July 7, 1953 M. ZIMIC ET AL 2,644,323

KNITTING MACHINE

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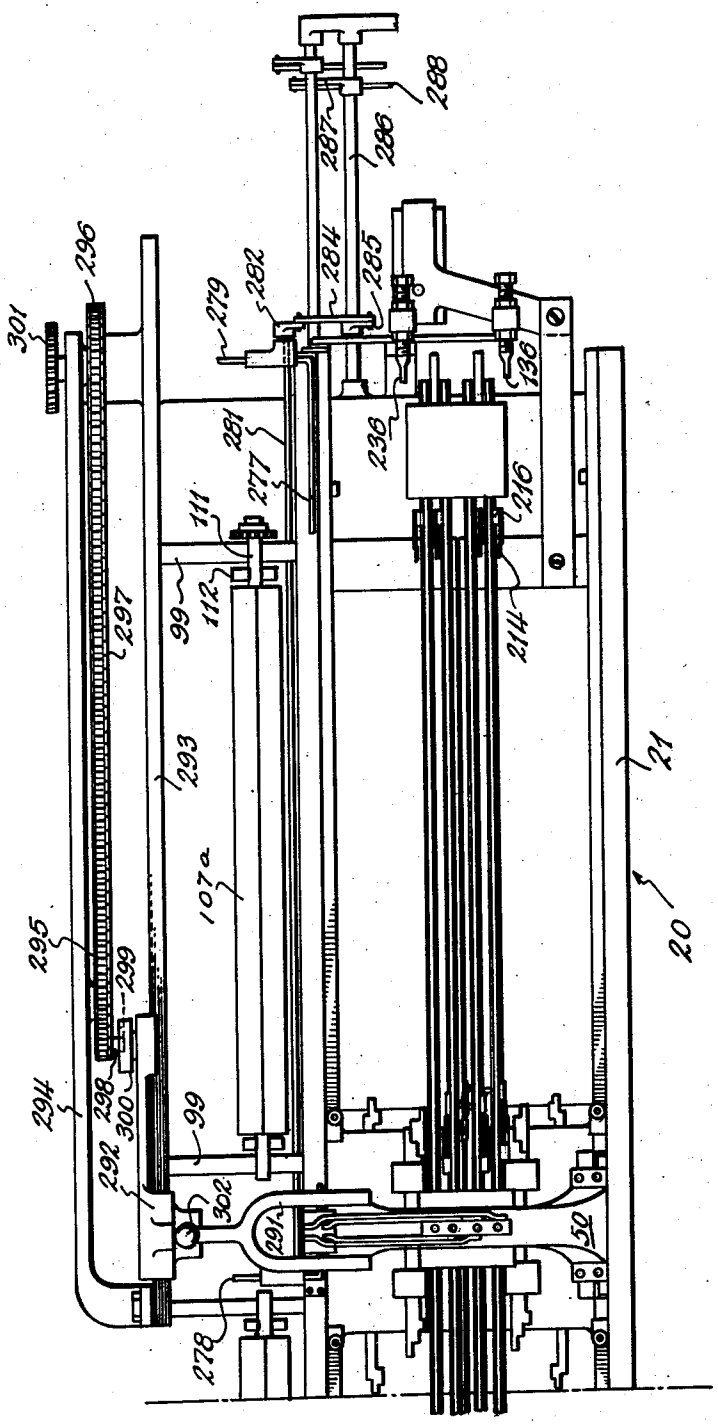


Fig. 1.

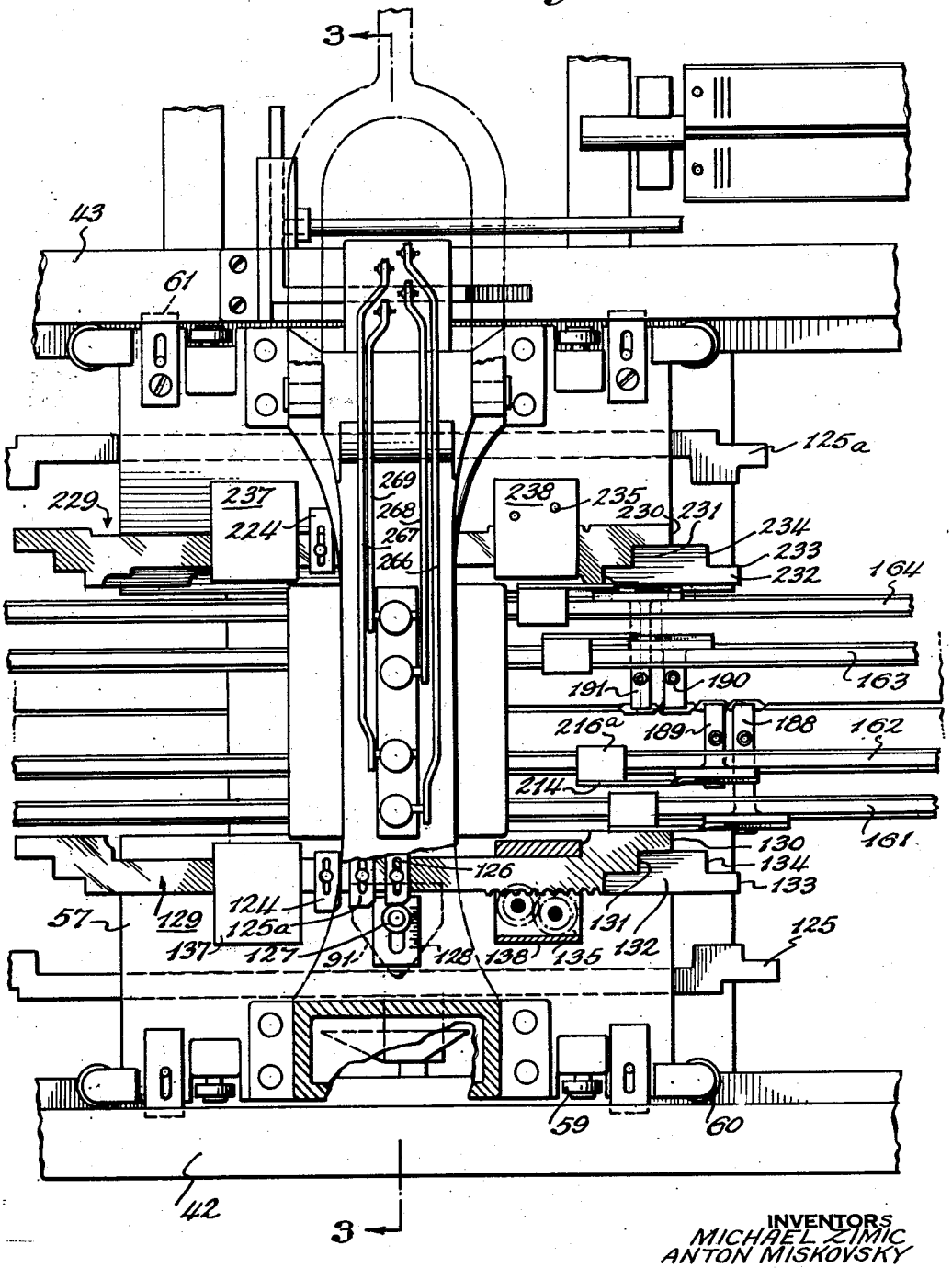
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July 7, 1953 M. ZIMIC ET AL 2,644,323

KNITTING MACHINE

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Fig. 2.



