Dec. 24, 1935. V. LOMBARDI 2,025,464

KNITTING MACHINE AND ADJUSTABLE ELEMENTS THEREFOR

Filed April 17, 1934

FIG. 1

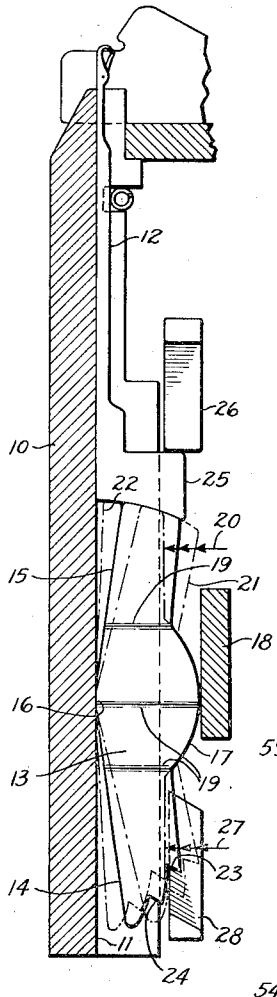


FIG. 2

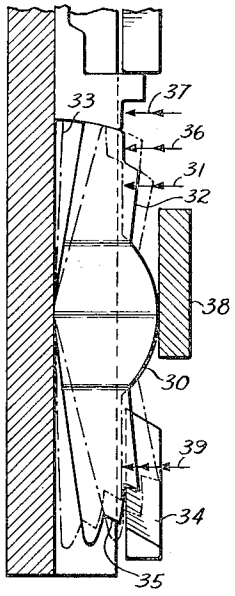


FIG. 3

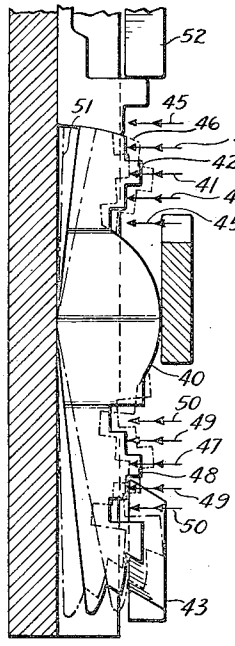


FIG. 7

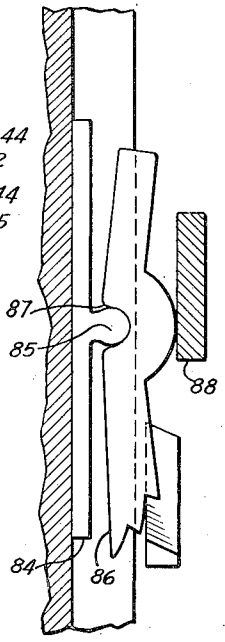


FIG. 4

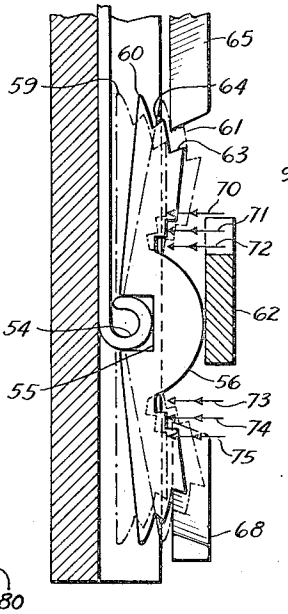


FIG. 8

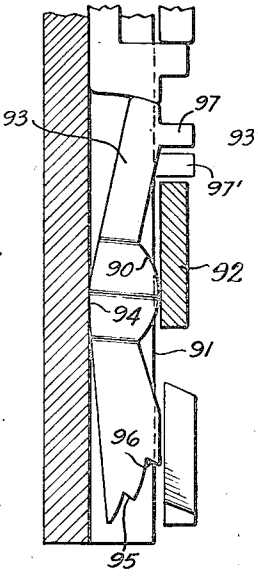


FIG. 9

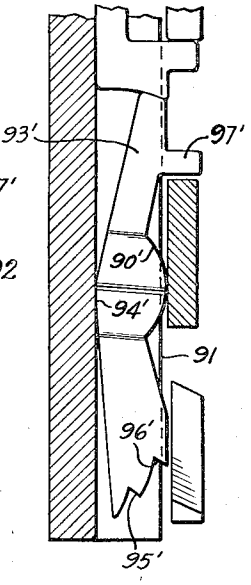


FIG. 5

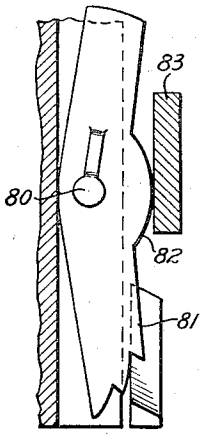
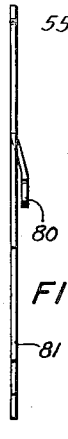


