June 4, 1935. M. ZIMIC 2,003,674

KNITTING MACHINE

Filed Sept. 25, 1933 3 Sheets-Sheet 1

Fig. 1.

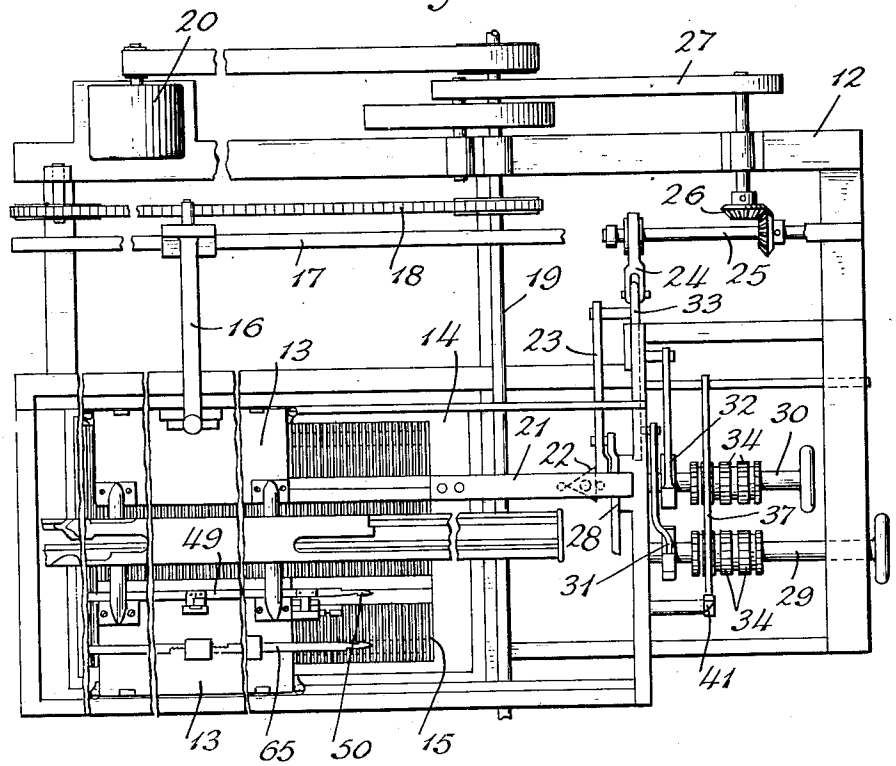
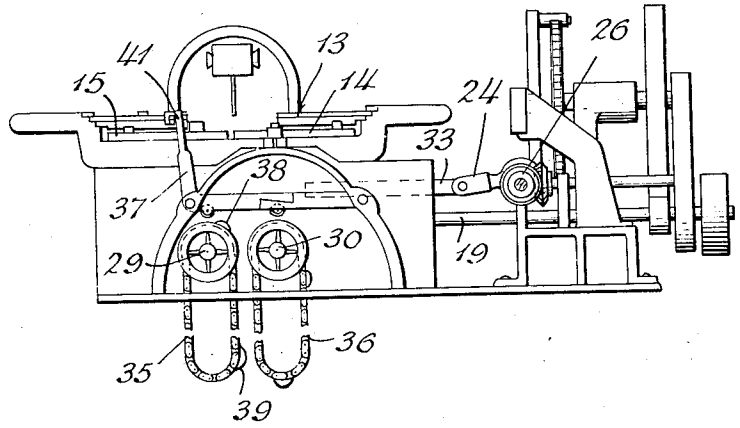


Fig. 2.



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June 4, 1935. M. ZIMIC 2,003,674