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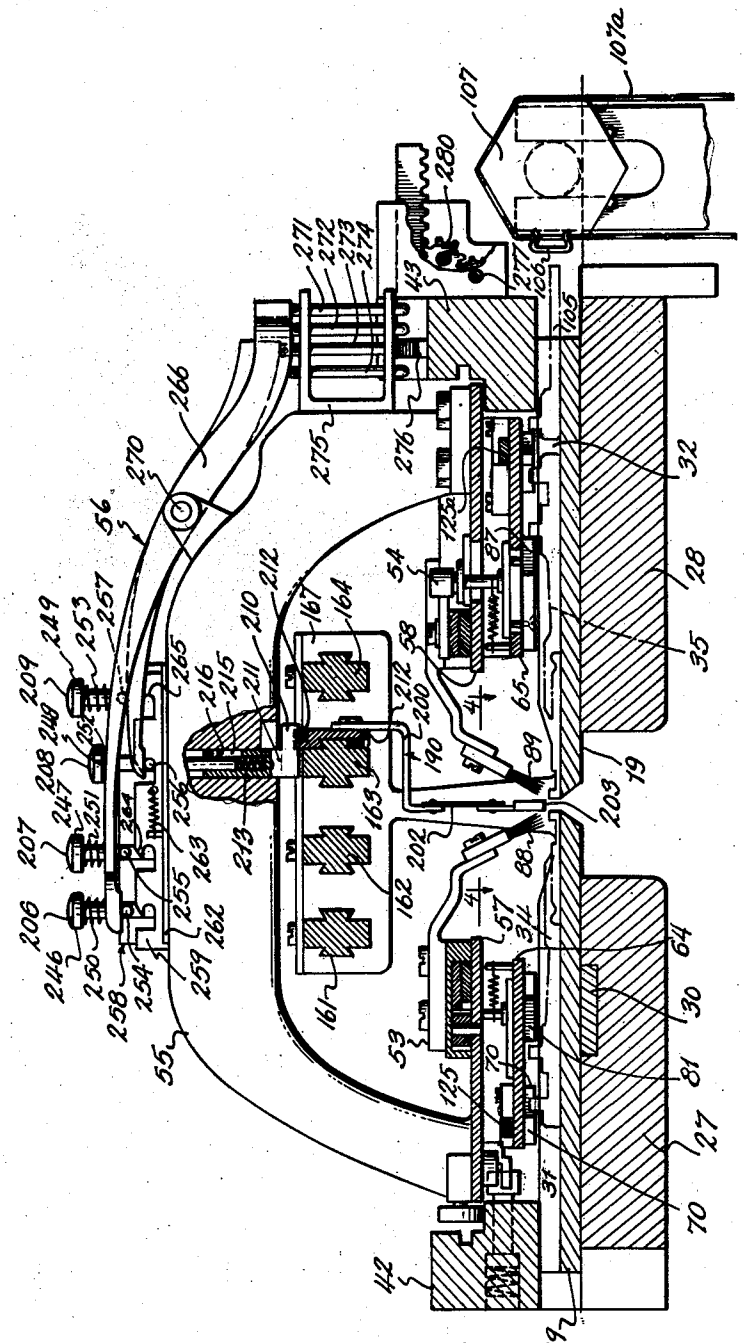


Fig. 3.

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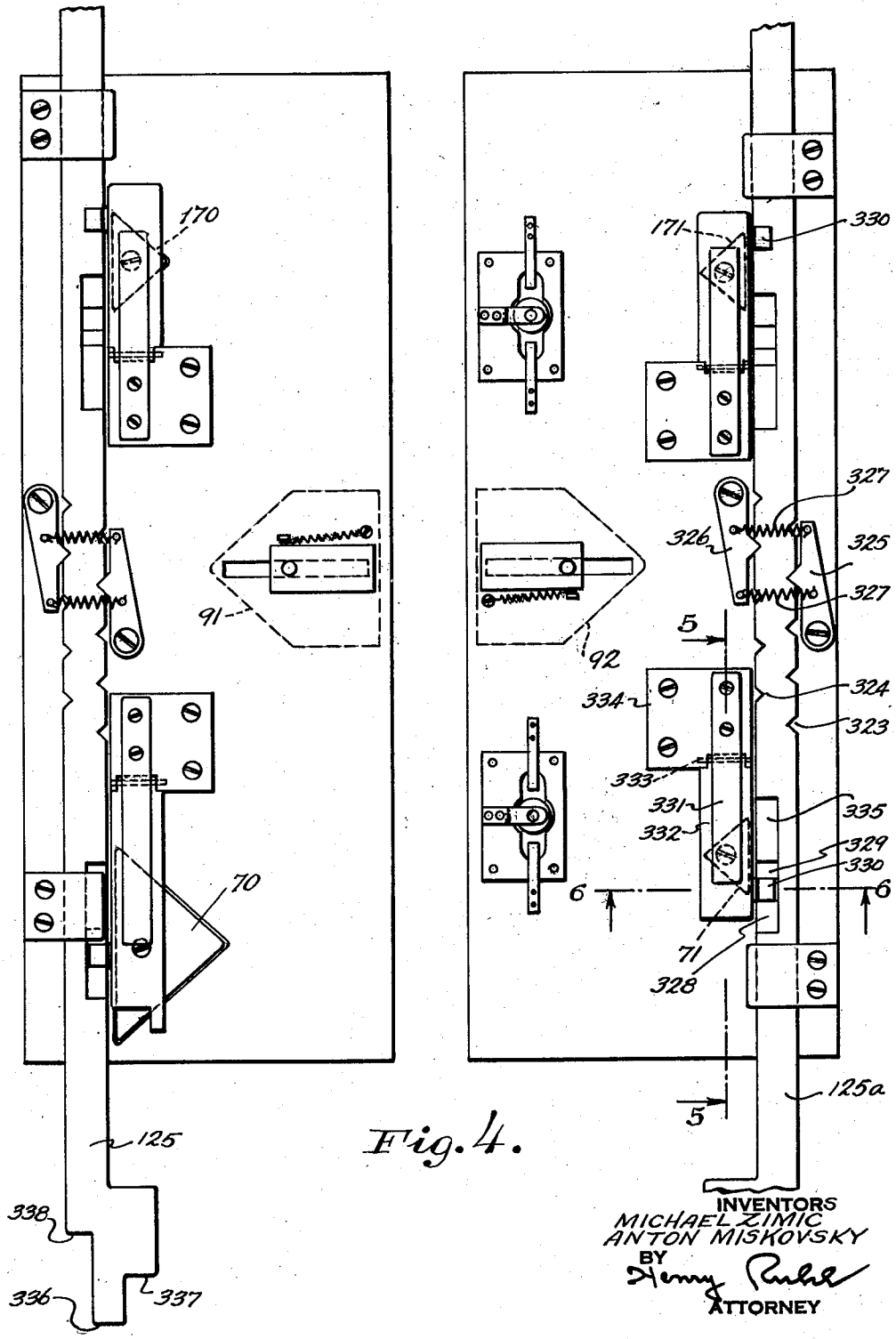


Fig. 4.

