounted adjacent the needle bank to move transversely of the needles, said cam member having a cam groove therein for receiving needle butts and actuating said needles as the cam member moves, means for moving said cam member, a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, and means carried by the cam member and engaging said cam plates to move said cam plates and project or retract the cam faces thereof into and out of the cam groove.

Still other features include means carried by the machine and connected with the cam member moving means periodically to advance the last-named means into the path of movement of the cam plate moving means to alter the positions of the cam plates in timed relation with the operation of the knitting machine.

Still further features include a timing chain operating in unison with the drive of the knitting machine, lugs on the chain, and means actuated by a lug as the latter is moved by the chain, and connected to the cam plates for altering the position of the latter in timed relation with the operation of the machine.

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In the drawings:

Figure 1 is a fragmentary side view of a conventional knitting machine showing portions thereof broken away to illustrate this attachment in use thereon;

Figure 2 is a fragmentary top plan view on a somewhat enlarged scale of a portion of the knitting machine showing this attachment in place thereon;

Figure 3 is an enlarged fragmentary sectional view taken substantially along the line 3—3 of Figure 2;

Figure 4 is a fragmentary enlarged sectional view taken substantially along the line 4—4 of Figure 2;

Figure 5 is a vertical sectional view on an enlarged scale of a fragment of the needle bank and the needle actuating cam showing this improved attachment thereon in needle moving position;

Figure 6 is a view similar to Figure 5 illustrating the needles in another position;

Figure 7 is a view similar to Figures 5 and 6 showing the needles in still a different position;

Figure 8 is an enlarged fragmentary sectional view taken substantially along the line 8—8 of Figure 3;

Figure 9 is a fragmentary sectional view taken substantially along the line 9—9 of Figure 1;

Figure 10 is a fragmentary enlarged sectional view taken substantially along the line 10—10 of Figure 1;

Figure 11 is a fragmentary side view of the pattern control chain;

Figure 12 is a plan view of one of the chain links illustrated in Figure 11;

Figure 13 is a perspective view of the cam plate actuating element;

Figure 14 is a perspective view of the fingers employed for rotating the cam plate operating means;

Figure 15 is a fragmentary sectional view taken substantially along the line 15—15 of Figure 6 showing the positions of the cam plates while the machine is knitting in a conventional manner;

Figure 16 is a view similar to Figure 15 and taken substantially along the line 16—16 of Figure 5;

Figure 17 is a view similar to Figures 5 and 6 taken substantially along the line 17—17 of Figure 7;

Figure 18 is a view illustrating the long butt long latch needle, the long butt short latch needle, and the short butt short latch needle of

the type making up the groups of needles employed in carrying this invention into practice, and

Figure 19 is a diagrammatic view illustrating the various positions taken by the cam plate actuating member.

Figure 20 is a perspective view of the vertical slide member which is actuated by the chain-carried cams.

Referring to the drawings in detail, a conventional circular knitting machine to which this invention may be applied is designated generally 10 and comprises a supporting frame having legs 11 and 12 on which is supported a conventional knitting table 13 carrying a conventional needle bank 14 which, in the present instance, embodies a cylinder having conventional longitudinally extending needle guiding grooves therein. The machine is also equipped with a conventional revolving cam 15 which revolves about the cylinder 14 near the lower end thereof, and is driven in a conventional manner through the medium of a conventional speed reduction gearing 16 to which a suitable source of power, such as drive pulleys 17 are coupled in a conventional manner for driving the drive shaft 18 thereof. In addition to the conventional drive mechanism for the cam member 15, the speed reduction gear train is equipped with a power transmitting shaft 19 carrying adjacent one end an eccentric 20 which is equipped with a conventional eccentric strap 21 to which is connected a downwardly extending spring arm 22 carrying adjacent its lower end an outwardly extending ratchet dog 23, the purpose of which will be more fully hereinafter described. A suitable spring arm 24 is carried by the leg 12 and bears against the ratchet dog as will be readily understood upon reference to Figure 9.

Mounted for rotation in a suitable bearing 25 carried by the leg 12 is a horizontal shaft 26 carrying adjacent one end a toothed ratchet wheel 27 which operates through an arc which aligns with the arm 22 so that as the eccentric 20 rotates, the ratchet dog 23 will engage the teeth of the ratchet wheel 27 to rotate the shaft 26 in one direction. A suitable sprocket 28 is carried by the shaft 26, and trained over said sprocket is a timing chain designated generally 29 which is composed of individual links 30, 31 and 32. The links 30 carry no lugs, but the links 31 are equipped with outwardly extending cams or cam lugs 33 while the links 32 are equipped with outwardly extending cams or cam lugs 34. The lugs 34 are substantially one-half of the height of the lugs 33, and each link is provided with an attaching hook 35 which detachably connects it to the next adjacent link. It will thus be seen that any desired arrangement of high lugs and low lugs, as well as links without lugs, may be constructed merely by unhooking a link from its next adjacent link and substituting another therefor. In this way the pattern chain may be altered to produce the desired pattern in the product of the machine.