KNITTING MACHINE

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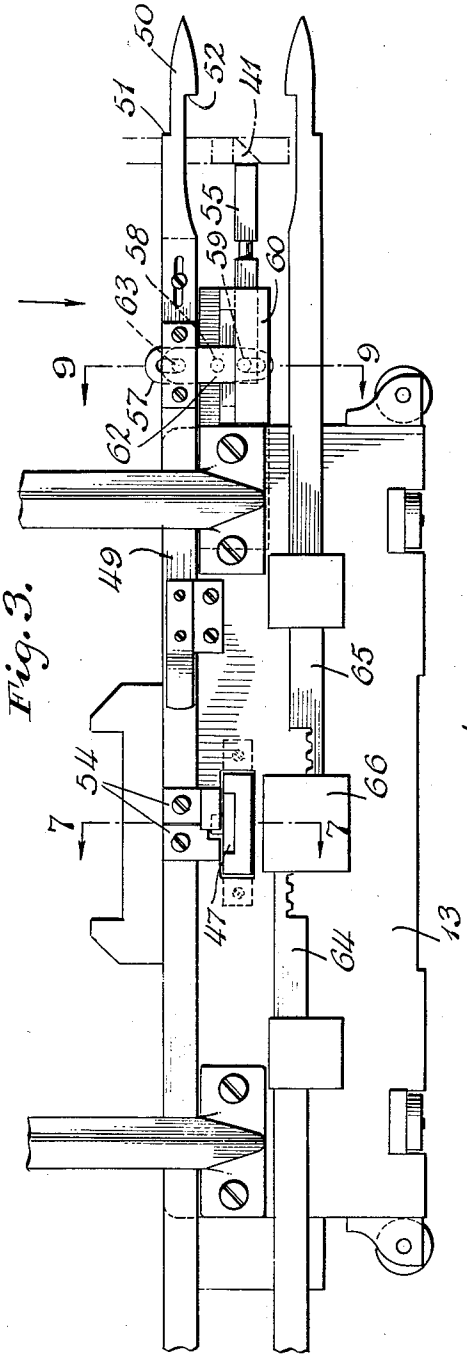


Fig. 3.

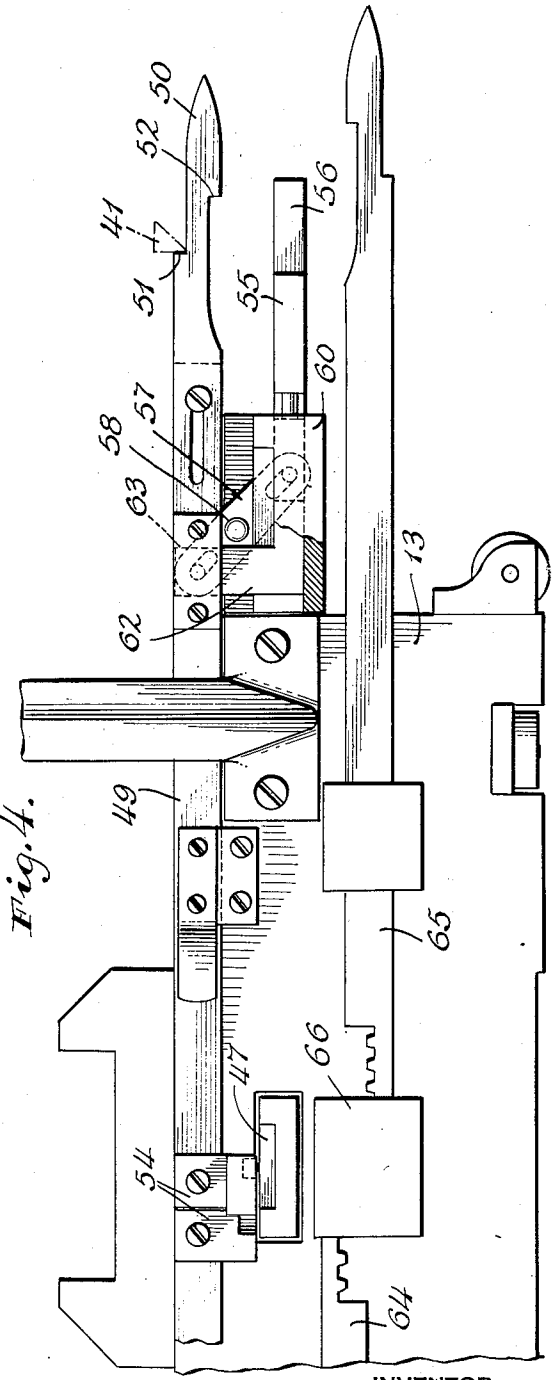


Fig. 4.