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Fig. 5.

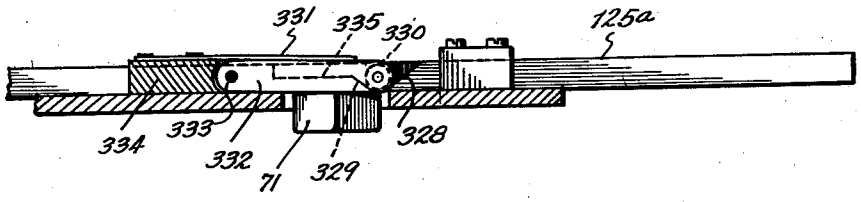


Fig. 6.

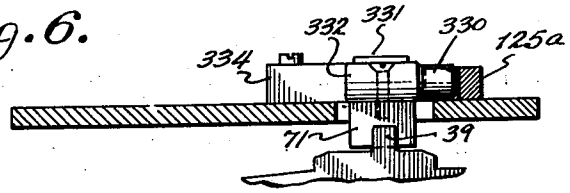


Fig. 7.

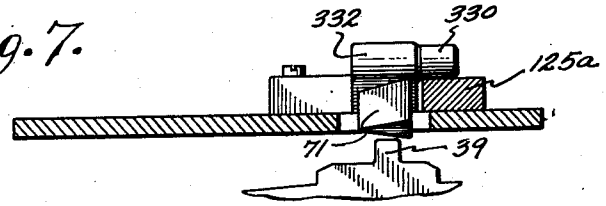


Fig. 8.

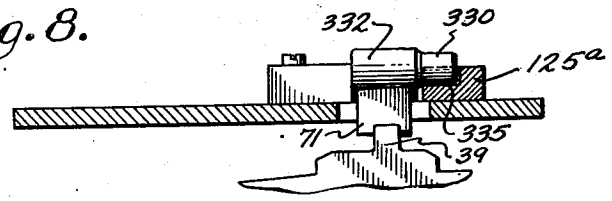
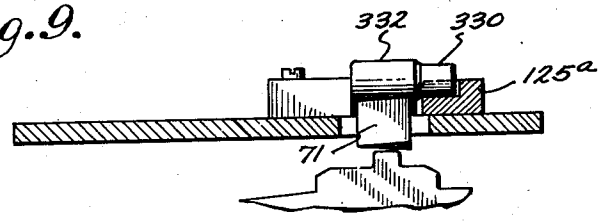


Fig. 9.



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Fig. 10.

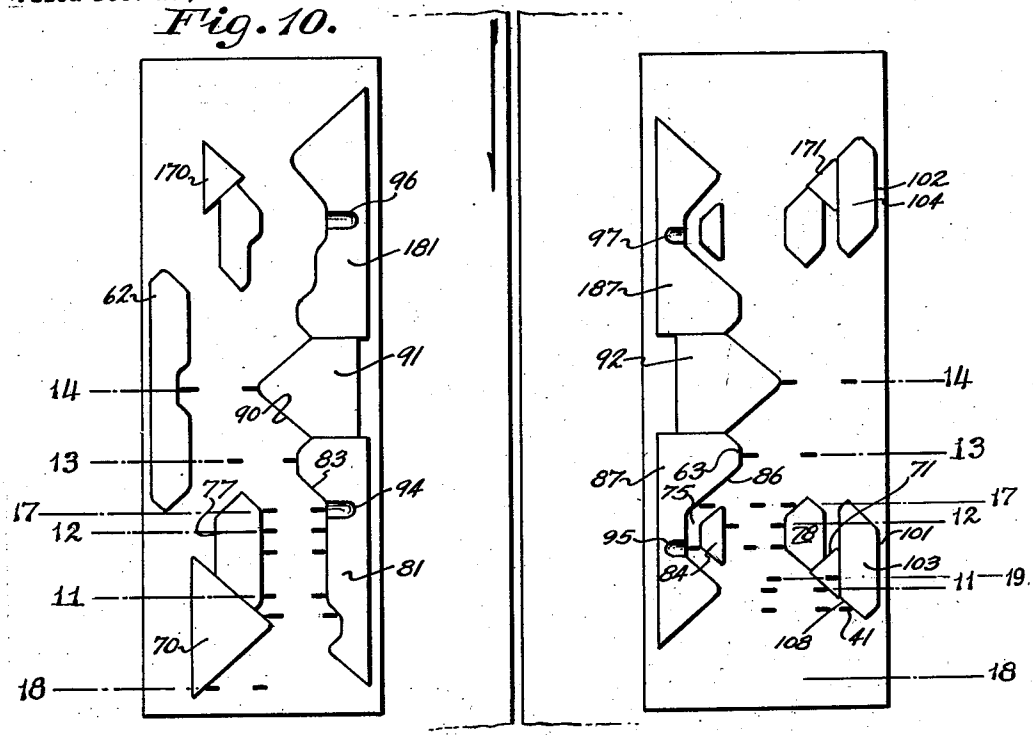


Fig. 11.

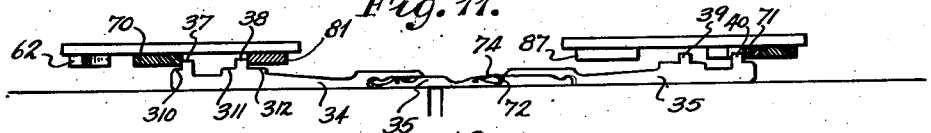


Fig. 12.

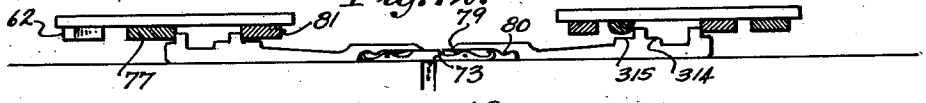


Fig. 13.

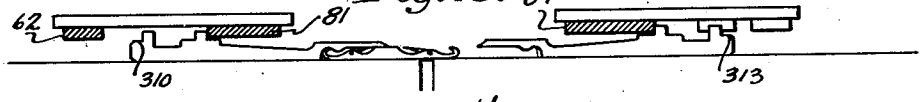
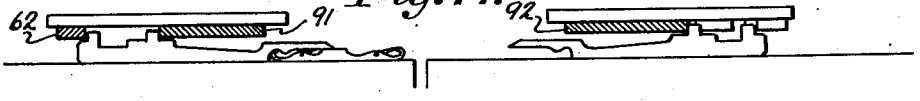


Fig. 14.



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KNITTING MACHINE

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Fig. 15.

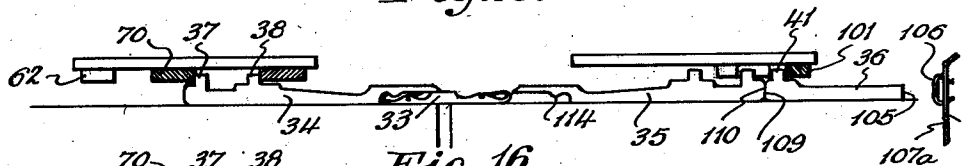


Fig. 16.