FIG. 6



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KNITTING MACHINE AND ADJUSTABLE ELEMENTS THEREFOR

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Application April 17, 1934, Serial No. 720,960

14 Claims. (Cl. 66—50)

This invention relates to knitting machines and certain types of controlling devices therefor such as needle jacks and has for an object the provision of such a device capable of a variety of uses in a knitting machine to secure a greater degree of selective operation than has heretofore been possible.

In certain aspects this invention constitutes an improvement over certain of the forms of construction particularly exemplified in my U. S. application No. 630,168 filed July 13, 1933 wherein knitting needles are disclosed having pivoted elements mounted thereon at a point remote from the yarn receiving hook, the said pivoted elements having a plurality of cam receiving surfaces to enable each needle to be selectively advanced or retracted in accordance with any predetermined pattern control. In accordance with the preferred form of the present invention the said pivoted element is not pivotally mounted on the needle shank but is placed in the needle slot preferably as a separate unit with such a configuration as to permit step by step rotative movement as well as longitudinal movement while being held in place preferably between the bottom of the slot and a stationary member external to the slot. Thus one side edge may be wide V-shaped with the point of the V at the center of its length while the opposite side edge in its central portion comprises a rounded bearing surface. Preferably the V-shaped side is in the bottom of the slot with the rounded surface contacting with said external member.

This invention will be better understood by reference to the following detailed description taken in connection with the accompanying drawing in which.

Fig. 1 represents a needle actuating element embodying this invention for selective advancement to a fully advanced or partially advanced position;

Fig. 2 is similar to Fig. 1 except for the manner in which the pre-selection of the angular position of the element is secured;

Fig. 3 is also similar to Fig. 1 except for a different type of cam actuated surfaces for receiving pattern determinations;

Fig. 4 is another form of the invention in which the needle actuating element is loosely mounted on the end of a needle for longitudinal movement but not rigidly pivoted thereto;

Figs. 5 and 6 represent different views of still another form of the invention with special frictioned means for opposing jack movement;

Fig. 7 represents a type of jack held in the slot in the same manner as the other figures but pivotally mounted on a separate slidable element and

Figs. 8 and 9 illustrate a modified type of jack where the central portion of the jack does not project beyond the needle slot.

Referring more particularly to Fig. 1 a sectional view of a needle cylinder 10 of a knitting machine is shown with the usual needle slot 11 containing a needle 12. As previously stated it is frequently desired in a knitting machine to selectively actuate each needle to any one of several levels to produce varied pattern effects. One way in which this may be accomplished is shown in Fig. 1 in which the lower part of the needle slot 11 contains a special jack 13 designed to be angularly moved to any one of several positions by a pattern controlling agency. The effect of the jack 13 in actuating needle 12 depends upon its angular position at the time advancing cam 14 comes into operation.

Referring to configuration and mounting arrangement of jack 13 it is to be noted that its edge at the bottom of the slot comprises two tapered edges 14 and 15 which meet at a point 16 centrally with respect to the length of the jack. Thus in the solid line position shown the jack is in contact with the bottom of the needle slot only at the point 16 and tapers away from the slot bottom in the direction of each end of the jack. This enables the jack to be readily rocked about the point 16 for angular movement. The opposite edge of the jack in the central portion thereof has a smoothly rounded or arcuate shaped portion 17 normally in slight frictional engagement with a stationary ring 18 inside the needle cylinder 10 and suitably supported in a manner not shown. The width of the jack is substantially equal to the distance between ring 18 and the bottom of the slot. The jack is therefore free to rotate through a substantial angle about the point 16 as an axis, the rotative movement resulting in the sliding of the curved surface 17 past its point of contact with ring 18, ring 18 serving to retain the jack in the needle slot in its proper position. In order that the jack may hold any particular angular position in the needle slot the jack is preferably somewhat thinner than the width of slot 11 so that the jack may be corrugated as by being bent on the lines 19, to secure the necessary friction between the jack and the slot walls against movement except when a definite force is applied.