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June 4, 1935. M. ZIMIC 2,003,674

KNITTING MACHINE

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Fig. 5.

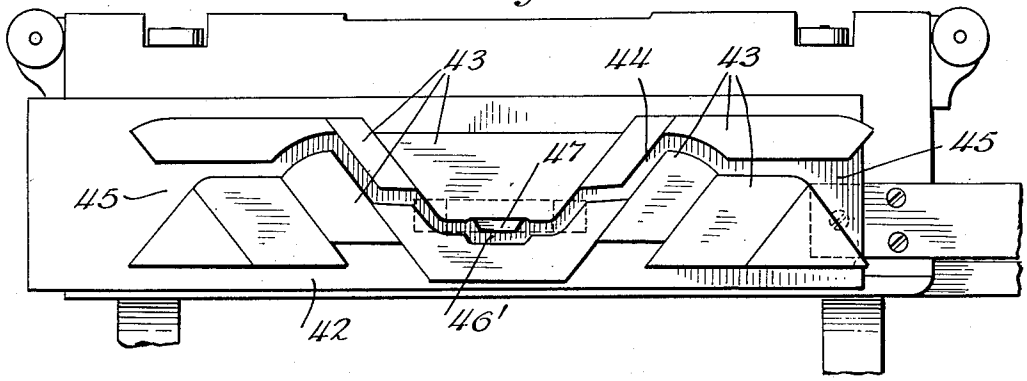


Fig. 6.

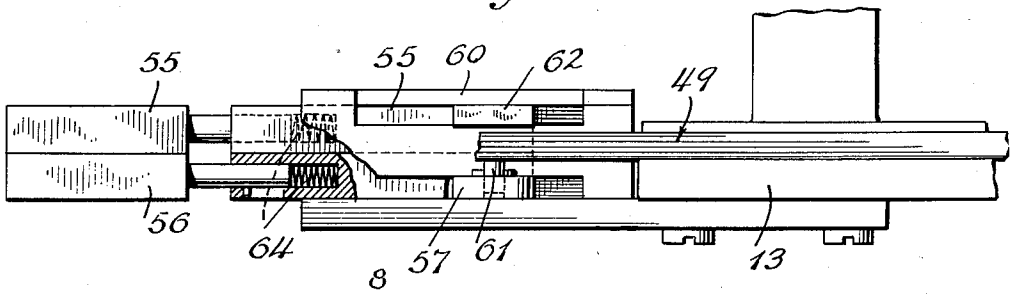


Fig. 7.

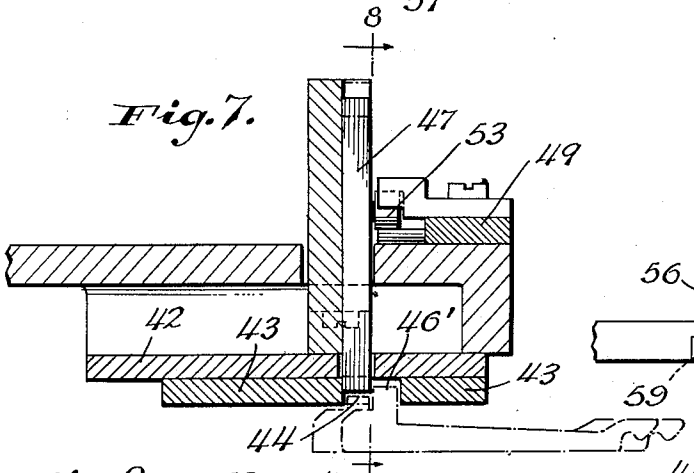


Fig. 9.

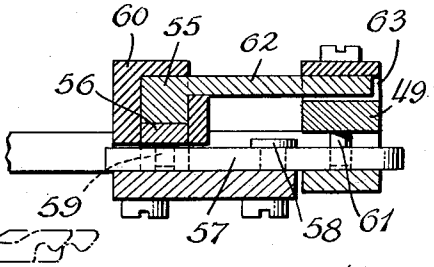


Fig. 8.