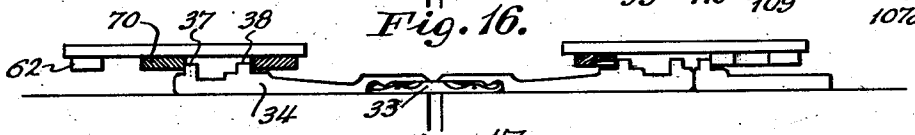


Fig. 17.

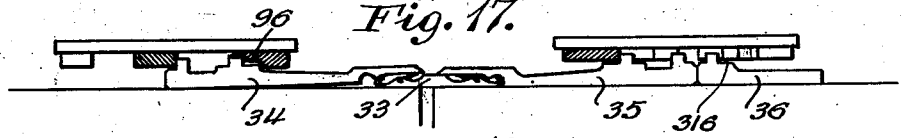


Fig. 18.

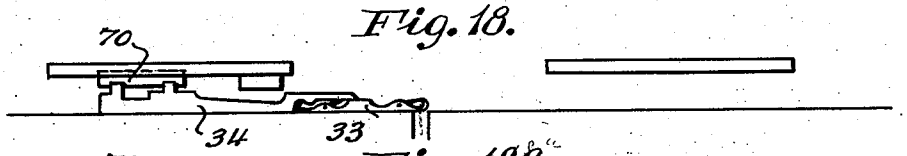


Fig. 18a.

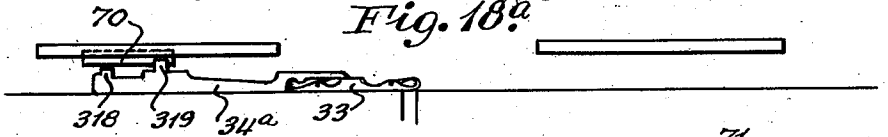


Fig. 19.

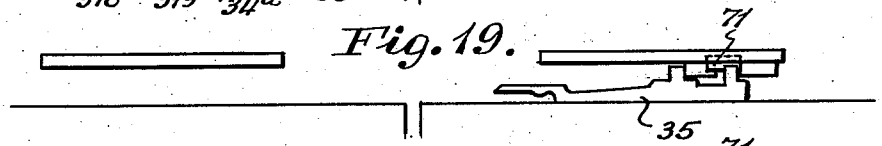
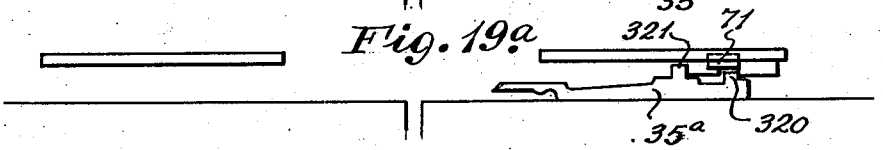


Fig. 19a



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Patented July 7, 1953

2,644,323

UNITED STATES PATENT OFFICE

2,644,323

KNITTING MACHINE

Michael Zimic, Lake Success, and Anton Miskovsky, Deer Park, N. Y.; said Miskovsky assignor to said Zimic

Application December 28, 1949, Serial No. 135,393

9 Claims. (Cl. 66—63)

1

The present invention relates primarily to knitting machines of the type employing needle jacks and shiftable needles, and, more particularly, to novel knitting apparatus including needle shifting and machine control apparatus which removes limitations in operation of prior knitting machines.

In accordance with the invention, there is provided a novel system of locks or cams for a knitting machine carriage, these locks or cams being capable of cooperating with special needle jacks. The special needle jacks are comprised within the system of this invention along with novel control and selecting means for the locks or cams. Certain of the locks or cams on the machine carriage are, in accordance with the invention, positioned at one or more levels in operation of the knitting machine upon which the carriage operates. The level selecting mechanism for these cams is an important feature of the present invention.

Accordingly, the principal object of the present invention is to provide a knitting machine of the type having longitudinally shiftable needles which embodies novel means for moving and positioning the needles.

Another object is to provide a novel lock or cam mechanism for a knitting machine carriage.

A further object is to provide a novel lock or cam controlling mechanism. A closely related object is to provide novel selecting means for the cam controlling mechanism.

A still further object is to provide a novel jack for use in a knitting machine, the novel jack being provided with lock or cam engaging means which cooperate selectively with the lock or cam mechanism of the machine. In carrying out the invention in the illustrative embodiment, the jack of this invention is provided with long and short butts.

Other objects and advantages of the invention will, of course, become apparent and immediately suggest themselves to those skilled in the art to which this invention is directed from a reading of the following specification in connection with the accompanying drawings in which:

Fig. 1 is a view in plan of the right-hand portion of a machine embodying the present invention in a preferred form;

Fig. 2 is an enlarged top plan view of the carriage which is shown at the left of Fig. 1;

Fig. 3 is a vertical elevation view partly in section of the machine of Fig. 1 as seen from the plane 3—3 on Fig. 2;

Fig. 4 is an enlarged fragmentary view in plan and partly in section of the carriage shown at the left of Fig. 1, the section being taken on line 4—4 of Fig. 3;

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Fig. 5 is an enlarged fragmentary sectional view taken on line 5—5 of Fig. 4;

Fig. 6 is an enlarged fragmentary sectional view taken on line 6—6 of Fig. 4;

Figs. 7 to 9 are views similar to Fig. 6 of different modes of operation of the mechanism;

Fig. 10 is a schematic plan view of the stitch locks or cams on the carriage, the latter being shown in detail by Figs. 2, 3 and 4;

Figs. 11 through 14 are schematic fragmentary vertical sectional views taken on the successive lines in Fig. 10 designated by numbers corresponding with these figure numbers and show operation of the mechanism to form plain stitches;

Figs. 15, 16 and 17 are similar to Figs. 11 through 14 and illustrate the transfer jack operation;

Figs. 18 and 18*a* are schematic fragmentary vertical sectional views taken on line 18 of Fig. 10; and

Figs. 19 and 19*a* are schematic fragmentary vertical sectional views taken on line 19 of Fig. 10.

The general organization of the illustrative embodiment of the invention, shown by the accompanying drawing, will be discussed prior to giving a more detailed description of the components of its mechanism. It is believed that in this way a better understanding of the entire mechanism, more especially with respect to its operation in accordance with the invention, will be obtained. Also novel knitting methods, which are included in the invention as one of its aspects, will be pointed out.

Fig. 1 shows a single knitting unit complete with its control mechanism. Groups of needles in the unit perform the knitting operation as will be explained and these needles are actuated by controllable cams carried by the carriage designated generally by reference character 50. As will be understood by those skilled in the art, the carriage 50 may be duplicated and controlled by extensions of the mechanism to be described. For the sake of convenience of illustration and description, only one carriage 50 is shown. The knitting unit which comprises the entire machine, as shown in Fig. 1 has a front needle bed 29 and a rear needle bed 19 (Fig. 3). One of the needle beds, for example the front needle bed, is movable longitudinally of the machine.