In the particular form of jack shown in Fig. 1 the upper arm thereof external to the needle slot

is designed to be acted upon by certain cam means or other force intended for conveying to the jack a setting which will produce a desired effect on the associated needle. The multi-headed arrow 20 indicates such a means which dependent upon its character may move jack from dotted line position 21 to the full line position shown or to the dotted line position 22 or may leave the jack undisturbed in dotted position 21. If we assume that the means 20 actuates jack 13 to the full line position it will be apparent that a cam 28 arriving after such actuation will contact with shoulder 23 and lift jack 13 and associated needle 12 to an intermediate position but not to a fully advanced position. If the means 20 actuates jack 13 to the dotted line position 22 it will be apparent that the cam 28 will contact with shoulder 24 and cause the needle 12 to be fully advanced. However if means 20 allows the jack to remain in the dotted position 21 it will be apparent that both shoulders 23, 24 will be out of the path of cam 28 and no advancement of jack 13 or needle 12 will take place.

It will also appear from the drawing that needle 12 has a suitable butt 25 which will enable cam 26 to retract the needle and its jack either from a fully or partially advanced position.

In order to restore jack 13 after it has been moved counterclockwise by force 20, the same may be accomplished by applying a force at the point 27 which will turn the jack in a clockwise manner either to the solid line position or to the dotted line position 21 or allow it to remain in dotted line position 22 as the pattern may dictate.

Due to the rotative nature of the settings given jack 13 it is preferable that the lower edge of the needle and the upper edge of the jack be arcuate shaped so that any setting of jack 13 does not immediately disturb the curve about a center of curvature 16. It will be noticed however that jack 13 is not fastened to the needle 12 in any way but is an independently formed element.

The needle jack 30 of Fig. 2 is quite similar in operation and construction to jack 13 of Fig. 1 except for the configuration of the upper arm of the jack where the pattern determining actuations are applied to the jack. It is assumed in this figure that the actuating force is constant in length of stroke but is variable in location. Thus if the pattern determining force is applied at the level 31 contact is made with edge 32 to drive the jack 30 to the dotted line position 33 in which case the subsequent arrival of cam 34 will contact with shoulder 35 and raise the jack and its needle to a fully advanced position. If the force is applied at level 36 the jack is moved to the solid line position of Fig. 2 which permits cam 34 to raise the jack and needle to a partially advanced position. If the force is applied at level 37 the jack is not moved from the position it may have at that movement, that is, it retains its previous setting. The jack 30 as shown is retained in the needle slot and adapted for rotative movement for the same reasons as the jack of Fig. 1. Ring 38 is the same as ring 18. Restoring force 39 may act in the same way as at the point 27 in Fig. 1.

The jack 40 of Fig. 3 is also quite similar to the jack of Fig. 1 except for more elaborate pressure surfaces on the outside edge both of the upper and lower arms. In Figs. 1 and 2 the jacks are adapted to be selectively set by a counter clockwise movement only. In Fig. 3 the jack may be selectively set either in a clockwise or counter clockwise manner.

For counterclockwise movement the actuating force may be applied at different levels but all effective for the same distance towards the needle cylinder. If the actuating force is applied at the level 41 the projection 42 is encountered and the jack will be moved the maximum distance in a counter clockwise direction resulting in the raising cam 43 advancing the needle to a fully advanced position. If the actuating force is applied at the levels 44 a recessed shoulder is struck which will result in the jack being moved to the full line position which will mean a partially advanced needle when cam 43 arrives. If the actuating force is simultaneously applied at levels 45 there will be no counter clockwise movement of the jack even when the jack lies in the dotted line position 46.

The movement of the jack 40 in a clockwise manner may be secured by an arrangement quite similar to that just described. If the pattern controlled actuating force is applied at the point 47 against shoulder 48 it will be apparent that the jack will be moved to dotted line position 46, while if the said force is applied at the points 49 the jack will be moved to its full line position; and if the said force is applied at the points 50 there will be no clockwise movement even when the jack is in dotted line position 51. These actuating forces for clockwise movement are assumed to be effective after cam 43 has raised the jack and its needle and after cam 52 has retracted them.