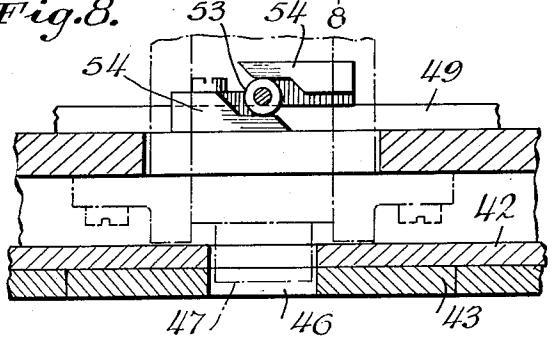


Fig. 10.

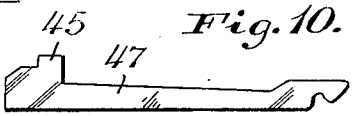
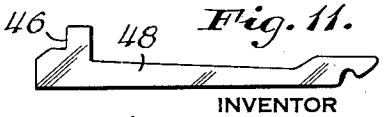


Fig. 11.



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Patented June 4, 1935 2,003,674

UNITED STATES PATENT OFFICE

2,003,674

KNITTING MACHINE

Michael Zimic, Forest Hills West, N. Y.

Application September 25, 1933, Serial No. 690,818

5 Claims. (Cl. 66—63)

This invention relates to improvements in knitting machines and has particular reference to a needle jack-control mechanism especially adapted for use on the flat, link and link type of machines.

It has heretofore been the practice, in machines of the above type, to employ a lock mechanism supported upon the carriage of the machine which travels back and forth above the needle or bed plates wherein the needles and their jacks are mounted. Said lock mechanism comprised a series of locks so arranged as to provide a channel or course through which the butts of the needle jacks of the associated bed plate pass as the carriage and lock mechanism are reciprocated, to thus guide said jacks and thereby control the movements thereof relative to the other bed plate in the making of flat and link stitches which combine to form the design of a knitted fabric. Previously, it has been customary to utilize two sets of jacks in a bed plate, one set having long butts and the other short ones. The latter were employed to form the link stitches and were caused to pass through the channel or course of the lock mechanism, while the jacks with long butts were operated to form the flat stitches. In the making of flat stitches, the long-butted jacks were prevented from being projected or driven into the needle grooves of the opposed bed plate, as in the case of link stitches, and to this end, these long-butted jacks, instead of following the course through which the short butts passed, were shunted or diverted from said course and the butts thereof caused to pass along the edge of the lock mechanism remote from the opposed needle or bed plate. To accomplish this shunting or diversion of the long-butted jacks, a means has been provided at each end of the lock mechanism, and outside the entrances to the guide channel or course, which contacted the long butts to divert them toward the mentioned edge of the lock mechanism and thereby prevented their entrance into said channel, while the short butts were permitted, by said means, to enter said channel. Thus, as the carriage and lock mechanism were moved over the bed plate, the long-butted jacks were held in a retracted position relative to the opposed bed plate by reason of the engagement of their butts with the aforesaid edge of said mechanism.

In the development of this art, the use of link stitches has increased materially and it has been found that the long-butted jacks are better adapted, owing to the size of their butts and consequent increased durability, to the making of such stitches. As a consequence, it is desirable that the old procedure, explained above, be reversed by employing the long-butted jacks to form the link stitches while the jacks with short butts are used to make the flat stitches. In the old method, wherein the long-butted jacks were diverted from the channel in the lock mechanism and away from the opposed needle plate, said jacks could not be utilized for the formation of the link stitches. Therefore, provision had to be made for passing the long butts through the guide channel or course together with the short-butted jacks and, during such passage, the long butts had to be so controlled that they would cause the production of either link or flat stitches, depending upon the particular design being knitted.

In accordance with the present invention, such control of the long-butted jacks is attained by having a lock element, or its equivalent, positioned in the guide channel of the lock mechanism in such manner that when it is desired to have the long-butted jacks produce link stitches, said element becomes effective to temporarily divert the long butts from the course of said channel to thereby project the jacks into the opposed needle plate, while the short-butted jacks are permitted to follow said course.

The invention further contemplates the provision of automatic means for adjusting the position of the above-mentioned lock element relative to said guide channel so that all of the jacks may be caused to form either link or flat stitches, or so that the long-butted jacks alone will effect the link stitches.