Mounted on the table 13 is a slide box designated generally 36, one end of which extends beyond the edge of the table, and has slidably mounted therein a vertical slide member designated generally 37 which comprises a slide plate 38 having adjacent opposite marginal edges longitudinally extending spaced parallel flanges 39 and 40. The flange 39 is provided at one end with an inclined face 41 which merges into an inclined face 42 formed on the adjacent end of the plate 38, and formed on the end of the flange 40 which lies nearest to the inclined face 42 is an inclined face 43. The lower end of the plate 38 lies in the path of movement of the cams 33 and 34, so that as the chain 29 is moved, the slide member 37 will be alternately raised and lowered, and the length of its stroke will be governed by the cams 33 and 34. Mounted for horizontal sliding movement in slots 44 and 45 of the slide box 36 are horizontal slides 46 and 47, respectively, carrying at their rear ends inclined faces 48 and 49, respectively, which are engaged by the inclined faces 41 and 43, respectively, when the slide members are to be projected. A retractile coil spring 50 is connected at one end to the slide box 36, and at its opposite end to the slide 46 while a similar coil spring 51 is connected to the box 36 and to the slide 47. These springs 50 and 51 yieldingly hold the slide members 46 and 47 retracted as will be readily understood upon reference to Figure 2. A finger 56 projects longitudinally from the end of the slide member 46 remote from the inclined face 48, and a similar finger 57 projects longitudinally from the end of the slide member 47 remote from the inclined face 49 thereof. These fingers 56 and 57 extend in the direction of the needle bank 14, and are projected against the effort of the springs 50 and 51 by the engagement of the bevel faces 41 and 43 of the vertical slide member 37. The plate 38 is mounted adjacent its lower end to slide through an opening 58 in a suitable guide bracket 59 carried by the table 13.

Formed in the cam member 15 and extending transversely therethrough perpendicular to the path of movement of the needles is an opening 60 in which a shaft 61 is mounted to rotate. The cam member 15 is also provided with a conventional cam groove in which the needle butts are received, and opening into the cam groove adjacent the needle bank 14 is a recess 62 in which a pair of relatively thin superposed plates 63 and 64 are mounted to slide. These cam plates are provided respectively at their upper edges with cam faces 65 and 66 which are adapted to be projected upwardly into the cam groove to alter the positions of the needles as the cam member moves relative to the needle bank 14. The plates 63 and 64 are provided with openings 67 and 68, respectively, for the reception of cams 69 and 70 which are carried by the end of the shaft 61 nearest the needle bank. The cams 69 and 70 are of a thickness substantially equal to the thickness of the plates 63 and 64, and the openings 67, and 68 are of such a shape that as the cams are rotated about the axis of the shaft 61, the plates will be shifted vertically in the recess 62 into the various positions illustrated in Figures 15, 16 and 17. Carried on the shaft 61, and on the exterior of the cam member 15 is a shaft actuating member designated generally 71 which carries at one end a disk 72 which is provided in its face adjacent the cam member 15 with an annular row of recesses 73 for the reception of a spring-pressed pin 74 carried by the cam member which cooperates with the walls of the recesses 73 to offer resistance to rotation of the shaft 61. Extending radially from the member 71 at the end thereof remote from the flange 72 are arms 75, 76, 77 and 78 which move horizontally with the movement of the cam member 15.

Mounted in the needle bank for vertical sliding movement therein are separate groups of needles, one of which is composed of a number of long butt long latch needles 79, a second group

of needles composed of long butt short latch needles 80, and a third group of needles composed of short butt short latch needles 81.