Fig. 4 discloses a somewhat different form of the invention in which the jack travels up and down in the needle slot with the needle but the jack is not fixedly pivoted to the needle. The lower end of the needle shank 54 is curved in a somewhat circular path fitting loosely in a rectangular slot 55 in the central portion of the jack 56. On either side of slot 55 the inner edge of the jack slopes away towards the upper and lower ends of the jack as in the previous figures to allow for the angular movement which will place the jack in any one of the three positions 59, 60, and 61. Similarly as in the other figures the jack is held in place in the needle slot by the ring 62. The jack of this figure allows for partial retraction as well as partial advancement. If jack 56 is in position to have cam 65 contact with shoulder 63 there will be a partial retraction of the jack while if the jack is in position to have cam 65 strike shoulder 64 there will be a full retraction of the jack. It is obvious from the figure that jack 56 may be partially or fully advanced by cam 68 in the same manner as in Fig. 3. The actuating forces for setting the jack in a counter clockwise manner are shown at the points 70, 71, 72 all of which are of equal extent but have a variable effect on the jack because of the stepped contour of the jack. A similar observation applies to the actuating forces 73, 74, 75 for setting the jack in a clockwise manner. Thus both the upper arm and the lower arm have stepped shoulders for contacting with the cams for longitudinal motion and also have stepped shoulders as contacting surfaces for the forces producing the angular movement.

It should be noted that in all figures the jacks are maintained within the needle slots by a special ring such as ring 18 and that each jack is enabled to hold any particular angular setting given thereto by being bent in such a manner as to frictionally engage the side walls of the needle slot as at the points 19, Fig. 1. It is to be understood that if desired all of the needle slots of the

machine may be provided with jacks of this invention. Where several actuating forces are shown for producing an angular movement of a jack it will be apparent that they are intended to be operative only one at a time and at the proper time with respect to the longitudinally advancing or retracting cams.

Figs. 5 and 6 illustrate a jack quite similar to that of Fig. 1 except that the frictional opposition against movement is secured by a finger or tab **80** which acts as a spring to frictionally contact with a side wall of the slot. The lower end of the jack **81** has the cam actuated shoulders as in Fig. 1 and the jack is held in the slot by having its arcuate shaped central portion **82** contact with the stationary ring **83**.

In Fig. 7 the jack comprises two members, member **84** lying in the bottom of the slot and having on its opposite edge a knob **85** fitting into a socket opening **87** in the other member **86** of the jack. But it should be noted that the socket opening **87** is large and does not per se prevent the separation of the two members. The two members however are held together by the stationary ring **88** outside the needle slot. It will of course be understood that each cylinder needle of a knitting machine may be provided with a jack such as that shown in Fig. 7 or any of the other figures, all jacks being held in place by the special ring such as ring **88**.

In Fig. 8 the jack is somewhat modified over the other examples in that the bearing surface **90** does not project beyond the needle slot walls **91** but is substantially flush therewith. Stationary ring **92** holds the jack **93** in the slot by contacting with the arcuate bearing surface **90** as the jack is moved longitudinally or is rotated about its center. The inner edge of the jack does not project as a single point contact with the slot bottom as in Fig. 1 but is slightly rounded as shown at the point **94**, about which the jack rocks in its angular movement. The lower arm of the jack has the two spaced shoulders **95**, **96** to provide for selective longitudinal movement of the jack depending upon which shoulder is effective at a given instant. The upper arm of the jack has a butt **97** at its extreme upper end to be used as the point of application of force to the jack to set the jack in a given angular position, as by a pattern wheel for example, the jack being capable of assuming three angular positions, one where neither of the shoulders **95**, **96** is effective and two other positions where they are effective.

The jack of Fig. 9 is identical with that of Fig. 8 except that its jack has the butt on the upper arm at a point near the central portion of the jack. The jack of Fig. 9 has therefore been given the same reference characters as in Fig. 8 except that they have been primed. The two jacks of Figs. 8 and 9 are particularly useful for being placed in alternate slots of a knitting machine particularly a machine of fine mesh so that the same pattern mechanism may selectively set both types of jacks through butts **97**, **97'** without the degree of accuracy that would be required if jacks with the same type butt were used around the needle cylinder.

It is of course to be understood that any of the above described jacks may be corrugated as the jack of Fig. 1 to provide sufficient friction with the side walls of the slot to enable the jack to hold a given angular position while it is being moved longitudinally.

It will be apparent that the jack of this invention may be adapted for a wide variety of uses in knitting machines as affording independent control of the knitting operations of each needle in producing many and varied pattern effects. For such purposes it is to be understood that this invention is not limited to the forms of jacks specifically illustrated but may have other embodiments coming within the scope of the appended claims.

What is claimed is:

1. In a knitting machine, in combination, a slotted bed, a knitting element in one of the slots, a jack mounted for sliding movement in said slot and for rocking movement in said slot on an axis intermediate to its ends, said jack being separable from said knitting element without removal of the knitting element from the slot, and frictional means adjacent to said axis for resisting movement of said jack from any rocked position.