The inventive idea involved is capable of receiving a variety of mechanical expressions, one of which, for purposes of illustration, is shown in the accompanying drawings wherein:—

Figure 1 is a fragmentary plan view of a knitting machine of the flat, link and link type, showing the present invention applied thereto.

Figure 2 is an end elevation of the machine.

Figure 3 is an enlarged fragmentary plan view of the reciprocating carriage of the machine, illustrating the lock control mechanism of the present invention in the intermediate position which it assumes when the lock element is partially projected into the guide channel or course of the lock mechanism.

Figure 4 is a view similar to Figure 3 showing the position of the control mechanism when the lock element is in a fully projected position relative to said guide channel.

Figure 5 is a partial bottom plan view of the

carriage showing the lock mechanism associated therewith.

Figure 6 is a fragmentary edge elevation of the lock control mechanism, partly broken away and shown in section.

Figure 7 is a sectional view on the line 7—7 of Figure 3, the dotted lines indicating the various positions of adjustment of the lock element.

Figure 8 is a section on the line 8—8 of Figure 7.

Figure 9 is a section on the line 9—9 of Figure 3, and

Figures 10 and 11 are elevations of needle jacks having short and long butts, respectively.

The present invention is shown in conjunction with a knitting machine of the kind illustrated in Patent #1,669,032, dated May 8, 1928, and in Figures 1 and 2 of the drawings, there is illustrated as much of said machine as is necessary to an understanding of the construction and operation of the jack control mechanism which includes essential characteristics of the apparatus herein claimed. As shown, the machine comprises generally a frame 12 in which is supported for reciprocation the carriage 13 movable lengthwise of the machine and above the needle plates 14 and 15. The reciprocation of the carriage 13 is accomplished through the medium of a bar 16 connected to said carriage and slidable upon a rail 17. The bar 16 is operatively connected to an endless chain 18 driven off of a shaft 19 which is connected through suitable gearing to a motor or other source of power 20. The aforesaid patent relates to a racking mechanism in which one of the needle plates, such as the plate 14, is periodically shifted longitudinally relative to the other plate. Because of the fact that the means for driving the jack control mechanism of the present invention, in its preferred form, is coupled to the drive of the racking mechanism, a portion of the latter is shown, although it will be understood that this racking mechanism may be entirely dispensed with in the operation of the present invention. Briefly, the racking mechanism includes a bar 21 secured to the needle plate 14 and controlled by a three-point cam 22 which is turned in a stepwise movement under the control of a pawl 23. This pawl is driven through a pitman connection 24 operated off of a shaft 25 which is connected through gearing 26 and suitable transmission 27 to the motor 20. When the machine is not racking, pawl 23 is inoperative to rotate the shaft upon which the cam 22 is mounted, said pawl being held in an inoperative position by a lever 28 which, when lowered about its pivot permits said pawl 23 to become operative. The control for the lever 28 is not illustrated in the drawings, except that portion thereof which cooperates with the jack control mechanism of the present invention and therefore, for a further detailed description of the racking mechanism, reference is made to the above-mentioned Letters Patent.

Said portion of the apparatus which operates the lever 28 and also actuates the jack control mechanism, hereinafter to be described, comprises a pair of shafts 29 and 30 rotatably mounted in a portion of the framework 12 of the machine and each turned in a step-by-step movement by the pawl and ratchet mechanism 31 and 32 which are operatively connected, through the link 33, to the pitman 24. Each of the shafts 29 and 30 customarily carries a series of connected sprockets 34 arranged in opposed pairs on the two shafts with the sprockets of each pair carrying endless chains 35 and 36. The opposed chains on the different sprockets are utilized to control various instrumentalities in the operation of a knitting machine, such as racking, turning of the jacquard, changing of the yarn carriers, etc., and also the operation of the jack control mechanism of the present invention. For purposes of clarity, only those chains 35 and 36 which are involved in the operation of the present invention are illustrated and insofar as the latter is concerned the operation may be effected through a single chain, if desired. As previously indicated, the lock element, which is later to be described in detail and which is utilized to control the jacks in the making of link and flat stitches, is capable of assuming three positions relative to the guide channel or course of the lock mechanism of which said element forms a part, and in order to control the adjustment of said lock element to such positions a trip device comprising a bell-crank lever 37 (Fig. 2) is pivoted onto the frame of the machine in association with the chains 35 and 36. Said lever 37 may be similar in all respects to the lever 65, 66 of the aforesaid patent. The rocking of said lever about its pivot, by projections 38 and 39, on the chains both of which projections are of different heights, is effective to adjust the upper end 41 of the lever 37 to either of two positions in addition to the one shown in the drawings, each of which corresponds to one of the positions of the locking element which controls the jacks, as will appear more clearly in the course of the following description.