As illustrated in Figure 18 each needle 79 is provided with a long butt 82 and a long latch 83, while each needle 80 is provided with a long butt 84 and a conventional short latch 85. The needles 81 are each provided with a short butt 86 and a conventional short latch 87, and the butts 82, 84 and 86 ride in the cam groove in the cam member 15 while the needles ride in conventional needle guiding grooves 88 formed in the needle bank 14. In addition to the cam plates 63 and 64 carried by the cam member 15, the cam member is provided in the cam groove with a long butt needle elevating cam 89 which is positioned adjacent the recess 62 in the cam member, and is of such a thickness that the short butt needles 81 will pass by this cam 89 without being elevated into an operative position. As the cam member 15 advances with the cams 69 and 70 in the position illustrated in Figure 15 the short butts 86 of the needles 81 escape the cam 89 but are engaged by the cam face 65 and are elevated as illustrated in Figure 15 so that all of the needles will be knitting in a conventional manner. When in this position it will be noted also that the butts 82 of the long latch needles 79 are engaged by the cam face 66 so as to cause the needles 79 to be elevated the proper distance to receive the stitch, so that all of the needles will be knitting. Upon shifting the cams 69 and 70 into the position illustrated in Figure 16, the butts 86 of the short butt needles 81 will be elevated into knitting position, but the butts 82 of the long latch needles 79 will not lift their respective needles beyond the point at which their respective latches 83 open, and consequently these needles will not perform the knitting operation and a tucking of the product will result. Upon turning the cams 69 and 70 into the position illustrated in Figure 17, the plate 64 is elevated while the plate 63 is lowered with the result that the cam face 65 lies below a level that will cause the short butt needles 81 to be elevated, while the long butt needles will be raised to a point where both groups thereof will perform the knitting operation. Inasmuch as when the parts are in the position illustrated in Figure 17, the short butt needles are not elevated into knitting position, it will be evident that a tucking of the product of the machine will result. From the foregoing it will be obvious that while the long butt short latch needles 80 will at all times be moved into knitting position, the long butt long latch needles 79, or the short butt short latch needles 81 may selectively be thrown out of knitting position so that a selection of tucks may be produced in the product of the machine.

In order automatically to govern the operation of the needles and throw one or the other group out of operation automatically, the chain 29 is equipped with links having lugs of the desired height or heights thereon so that as the chain is moved, a lug will engage the lower end of the slide member 38 to move said member upwardly and cause the cam face 41 to encounter the cam face 48 on the slide member 46 so as to project said slide member against the effort of the spring 50, and move the finger 56 thereof into the path of movement of one of the arms 75, 76, 77 or 78. With the finger 56 projected, it will be evident upon reference to Figure 19 that the arm 76 will be encountered by the finger 56 during its movement with the cam member 15, so that as the cam member moves in the direction of the arrow in Figure 19, the arm 76 will be moved into the position B of Figure 19, thus rotating the shaft 61 and altering the position of the cams 69 and 70. In event that the slide member 37 moves upwardly to cause the cam face 43 thereof to engage the cam face 49 of the slide member 47, it will be evident that the finger 57 will be projected as illustrated in position B of Figure 19 so that continued movement of the cam member 15 will bring the arm 76 into engagement with the finger 57, with the result that by the time the cam member moves to bring the parts in the position C of Figure 19, the cam shaft 61 will have made a one-half turn, thus completely reversing the position of the cam plates 63 and 64. Should it be desired to rotate the shaft only a quarter turn, a lower lug 34 is employed, so that only the finger 56 will be projected, and in this way automatic selection of the needle group to be employed may be achieved. Obviously, the engagement of the spring-pressed pin 74 in the recesses 73 will serve to prevent the shaft 61 from moving until positive rotating pressure is applied thereto, and hence accidental change of the position of the cams 69 and 70 may be prevented.

While in the foregoing there has been shown and described the preferred embodiment of this invention it is to be understood that minor changes in the details of construction, combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as claimed.

Having described the invention, what is claimed as new is:

1. In a knitting machine of the type having a needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move in spaced parallel paths, a cam member mounted adjacent the needle bank to move transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and actuating said needles as the cam moves, and means for moving said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the paths of movement of the cam plates, cams on the shaft engaging the cam plates to project or retract the cam faces thereof into and out of the cam groove and means on the shaft adjacent the cam member for rotating said shaft and moving the cam plates.

2. In a knitting machine of the type having a needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move in spaced parallel paths, a cam member mounted adjacent the needle bank to move transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and actuating said needles as the cam moves, and means for moving said cam member, means to produce tuck stitches in the product

of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the paths of movement of the cam plates, cams on the shaft engaging the cam plates to project or retract the cam faces thereof into and out of the cam grooves, means on the shaft adjacent the cam member for rotating said shaft and moving the cam plates, and means mounted on the machine adjacent the cam member for engaging the shaft rotating means and rotating the shaft as it moves with the cam member.