In the machine shown by the way of example, needles 33 are controlled in the front and rear

beds 29 and 19 to form stitches through the medium of a lock or cam mechanism supported by carriage 50 which reciprocates over the needle beds. The carriage 50 in reciprocating over the needle beds controls needle jacks 34 and 35 associated with the various needles to accomplish the regular knitting operations. Auxiliary jacks 36 are also controlled.

For the sake of convenience of description, it will be assumed that operation is initiated with the carriage at its left hand position with respect to the needle beds, as seen from the machine front. In Fig. 1, the machine is designated in its entirety by reference character 20 and comprises a base or frame 21 upon which is supported the knitting unit composed principally of the needle beds.

As seen in Fig. 3, there are stationary frame beds 27 and 28. The front needle bed 29 is slidably mounted on the front stationary frame bed 27 for movement longitudinally of the machine 20. The bar 30 (Fig. 3) provides for movement of the needle bed 29. Shifting of the bar 30 to produce the desired type of stitches is accomplished in a well-known manner heretofore used on links and links machines of the type selected as the illustrative embodiment.

The front and rear needle beds are provided with a plurality of grooves 31 and 32 within which are located the needles 33, as well as the front and rear auxiliary jacks 34, 35 and 36, respectively (Fig. 3). In accordance with the present invention modified jacks are provided with long and short butts to provide for novel stitching operations. This feature of the invention is shown in Figs. 6 to 9 and Figs. 18, 18*a*, 19, and 19*a*. These special jacks will be described more in detail hereinafter. Obviously, the number of the grooves 31 and 32 will depend upon the width and gauge of the fabric and the size of the machine. It may be noted here, however, that the carriage in its operational cycles makes a complete traverse of the needle beds so that knitting may be carried on for the full width of the capacity of the machine. Where narrower fabrics are desired, the yarn controls feed the yarn for a lesser width.

The front jacks 34 are provided with butts 37 and 38, and the rear jacks 35 have corresponding butts 39 and 40. The auxiliary jacks 36 (Figs. 15, 16 and 17) have single butts 41. These butts co-act wtih cams on the carriage in a manner to be explained.

Disposed at the front and rear portions of the machine and supported above the beds 27 and 28 are the front and rear rails 42 and 43 (Fig. 2). The cross-sectional configuration of these rails is seen in Fig. 3 and they serve as tracks along which the main carriage 50 rides.

As seen in Figs. 2 and 3, the carriage 50 has front and rear assemblies indicated generally by reference characters 53 and 54. The assemblies 53 and 54 are connected by an arched bridge 55. The bridge 55 supports the yarn control 56. The front and rear assemblies 53 and 54 are built about the front and rear carriage plates 57 and 58. The front and rear base portions of the bridge 55 are secured to the upper surfaces of the plates 57 and 58 in any suitable manner, as by bolting.

The front and rear plates 57 and 58 are provided with a plurality of horizontally journalled rollers 59 and a plurality of vertically journalled rollers 60. The rollers 59 and 60 are adjustable so that the carriage 50 may follow a substantially rectilinear oscillatory course. A plurality of latches 61 are shiftable inwardly and outwardly of the carriage to engage correspondingly positioned grooves in the rails 42 and 43. When in their extended position, these latches maintain the carriage in positive slidable engagement with the rails. When the latches 61 are retracted, they permit the vertical upward removal of the carriage from the rails.

Secured to the under-surface of the plates 57 and 58 by suitable means are the stitch cam supporting plates 64 and 65. The cams which co-act with the butts 37 to 41 are seen in Fig. 10 in which the cams which depend from the front plate 64 are seen at the left of said figure and the cams which depend from the rear plate 65 are seen at the right of said figure. The arrangement of the stitch cams is such that when the carriage 50 is moved to the right as the machine is faced from the front the cams would move downwardly as illustrated on Fig. 10.

Assuming the carirage to be moving downwardly as last described, and the particular jacks 34 and 35 to be at the position indicated by the plane 11 on Fig. 10, the butt 37 has previously been moved by the switch or gate cam 70 while the butt 40 is being moved by the switch or gate cam 71. These cams at that time are in their fully lowered or active position for cooperation with butts 37 and 40 which appear in Fig. 11.

The effect of the cams 70 and 71 and the movement of the carriage is to move the jacks 34 and 35 toward each other. The cam 81 and the cam 77 cooperate with the butts 37 and 38 to bring the jack 34 to the position of Fig. 11. The cam 71 is acting on the butt 40.

Figs. 5 to 9 show in detail the mechanism in accordance with the present invention for controlling the vertical position of the cam 71. The cams 170, 71, and 171 are similarly controlled as seen by Fig. 4 which is a detail view of the cam height selecting mechanism. This selecting mechanism includes the bar 125 for controlling the cams 70 and 170 and the bar 125*a* for controlling the cams 71 and 171. Figs. 4 to 9 will be described more in detail, later. In the position shown by Figs. 11 and 12, the rear hook 72 of the needle 33 carries the last formed loop 73 and the rear hook latch 74 is closed in Fig. 11. The carriage continuing its downward (as viewed in Fig. 10) movement, maintains the butts 37 and 38 in the position of Fig. 11. The cam 76 moves the jack 35 by its butt 40 as seen in Fig. 12. The jacks 34 and 35 are brought closer together and appear as shown in Fig. 12 at which position the tip 79 of the forward portion 80 of the jack 35 opens and maintains open the latch 74. The opening of the latch 74 makes way for the laying in of the yarn.

As the carriage proceeds downwardly (as viewed in Fig. 10) to the position of Fig. 13, the butt 38 is withdrawn by the cam 81. In the case of the rear jack 35, the butt 39 engages the straight portion 63 of the cam 87. The butt 38 is engaged by the cam 81 at the portion 83, the jack 34 having been retracted (in this case, moved to the left). The rear jack 35 has been retracted so that the butt 39 now engages the cam portion 63, as stated. In this position of the needle and the jacks the yarn is laid in.

Continued movement of the carriage in the same direction brings the butt 38 into contact with the portion 90 of the stitch size cam 91, which is shiftable forwardly or rearwardly as further appears herein. The farther forward

(or to the left as viewed in Fig. 10) the stitch cam 91 is moved, the longer will be the stitch in the finished material. At this time, the rear jack 35 is further retracted by the rear stitch size cam 92. The completion of the stitch occurs in the position indicated by Fig. 14. From this position, the butts are passed by the carriage since the gate cams 170 and 171 are up.

The cams 81 and 87 and 181 and 187 are provided with slots 94, 95, and 96 and 97 which cause or allow the jacks to rise and permit the needles 33 to be shifted from the front to the rear needle bed plates 29 and 19, respectively, or vice versa, for changing the character of the stitch. Figs. 15, 16 and 17 show the jack transfer operation as performed by the lock mechanism of the carriage 50. The shifting of the needles from one needle bed plate to another for this purpose is controlled by the auxiliary jacks 36. The jacks 36, when in their normal or inactive position, are disposed in the rear-most portions of the grooves therefor in the rear needle beds 19, the butt 41 being passed by the rear portions 101 and 102 of the needle transfer cams 103 and 104.