As is usual in machines of this type, a lock mechanism (Figure 5) is supported on the underneath side of the carriage 13 above either one or both of the needle or bed plates 14 and 15. For purposes of the present invention, there need only be described one of these lock mechanisms and its associated instrumentalities including the jack control of the present invention, but it will be understood that the lock mechanism and other parts may be duplicated and associated with the other needle plate, if found desirable. As shown in Figure 1, the jack control mechanism of the present invention is illustrated in connection with the needle plate 15. The lock mechanism of Figure 5 comprises a plate 42 having a series of locks 43 arranged thereon to form a guide channel 44 for the short and long butts 45 and 46 of the jacks 47 and 48, respectively, shown in Figures 10 and 11. The entrances to the channel or course 44 at the ends thereof are widened as indicated at 45 so as to facilitate the entry of the butts into said channel as the carriage 13 is moved back and forth lengthwise of the machine. In accordance with the present invention, the channel 44 is widened intermediate its ends as indicated at 46' and associated with this widened portion is a vertically adjustable lock element 47 which, in a manner to be described, is movable to fully retracted, partially projected and wholly projected positions with respect to the channel 44 as shown in dotted and full lines in Figure 7 of the drawings. When the lock element is in its raised or retracted position both the short and long butts of the jacks will pass under the lower end of said lock element and thus follow the main course of the channel 44. In this instance all of the jacks will operate their respective needles to form flat stitches. Adjustment of the lock element 47 to its intermediate or partially projected position, as shown in full lines in Figure 7, will allow the short butts 45 of the jacks 47 to pass under said lock element so that flat stitches will be formed; but the long butts 46 will

be momentarily diverted, by the lower projecting end of the element 47, into the widened portion 46' of the channel and will thus be by-passed around a portion of the main channel. The jacks 48 will thus be actuated to produce the link stitches of the machine during the passage through the by-pass portion 46'. In order that both types of jacks 47 and 48 may be operated to produce link stitches at the intermediate point of the channel 44, the element 47 may be further lowered to its fully projected position in said channel, in which instance both the long and short butts of the jacks will be diverted around that portion of the channel then occupied by the lower end of said lock element.

To accomplish the adjustment of the element 47 to its various positions, the invention provides an operating mechanism for said element which is under the control of the trip device including the lever 37 and its projecting end 41. This operating mechanism is preferably in the form of an elongated bar 49 mounted upon the upper side of the carriage 13 for limited longitudinal movement relative thereto and having its pointed end 50 projected beyond the end of the carriage 13 nearest to the trip device and arranged to be contacted by the latter in two of its three positions of adjustment. On opposite edges of the point 50 the same is provided with longitudinally spaced shoulders 51 and 52, each of which is adapted for contact with the end 41 of the trip device when the latter has been adjusted to a position in the path of said shoulder. Thus, with the trip 41 in the position shown in Figure 4, the same will be in the path of the shoulder 51 as the carriage is moved toward the right, as viewed in the drawings, and upon engagement of said shoulder with said trip the bar 49 is moved a slight distance to the left and relative to the carriage 13 as the latter reaches the end of its movement. This particular shifting movement of the bar is designed to produce an adjustment of the lock element 47 to its lowermost position, as will presently appear. When the lever 37 of the trip device is moved about its pivot by the projection 38 of lesser height on either chain 35 or 36, so that the end or trip 41 assumes a position slightly to the left of the full line position shown in Figure 2, said end 41 is then brought into alignment with the shoulder 52. Contact is established between said shoulder and the trip 41 as the carriage 13 begins its return movement to the left and the trip 41 then becomes effective to exert an outward pull upon the bar 49 to shift the same to its extreme right hand position and thereby raise the lock element 47 to its uppermost or fully retracted position in which both the long and short butts pass thereunder. The means controlled by the bar 49 for raising and lowering the lock element 47 is best illustrated in Figures 7 and 8 and preferably comprises a roller 53 carried by the lock element intermediate its ends and arranged between two spaced cam members 54 forming a part of the bar 49. Due to the cam surfaces of the members 54, it will be obvious that when the bar 49 is moved to the right, as viewed in Figure 8, the roller 53 will ride upwardly upon the lower member 54 and thus raise the element 47 to its fully retracted position. Likewise, when the bar 49 is moved to the left the members 54 cause the roller to move downwardly between the same and thus project the element 47 to its lowermost position. In Figures 7 and 8 the roller 53 is shown in its intermediate position between the cams 54 and it is in this position that the element 47 is partially projected into the channel 44 so as to permit the passage of only the short butts 45 thereunder and to cause the long butts 46 to be by-passed around the projecting lower end of the lock element 47.