3. In a knitting machine of the type having a needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move in spaced parallel paths, a cam member mounted adjacent the needle bank to move transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and actuating said needles as the cam moves, and means for moving said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the paths of movement of the cam plates, cams on the shaft engaging the cam plates to project or retract the cam faces thereof into and out of the cam grooves, means on the shaft adjacent the cam member for rotating said shaft and moving the cam plates, means mounted on the machine adjacent the cam member for engaging the shaft rotating means and rotating the shaft as it moves with the cam member, yielding means carried by the machine to retract the last named means out of the path of movement of the shaft rotating means, and means carried by the machine adjacent the cam member and coupled to the cam member operating means periodically to advance the last-named means against the effort of the retracting means in timed relation to the movement of the cam member.

4. In a knitting machine of the type having a needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move in spaced parallel paths, a cam member mounted adjacent the needle bank to move transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and actuating said needles as the cam moves, and means for moving said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the paths of movement of the cam plates, cams on the shaft engaging the cam plates to project or retract the cam faces thereof into and out of the cam groove, means on the shaft adjacent the cam member for rotating said shaft and moving the cam plates, and stop fingers mounted on the machine adjacent the cam member for engaging the shaft rotating means and rotating the shaft as it moves with the cam member.

5. In a knitting machine of the type having a needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move in spaced parallel paths, a cam member mounted adjacent the needle bank to move transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and actuating said needles as the cam moves, and means for moving said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the paths of movement of the cam plates, cams on the shaft engaging the cam plates to project or retract the cam faces thereof into and out of the cam groove, means on the shaft adjacent the cam member for rotating said shaft and moving the cam plates, and stop fingers mounted on the machine for movement adjacent the cam member into and out of the path of movement of the shaft rotating means as the latter moves with the cam member for engaging said shaft rotating means and rotating the shaft to alter the positions of the cam plates.

6. In a knitting machine of the type having a needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move in spaced parallel paths, a cam member mounted adjacent the needle bank to move transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and actuating said needles as the cam moves, and means for moving said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the paths of movement of the cam plates, cams on the shaft engaging the cam plates to project or retract the cam faces thereof into and out of the cam groove, means on the shaft adjacent the cam member for rotating said shaft and moving the cam plates, stop fingers mounted on the machine for movement adjacent the cam member into and out of the path of movement of the shaft rotating means as the latter moves with the cam member for engaging said shaft rotating means and rotating the shaft to alter the positions of the cam plates, yielding means carried by the machine and connected to the stop

fingers to hold said fingers out of the path of movement of the shaft rotating means, and means carried by the machine and operated by the cam member moving means periodically to advance the yielding means into the path of movement of the shaft rotating means to rotate said shaft and alter the positions of the cam plates.

7. In a circular knitting machine of the type having a circular needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move longitudinally thereof in circumferentially spaced parallel paths, a circular cam member encircling said needle bank and movable in a circular path transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and moving said needles as the cam member revolves about the needle bank and means to revolve said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the direction of movement of the cam plates, cams on the shaft engaging the cam plates to alter the positions thereof when the shaft is rotated and means on the shaft adjacent the cam member to rotate the shaft.

8. In a circular knitting machine of the type having a circular needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move longitudinally thereof in circumferentially spaced parallel paths, a circular cam member encircling said needle bank and movable in a circular path transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and moving said needles as the cam member revolves about the needle bank and means to revolve said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the direction of movement of the cam plates, cams on the shaft engaging the cam plates to alter the positions thereof when the shaft is rotated, means on the shaft adjacent the cam member to rotate the shaft, and means mounted on the machine adjacent the cam member to engage the shaft rotating means and rotate the shaft as it revolves with the cam member to alter the positions of the cam plates.

9. In a circular knitting machine of the type having a circular needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move longitudinally thereof in circumferentially spaced parallel paths, a circular cam member encircling said needle bank and movable in a circular path transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and moving said needles as the cam member revolves about the needle bank and means to revolve said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the direction of movement of the cam plates, cams on the shaft engaging the cam plates to alter the positions thereof when the shaft is rotated, means on the shaft adjacent the cam member to rotate the shaft, means mounted on the machine adjacent the cam member to move into and out of the path of movement of the shaft rotating means to rotate said shaft rotating means and alter the positions of the cam plates.

10. In a circular knitting machine of the type having a circular needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move longitudinally thereof in circumferentially spaced parallel paths, a circular cam member encircling said needle bank and movable in a circular path transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and moving said needles as the cam member revolves about the needle bank and means to revolve said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the direction of movement of the cam plates, cams on the shaft engaging the cam plates to alter the positions thereof when the shaft is rotated, means on the shaft adjacent the cam member to rotate the shaft, means mounted on the machine adjacent the cam member to move into and out of the path of movement of the shaft rotating means to rotate said shaft rotating means and alter the positions of the cam plates, yielding means carried by the machine and connected to the last-named means to hold said means out of the path of movement of the shaft rotating means, and means carried by the machine and driven by the cam member revolving means periodically to move the said last-named means into the path of movement of the shaft rotating means as the later revolves with the cam member, thereby to alter the positions of the cam plates.