The auxiliary jacks 36 are shifted to the active position thereof by the contact of the rear tip 105 with a clip 106 (Fig. 3) secured to the hexagonal jacquard drum 107 or to a chain 107a. The jacquard drum 107 is a well-known type having openings, into which the tips 105 may pass, and when it is desired to advance an auxiliary jack to an active position thereof, the particular opening is blocked by a clip 106. Where it is desired to expand the range of jacquard design control, a relatively long endless chain 107d, having a corresponding function (aligned openings and clips) may be driven by the polygonal drum.

The jacquard drum 107 may be mounted upon a shaft 111 which is engaged in the slotted upper ends of a plurality of radial arms 112 which are swingably mounted on a longitudinal shaft (not shown). The shaft 111 slidably rests upon the supports 99.

When the jacquard drum 107 advances the auxiliary jack a relatively slight amount, the butt 41 thereon becomes engaged by the portion 108 of the cam 103 as seen in Figs. 10 and 15. This butt 41 then has the effect of displacing the butt 40 (Fig. 15) and the forward edge 109 contacts the rear edge 110 of the rear jack 35 so as to advance said jack from its normal course of travel, a distance equal to the distance between the rear edges of the butts 40 and 41. The cam 70 advances the jack 34. The rear jack 35 is advanced by the cam 78 and the downward projection 114 rides up over and is engaged by the rear hook 72 of the needle 33 as seen in Fig. 16. The slot 95 in the cam 87 permits the jack to rise. The cam 77 maintains the jack 34 in position. In Fig. 17, the jack 34 is permitted to rise by the slot 94 in the cam 81 to release the needle for its rearward travel. The cam surface 86 engages the butt 39 to move the jack 35 to the rear. Subsequently, the cam 104 clears out the auxiliary jack. A passage 75 provided by the cam 34 guides the butts 39 of the jack 35.

The jacks may be frictionally retained within the grooves of the beds by laterally extending springs at the sides thereof (not shown) as is well known in the art to which the present invention relates. The jacks rest in these grooves under gravity. When a jack is shifted longitudinally any tendency of the jack to rise is prevented by the shoulders on the jack which engage the under surfaces of the various cams which act upon the butts as followers. These jack shoulders are designated 310 to 315 and appear in Figs. 11 to 17. One of the slots 94 to 97 permit a jack to rise at an appropriate time.

By the described construction, independent needle latch openers which overlie the forward portions 30 of the jacks 36 or the corresponding inner ends of the jacks 34 are eliminated. Since the jacks are thus supported against vertical movement in the area of the butts, the portions of the jacks which engage the needles may flex slightly upwardly, with a substantial reduction in damage to needles caused by jacks striking the needles.

As stated above, the cams 70, 71, 170 and 171 are set at different levels in accordance with the invention to serve as switching cams which cooperate in a special way with long and short butts on the jacks positioned in the needle beds. In the illustrative examples of Figs. 18 and 18a, the action of the cam 70 on a jack such as the jack 34 with long butts is shown in contrast with the action on the jack 34a with the long and short butts of this invention. In order that operation may be secured in accordance with the arrangement of Fig. 18a, a special jack 34a is provided with a short butt 318 and a longer butt 319. The longer butt may be the same length as the butts on the jacks 34 and 35 heretofore described. Figs. 19 and 19a show the next successive operation as the carriage is moved downwardly as viewed in Fig. 10. In Fig. 19a, the jacks 35a cooperate with the cams 71 and 171, and each jack is provided with butts 320 and 321. The inwardly extending portions of the jacks 34a and 35a may be of any configuration to cooperate with a desired needle. In the illustrative examples the jacks 34a and 35a are shown as being similar to the jacks 34 and 35.

In Fig. 18 which is the section taken on the plane 18—18 of Fig. 10, the butt 37 of the jack 34 is shown as being in contact with the leading cam face of the cam 70, so that the jack 34 will be propelled to the advanced position. In Fig. 18 with the cam 70 in its intermediate position the butt 37 will cause movement of the jack. Operation will then be in accordance with the previously described steps. In Fig. 18a the jack 34a will be moved by the butt 319 since the butt 318 will be cleared by the cam 70. In Fig. 18a, therefore, the needle will not be advanced as far forwardly as in Fig. 18 (the drawing does not indicate what has been described). In Fig. 18a with the cam 70 in its lower-most position, operation will be the same as for Fig. 18 where the butts are of equal length.

As the carriage 10 progresses to the point 19 a jack 35 with butts 39 and 40 as described heretofore will be moved as described above in connection with Figs. 11 to 14. In Fig. 19a there is shown a jack 35a with a long butt 321 and a short butt 320. This jack 35a will be moved in a different manner from the jack 35 of Fig. 19 inasmuch as the short butt 320 will not be contacted by the cam 71 in its intermediate position. If the cam 71 is in its lower-most position as shown by Fig. 6, for example, the short butt will cooperate with the cam 71 for movement of the jack. Varying combinations of long or short butt jacks may be employed in accordance with the invention to obtain variations in the stitches produced.

The operating mechanism for the gate cams 71 and 171 is shown in detail on Fig. 4 of the draw-

ings. Further details of the particular portion of the rod 125a which operates the gate or switch cam 71 is shown by Figs. 5 to 9. The cams 71 and 171 are on the rear cam plate of the carriage and are operated by the previously mentioned bar 125a. The cams 70 and 170 are operated by the bar 125. Movable abutments on each end of the machine cooperate with the bars 125 and 125a to select their positions.

The mechanism for moving the cams 71 and 171 will now be described in detail. It is to be noted that the mechanism for operating the cams 70 and 170 is similar and operates in a similar manner. The bar 125a is provided with a plurality of notches 323 and 324. These notches are engaged by pawls or detents 325 and 326 which are biased toward each other by springs 327. In the position illustrated by Fig. 4, the cam 71 is in its lower-most position as shown in Figs. 5 and 6. To permit the cam 71 to occupy the lower-most position, the bar 125a has sloping cam surfaces 328 and 329 which permit the cam follower 330 to move to its lower-most position under action of a flat spring 331. The cam 71 is carried by an arm 332 which is pivoted at 333 on a block 334. An elongated recess 335 provides for the intermediate position of the cam which is shown by Figs. 8 and 9. As previously stated, the bar 125a is movable to five positions. In the position illustrated by Fig. 4 the cam 71 is in its lower-most position and the cam 171 is raised. This comes about by reason of the follower 330, which controls the cam 171, being elevated by the sloping surface leading to the recess so that it is seated on top of the bar. When the bar 125a is moved downwardly as viewed in Fig. 4 of the drawings the cam 71 will be raised to its intermediate position and the cam 171 will remain in its fully raised position. When the bar is moved upwardly as viewed in Fig. 4 to the limit of its movement then the cam 171 will be in its intermediate position and the cam 71 will be raised. From the description just given the relative positions of the cams 71 and 171 will be apparent when the pawl 323 for example, cooperates with the different notches 324.