The adjustment of the lock element 47 to the aforesaid intermediate position will now be described. To effect this intermediate adjustment, the trip 41 is thrown over to its extreme left hand position, as shown in dotted lines in Figure 3, by the engagement of the higher projections on either of the chains 35, 36 with the lever 37. In this position of the trip, it is thrown into direct alignment with a pair of superimposed abutments or contact members 55 and 56. When the parts are in the positions shown in Figure 4, which positions are assumed following the actuation of the bar 49 to project the element 47 to its lowest point, the lower contact member 56 is extended outwardly and the upper member 55 is correspondingly withdrawn inwardly by the linkage arrangement presently to be described. With the trip 41 now adjusted into alignment with the contact members 55 and 56, the latter member will first engage said trip as the carriage moves to the right and will be forced inwardly. At the same time the upper member 55 will move outwardly, due to said linkage arrangement, until the outer ends of the two members are flush against the trip. This sliding movement in opposite directions of the two members results in the adjustment of the bar 49 to the intermediate position shown in Figure 3. The linkage which effects this result will now be described. To a portion of the carriage, a link 57 is pivoted intermediate its ends at 58 and one end of said link has a sliding connection, at 59, with the rear end of the lower contact member 56 which is slidable in a portion 60 of the carriage. The opposite end of the link also has a sliding connection at 61 with the bar 49. Therefore, as the contact member 56 is forced inwardly by its engagement with the trip 41, this movement will swing the link 57 from the position shown in Figure 4 to that shown in Figure 3, thereby shifting the bar 49 to its intermediate position and as a consequence thereof the lock element 47 will be adjusted to the full line position shown in Figure 7. Now, assuming that due to a previous operation in which the trip 41 was engaged by the shoulder 52 and the lock element 47 thereby raised to its fully retracted position, the link 57 will have then been swung to a diagonal position opposite that shown in Figure 4 and, as a consequence, the positions of the two contact members would have been reversed; that is, the upper member 55 will have been projected beyond the member 56. This reversal of movement is accomplished by a lateral extension 62 at the inner end of the upper member 55, the free end of which extension projects into an opening 63 formed in the bar 49 (see Figure 9). By this arrangement, it will be seen that when the shoulder 52 of the bar 49 engages the trip 41 at the beginning of the left hand movement of the carriage, as viewed in Figure 4, the movement of the bar 49 is momentarily halted until the trip 41 is moved out of the path of said shoulder by the disengagement of the lower projection 38 from the lever 37, and as a consequence of this temporary stoppage of the bar 49 the same is shifted to its other extreme position. This shifting movement of the bar is transmitted through the extension 62 to the upper member 55 and causes the latter to be projected outwardly. At the same time, through the connection 61,

the shifting of the bar 49 rocks the link 57 to its other diagonal position and this results in the inward movement of the lower contact member 56 into the portion 60. Should these contact members now be in this position when the trip 41 is again adjusted into alignment with said members by the action of the higher projection 39 on one of the chains 35, 36, the contact member 55 will first engage the trip 41 and be forced inwardly thereby, with the result that its extension 62 will shift the bar 49 to the previously described intermediate position and this movement of the bar will, through the link 57, force the lower contact member 56 outwardly until the outer ends of the two members are flush against the trip 41.