11. In a circular knitting machine of the type having a circular needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move longitudinally thereof in circumferentially spaced parallel paths, a circular cam member encircling said needle bank and movable in a circular path transversely of the needles, said cam member having a cam

groove therein for receiving the needle butts and moving said needles as the cam member revolves about the needle bank and means to revolve said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the direction of movement of the cam plates, cams on the shaft engaging the cam plates to alter the positions thereof when the shaft is rotated, means on the shaft adjacent the cam member to rotate the shaft, and stop fingers mounted on the machine adjacent the cam member for movement into and out of the path of movement of the shaft rotating means as the latter revolves with the cam member for engaging said shaft rotating means and rotating the shaft to alter the positions of the cam plates.

12. In a circular knitting machine of the type having a circular needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move longitudinally thereof in circumferentially spaced parallel paths, a circular cam member encircling said needle bank and movable in a circular path transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and moving said needles as the cam member revolves about the needle bank and means to revolve said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the direction of movement of the cam plates, cams on the shaft engaging the cam plates to alter the positions thereof when the shaft is rotated, means on the shaft adjacent the cam member to rotate the shaft, stop fingers mounted on the machine adjacent the cam member for movement into and out of the path of movement of the shaft rotating means as the latter revolves with the cam member for engaging said shaft rotating means and rotating the shaft to alter the positions of the cam plates, springs connected to the machine and to the stop fingers for holding said fingers out of the path of movement of the shaft rotating means and means carried by the machine and having driving connection with the cam member revolving means periodically to advance the fingers against the effort of the springs into the path of the shaft rotating means in timed relation to the revolutions of the cam member.

13. In a circular knitting machine of the type having a circular needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move longitudinally thereof in circumferentially spaced parallel paths, a circular cam member encircling said needle bank and movable in a circular path transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and moving said needles as the cam member revolves about the needle bank and means to revolve said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the direction of movement of the cam plates, cams on the shaft engaging the cam plates to alter the positions thereof when the shaft is rotated, means on the shaft adjacent the cam member to rotate the shaft, arms fixed to the shaft adjacent the cam member, said arms projecting radially from said shaft and moving in a circular path concentric with the cam member, stop fingers mounted on the machine adjacent the cam member to move radially with relation to said cam member into and out of the circular path of the arms as the latter revolve with the cam member, yielding means to hold the fingers out of the circular path, and a plunger carried by the machine adjacent the fingers for moving the fingers against the effort of the yielding means into the circular path to cause an arm moving with the cam member to rotate the shaft and alter the positions of the cam plates.

14. In a circular knitting machine of the type having a circular needle bank, short butt needles having regular latches, long butt needles having long latches and long butt needles having regular latches, all said needles being mounted in said needle bank to move longitudinally thereof in circumferentially spaced parallel paths, a circular cam member encircling said needle bank and movable in a circular path transversely of the needles, said cam member having a cam groove therein for receiving the needle butts and moving said needles as the cam member revolves about the needle bank and means to revolve said cam member, means to produce tuck stitches in the product of the machine while the product is in the process of manufacture, said means comprising a pair of superposed cam plates mounted in the cam member to move parallel to the needles, a cam face on one edge of each cam plate for projection into the cam groove and engagement with the needle butts, a shaft mounted in the cam member to rotate about an axis which lies perpendicular to the direction of movement of the cam plates, cams on the shaft engaging the cam plates to alter the positions thereof when the shaft is rotated, means on the shaft adjacent the cam member to rotate the shaft, arms fixed to the shaft adjacent the cam member, said arms projecting radially from said shaft and moving in a circular path concentric with the cam member, stop fingers mounted on the machine adjacent the cam ring to move radially with relation to said cam member into and out of the circular path of the arms as the latter revolve with the cam member, yielding means to hold the fingers out of the circular path, a plunger carried by the machine adjacent the fingers for moving the fingers against the effort of the yielding means into the circular path to cause an arm moving with the cam member to rotate the shaft and alter the positions of the cam plates, and means carried by the machine

adjacent the fingers and driven by the cam member revolving means for engaging the fingers and moving them into the circular path in timed relation to the operation of the machine.

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The following references are of record in the file of this patent:

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