In the third notch from the top of Fig. 4 both of the cams are up. In the fourth notch from the top of Fig. 4 the cam 171 is down to its lower-most position and cam 71 is raised. In the fifth notch with the bar moved upwardly as far as it will go, cam 171 is in its intermediate position and cam 71 is raised.

The bars 125 and 125a have stepped ends. These ends are similar as shown in Fig. 2 taken in conjunction with Fig. 4. The end of the bar 125 which is depicted by Fig. 4 will be described, it being understood that this description applies to both ends of the bars 125 and 125a. The end of the bar 125 is provided with exposed surfaces, which are designated by reference characters 336, 337, and 338 for abutting a stop (not shown). In the position of the bar 125 shown in Fig. 4, the abutting surface 337 at the upper end of the bar has been contacted by its stop, placing the pawl 326 in cooperation with the second notch from the top. The same is true of the bar 125a. The middle notch of five notches would be selected by abutting surfaces 338.

The stitch size cams 91 and 92 are substantially identical in construction and operation, and are shifted in position by adjustable fingers such as the fingers 124, 125a and 126, Fig. 2, which engage the follower 127, projecting upwardly from the cam 91, for example. The follower 127 may have associated therewith suitable indicating means 128 to show the relative position of the cam 91 in its retracted positions. The fingers 124, 125a and 126 are adjustably secured to a bar 129 by means of the screws, which penetrate slots in said fingers and threadedly engage said bar. Both ends of the bar 129 are provided with stepped faces 130 and 131. Lying directly below the bar 129 is another bar 132, having the stepped faces 133 and 134. The bars 132 and 129 are interconnected by a known rack and pinion device 135, so that any one of the three fingers, 124, 125a or 126 may be selectively engaged with the follower 127 by means of the dog 136 (Fig. 1) which is movably mounted with respect to the frame 20 for movement forwardly or rearwardly of the machine, but is fixed longitudinally. The dog 136 is seen at the right end of Fig. 1. The bars 132 and 129 are slidably mounted in the guides 137 and 138 which are secured to the top surface of the plate 57. A similar structure is utilized to shift the stitch cam 92 and includes the bars 229 and 232 in the guides 237 and 238, and fingers (only one, 224, of which is seen). The stepped faces 230, 231, 233 and 234 co-act with the dog 236 (Fig. 1), while the bars 229 and 232 are oppositely moved by the rack and pinion device 235.

The dogs or abutments 136 and 236 are pivotally mounted on the frame and are adapted to be partially rotated in a stepped manner by linkage mechanism under the control of chains equipped with lugs in a known manner.

The yarn carrier changing structure, indicated generally by reference character 56, is seen in Figs. 1, 2 and 3. This arrangement is similar to that shown in United States Patent No. 2,139,790 granted on December 13, 1948, to Michael Zimic, but feeds only a single strand. The structure 56 is mounted upon the carriage 50 and operates on the yarn carriers which are slidably mounted on dovetailed bars 161, 162, 163, and 164. The dovetailed bars are secured to a support or supports 167 mounted on pedestals 177, suitably secured to a stationary part of the machine.

Each of the dovetailed bars 161–164 has a yarn guide slidably mounted thereon, as stated above, so that in Fig. 2 there is shown the guides 188, 189, 190 and 191. A view of the guide 190 is seen in Fig. 3 and it comprises an offset bracket 200, a connector 202, and a yarn tube 203. The particular yarn (not shown) may be supplied from any well known rack (not shown). Each of the other yarn guides is of substantially the same construction as the guide 190, the brackets varying in size and angularity to place the yarn over the open needle hooks during the knitting process.

Thus the knitting unit may be served with four different threads or yarns which may vary in character as desired. The yarn selected by the control is laid into the open needle hooks of the needles 33 by the yarn tube, such as the tube 203 being moved along the knitting area between the front and rear needle beds. The brushes 88 and 89 keep the latches open and prevent the yarn from coming out of the hooks.

The particular yarn carrier bar being activated is moved along by reason of its engagement with the carriage 50. This is accomplished by a series of four pins 206, 207, 208 and 209. The pins are vertically reciprocatable and have inactive upper positions and active lower positions. Each of the said pins 206 to 209 has a slidably and resiliently mounted lower terminal. See Fig. 3 in which the terminal 211 in the form of

a sleeve, is slidably mounted on the lower end of a pin 208. A spring 213 urges the terminal 211 to its lower-most position. The terminal 211 is provided with a slot 215 in which the projection 216 from the pin 208 rides. This slot and projection limits the upper and lower travel of the terminal 211 with respect to the pin 208. The terminals of the pins 206 to 209 are each provided with a finger 210 to coact with means 212 on the yarn carriers or guides which slide on the bars 161 to 164. A finger 214 and a block 216a serve to aid in picking up and releasing the yarn carriers.

The yarn control or selector 56 acts to lower the desired pin of the pins 206, 207, 208 and 209 to the active or yarn feeding position thereof. Each of these pins has (in addition to the movable terminals, corresponding to the terminals 211) a head 246, 247, 248 and 249, an expansive coil spring 250, 251, 252, and 253, and a laterally extending pintle 254, 255, 256 and 257, respectively. The shanks of the pins 206 to 209 are vertically reciprocable in cylindrical bores in the block 258 and there are slots laterally extending from said bores within which the pintles 254 to 257 may move.

A reciprocable latch plate 259 is longitudinally slidable in the face of the block 258. The block 258 is secured to the upper surface of the bridge 55. A guide 262 maintains the latch plate 259 in position. The latch plate 259 is urged forwardly by the coil spring 263, and has a plurality of cam surfaces 264 and notches 265. By virtue of the structure just described, the downward movement of any one of the pins 206 to 209 causes its respective pintle 254 to 257 to engage one of the cam surfaces 264 in turn shifting the latch plate 259 rearwardly. This releases any previously engaged pintle from a notch 265. As the pintle being lowered travels farther downwardly, it in turn becomes engaged by a notch 265, as the latch plate 259 is urged forward with a snap action.

The pins 206 to 209 are pressed to the lower or active position thereof by the long levers 266 to 269, inclusive, respectively, which engage the pintles on said pins.

All of the levers 266 to 269 are pivotally mounted on the axis 270. The outer or rear ends of the levers 266 to 269 are adapted to be selectively elevated by a plurality of vertically reciprocable rods 271 to 274, inclusive, said rods being mounted within pairs of aligned openings in the U-shaped support 275. Suitable projections in the upper portions of the rods prevent them from dropping down excessively when they are not engaged by the cam 276. The U-shaped support 275 is secured to the rear vertical surface of the bridge 55. The cam 277 is similar to the cam 276 just noted, cam 277 being seen in Fig. 1. Cams 276 and 277 have rearwardly directed racks 278 and 279, respectively, which engage a pair of gear trains, only one of which, the train 280 is seen, in Fig. 3, and these gear trains are actuated by the shaft 281.