In order to relieve the shock incident to the engagement of either of the members 55 and 56 with the trip 41 each of said members, as shown in Figure 6, may be made in sections with the outer abutment portion thereof having a limited sliding movement in the inner part of the member, with a spring 64' interposed between the sections so as to absorb the shock of said contact.

Brief reference is made to a mechanism which, although it does not form any part of the jack control, is illustrated in Figures 3 and 4. This mechanism is utilized to produce tight and loose stitches and comprises a sectional bar somewhat similar to the bar 49 and extending parallel thereto. The sections 64 and 65 of said bar are designed to be reciprocated in opposite directions by a rack and pinion mechanism generally indicated by the numeral 66 and, similarly to the bar 49, the section 65 has its outer end projecting beyond the right hand of the carriage 13. Said outer end is adapted to be controlled in the same manner as described in connection with the end 50, either by separate trip device or by the trip 41. In the latter instance, provision would be made for two additional positions of adjustment of the trip 41 by providing the chains 35, 36 with further projections of greater height than the projections 38 and 39.

What is claimed is:

1. In a knitting machine, a needle plate for receiving needle jacks having long and short butts, a carriage movable along said needle plate, a lock mechanism on said carriage having means to direct said jacks along a certain course as said carriage is moved, a lock element adjustable to a plurality of positions relative to said course, an operating mechanism for said element including a bar slidably mounted on said carriage and operatively connected to said lock element, a trip device for said bar having a series of positions each corresponding to one of the positions of said lock element and in certain of which the same is directly contacted by said bar to slide the latter relative to said carriage, and coordinated abutments linked to said bar and contacting said trip device in one of its positions to produce a different sliding movement of said bar.

2. In a knitting machine, a plurality of needle jacks, a reciprocating carriage, a lock mechanism movable with said carriage and including means to provide a course to be followed by said jacks, a control element movable to retracted, partially projected and fully projected positions relative to said course to variously control the operation of said jacks, and an actuating member for said control element mounted on said carriage and movable relative thereto, said actuating member and element having cooperating roller and cam means to adjust said element, when said actuating member is moved relative to said carriage, to any of the aforesaid positions in accordance with the movements of said actuating member.

3. In a knitting machine, a plurality of needle jacks, a reciprocating carriage, a lock mechanism movable with said carriage and including means to provide a course to be followed by said jacks, a control element movable to retracted, partially projected and fully projected positions relative to said course to variously control the operation of said jacks, an actuating member for said control element mounted on said carriage and movable relative thereto, said actuating member and element having cooperating roller and cam means to adjust said element, when said actuating member is moved relative to said carriage, to any of the aforesaid positions in accordance with the movements of said actuating member, and a trip device adjustable to a plurality of positions for engagement by said actuating member to vary the movement of the latter and thereby alter the position of said control element relative to said course.

4. In a knitting machine, a plurality of needle jacks, a reciprocating carriage, a lock mechanism movable with said carriage and including means to provide a course to be followed by said jacks, a control element movable to retracted, partially projected and fully projected positions relative to said course to variously control the operation of said jacks, an actuating member for said control element mounted on said carriage and movable relative thereto, said actuating member and element having cooperating roller and cam means to adjust said element, when said actuating member is moved relative to said carriage, to any of the aforesaid positions in accordance with the movements of said actuating member, a trip device for directly controlling certain of the movements of said actuating member, and means linked to said actuating member and operated by said trip device to control other movements of said actuating member.

5. In a knitting machine, a needle plate for receiving needle jacks having long and short butts, a horizontally reciprocating carriage movable above and relative to said needle plate, a lock mechanism on said carriage having means to direct said jacks along a certain course as said carriage is moved, a vertically adjustable lock element movable to a plurality of positions relative to said course, and operating mechanism for said element including a bar slidably mounted on said carriage for longitudinal movements relative thereto and operatively connected to said lock element, and a trip device for said bar adjustable to any one of a series of positions each corresponding to one of the positions of said lock element, and effective in each of its positions to slide said bar on said carriage to thereby shift said lock element to the position corresponding to that of said device.

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