The right end 282 (see Fig. 1) of the shaft 281 has a crank 282 which is pivotally connected by the link 284 to the crank 285, which is fixed upon countershaft 286. Another crank 287 is fixed on the countershaft 286. These cranks connect with levers which are actuated by a chain control (not shown). This mechanism is not part of the present invention and, therefore, it is not shown in detail. Its function is to provide that actuation of its mechanism results in the simultaneous shifting in position of the cams 276 and 277, so that they engage the desired rods 271 to 274. These in turn shift the levers 266 to 269 to lower the desired pins 206 to 209, thereby selecting desired yarn carriers 188 to 191.

The carriage 50 has pivotally connected thereto, at the rear of said carriage a yoke 291 which is detachably engageable with the slider 292. This connection, which is provided with a ball handle 302 may be such that upon overload the same will automatically disengage and preferably simultaneously break the circuit to the source of power for the machine. The slider 292 is slidably engaged upon the track 293 which is fixed to the frame of the machine and may be maintained in position by the supports 99. A bracket 294 may be supported by the track 293 and the supports 99 and upon the bracket are journalled a pair of sprockets 295 and 296. An annular sprocket chain 297 is carried by the sprockets 295 and 296, and said chain has a forwardly extending pin 298 which is vertically reciprocable within a vertically arranged slot 299 in the block 300, the latter being fixed to the slider 292. The sprocket 296 is fixed to a shaft (not shown) which carries the gear 301, and this gear may be driven by any suitable source of power, in time correlation to the yarn selecting, jacquard needle shifting, and bed shifting mechanisms in a well known manner.

What is claimed is:

1. In a knitting machine, a needle bed, a needle movably disposed on said bed, a jack having a pair of spaced butts of different length projecting therefrom, said jack being movably supported by the bed and having means for shifting said needle, a carriage movable along said bed, said carriage having cam surfaces and an independently movable gate cam, adapted in an active position thereof to engage one of said butts and in an inactive position thereof to clear said butt, said gate cam being positioned in the line of motion of said cam surfaces, whereby when the gate cam is in the inactive position thereof said cam surfaces may pass between said butts, the jack remaining stationary.

2. In a knitting machine, a needle bed, a needle movably disposed on said bed, a jack having a pair of spaced butts of different length projecting therefrom, said jack being movably supported by the bed and having means for shifting said needle, a carriage movable along said bed, said carriage having cam surfaces and an independently movable gate cam, adapted in an active position thereof to engage one of said butts and in an inactive position thereof to clear said butt, said gate cam having an intermediate position, said gate cam being positioned in the line of motion of said cam surfaces, whereby when the gate cam is in the inactive position thereof said cam surfaces may pass between said butts, the jack remaining stationary.

3. In a knitting machine, a needle bed, a needle movably disposed on said bed, a jack having a pair of spaced butts of different heights projecting therefrom, said jack being slidably supported by the bed and adapted to shift said needle in posion, a carriage movable along said bed, said carriage having first and second groups of cam surfaces adapted to cause the needle to move in a direction toward making a stitch when the carriage is going in first and second directions, respectively, first and second gate cams on said carriage adapted in their active positions to guide the jack into knitting positions and in

their inactive positions to clear the jack, said gate cams being positioned in the line of motion of said groups of cam surfaces, whereby when the first gate cam is active and the carriage is moving in a first direction it guides the jack to engage the outer edges of the pair of butts with the first group of cam surfaces and the inner edges of the butts to engage the second group of cam surfaces, and when the second gate cam is active and the carriage is moving in a second opposite direction it guides the jack to engage the outer edges of the pair of butts with the second group of cam surfaces and the inner edges of the butts to engage the first group of cam surfaces.

4. In a knitting machine, a needle bed, a needle movably disposed on said bed, a jack having a pair of spaced butts of different heights projecting therefrom, said jack being slidably supported by the bed and adapted to shift said needle in position, a carriage movable along said bed, said carriage having first and second groups of cam surfaces adapted to cause the needle to move in a direction toward making a stitch when the carriage is going in first and second directions, respectively, first and second gate cams on said carriage adapted in their active positions to guide the jack into knitting positions and in their inactive positions to clear the jack, said gate cams being positioned in the line of motion of said groups of cam surfaces whereby when the first gate cam is active and the carriage is moving in a first direction it guides the jack to engage the outer edges of the pair of butts with the first group of cam surfaces and the inner edges of the butts to engage the second group of cam surfaces, and when the second gate cam is active and the carriage is moving in a second opposite direction it guides the jack to engage the outer edges of the pair of butts with the second group of cam surfaces and the inner edges of the butts to engage the first group of cam surfaces, and an intermediate position for said gate cams whereby only the longer of said butts is engaged.

5. In a knitting machine, spaced front and rear needle beds, the knitting area being disposed substantially between said front and rear beds, a front jack normally slidably disposed in a front bed, a rear jack normally slidably disposed in a rear bed, a needle shiftable between said front and rear beds, an auxiliary jack slidably disposed in the rear bed rearwardly of the rear jack and adapted to contact the rear jack and move the rear jack forwardly to cause the rear jack to engage the needle and to shift the needle between the front and rear beds, one of said jacks having butts of different lengths.

6. In a knitting machine, spaced front and rear needle beds, the knitting area being disposed substantially between said front and rear beds, a front jack normally slidably disposed in the front bed, said front jack having long and short butts, a rear jack having a butt and normally slidably disposed in the rear bed, a needle shiftable between said front and rear beds, an auxiliary jack having a butt and slidably disposed in the rear bed rearwardly of the rear jack, a movable carriage having cam surfaces adapted to engage the butt on the rear jack to move

the rear jack forwardly in the direction of the knitting area for a knitting movement, a needle transfer cam, and means to move the auxiliary jack forwardly a distance sufficient so that the front end of the auxiliary jack may engage the rear end of the rear jack, and the butt on the auxiliary jack may be acted upon by the needle transfer cam.

7. In a knitting machine, a needle bed with a jack and needle groove, a needle, a jack in said groove and adapted for detachable engagement with said needle, said jack having a raised shoulder and butts of different length projecting from said shoulder, a carriage movable over said bed and having cams with edge cam surfaces and relatively planar bottom surfaces, said edge cam surface engaging the vertical edges of said butts to shift them along as said carriage is moved, and said relatively planar surfaces of the cams engaging the upper surfaces of the shoulder to maintain said jack in said groove.

8. A lock mechanism for the needle bed traversing carriage of a knitting machine comprising, a pair of cams which selectively serve to direct the butts of needle jacks along different courses through the lock mechanism in accordance with the position of said cams, means for selectively moving said cams comprising a movable bar, a follower for each of said cams, said bar having portions of different thickness upon which said follower rests whereby to provide for different cam positions as said bar is moved, said bar having at least one end thereof presenting the configuration of steps whereby said bar is movable to different positions upon engagement of stop means selectively with said steps.

9. In a lock mechanism for the needle bed traversing carriage of a knitting machine, a gate cam, means for supporting said cam for movement perpendicularly with respect to said lock mechanism, a follower member on said gate cam, a bar, means to support said bar for movement longitudinally of said carriage, said bar having a notch therein to accommodate said follower whereby said gate cam is at one extreme range of movement, a recess in said bar to accommodate said follower whereby said cam is in an intermediate position, said follower riding up on said bar to provide the second extreme position of said cam.

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