2. In a knitting machine, in combination, a slotted bed, a knitting element in one of the slots, a jack mounted for sliding movement in said slot and for rocking movement in said slot on an axis intermediate to its ends, said jack being separable from said knitting element without removal of the knitting element from the slot, and frictional means adjacent to said axis for resisting movement of said jack from any rocked position, said jack being formed at one end with a plurality of cam-engaging shoulders, and a cam adapted to engage said shoulders selectively depending on the position to which said jack is rocked.

3. In a knitting machine, in combination, a slotted bed, a knitting element in one of the slots, a jack mounted for sliding movement in said slot and for rocking movement in said slot on an axis intermediate to its ends, said jack being separable from said knitting element without the removal of the knitting element from the slot, frictional means adjacent to said axis for resisting movement of said jack from any rocked position, said jack being formed at one end with an arcuate end surface the center of which is the axis of rocking movement and at the other end with a plurality of cam-engaging shoulders, and said knitting element being formed with an arcuate surface conforming to and adapted to be engaged by the aforesaid arcuate surface, and a cam adapted to selectively engage said shoulders to impart sliding movement of different extents to said jack and said knitting element.

4. In a knitting machine, in combination, a slotted bed, a knitting element in one of the slots, a jack mounted for sliding movement in said slot and for rocking movement in said slot on an axis intermediate to its ends, said jack being separable from said knitting element without removal of the knitting element from the slot, and frictional means adjacent to said axis for resisting movement of said jack from any rocked position, said jack being formed on its outer edge at each side of its axis of rocking movement with a plurality of surfaces adapted to receive rocking force at different levels with respect to the bottom of the slot.

5. In a knitting machine, in combination, a slotted bed, a knitting element in one of the slots, a jack mounted for sliding movement in said slot and for rocking movement in said slot on an axis intermediate to its ends, said jack being separable from said knitting element without removal of the knitting element from the slot, frictional means adjacent to said axis for

resisting movement of said jack from any rocked position, said jack having a guide portion extending out of said slot and formed with an arcuate outer edge, the center of such arc being the axis of the rocking movement, and means extending parallel to said slot for a distance not less than the extent of said sliding movement and serving to act against said arcuate edge to maintain the element fully seated in its slot regardless of which of its positions it is in.

6. In a knitting machine, in combination, a slotted bed, an element mounted for sliding movement in one of the slots and for rocking movement in said slot and having a guide portion extending out of said slot and formed with an arcuate outer edge, the center of such arc being the axis of the rocking movement, and means extending parallel to said slot for a distance not less than the extent of said sliding movement and serving to act against said arcuate edge to maintain the element fully seated in its slot regardless of which of its positions it is in.

7. In a knitting machine, in combination, a slotted bed, and an element mounted for sliding movement in one of said slots and for rocking movement between a multiplicity of relatively angular positions in said slot, said element being formed with a bend intermediate its ends to frictionally engage opposite sides of its slot to resist movement of the element from any one of said angular positions.

8. In a knitting machine, in combination, a slotted bed, and an element mounted for sliding movement in one of said slots and for rocking movement in said slot on a portion intermediate its ends, said element being formed with a bend adjacent to said portion to engage opposite sides of its slot to resist rocking or sliding movement.

9. A knitting jack, comprising a central portion having a rocking surface and diverging end portions, one of said end portions having an arcuate end surface and the other of said end portions being formed with a plurality of shoulders adapted to be selectively engaged by a selecting cam depending on the position to which the jack is rocked, said jack being adapted to be inserted as an independent removable element into a slot of a knitting machine.

10. A knitting jack comprising a central portion having a rocking surface and diverging end portions, at least one of said end portions being formed with a plurality of shoulders adapted to be selectively engaged by a selecting cam depending on the position to which the jack is rocked, and said jack being formed with an arcuate guiding surface disposed outwardly of said rocking surface for engaging a surface extending longitudinally of the jack whereby lateral movement of said rocking surface may be prevented, regardless of which of its positions the jack is in.

11. A knitting jack having a rocking surface and end portions diverging in opposite directions from said rocking surface, said jack being bent laterally adjacent to its rocking surface to engage opposite sides of a slot in a needle bed to permit it to be frictionally held against easy movement in a needle slot.

12. A knitting jack adapted to be mounted for sliding movement on a portion of a knitting machine and to be swung between a multiplicity of positions thereon and formed to provide along its length a plurality of cam-engaging surfaces each adapted when the jack is in one of said positions to be intercepted by a single cam surface, said cam-engaging surfaces being so disposed on said jack that the cam surface will impart to the jack sliding movements in one direction of different extent dependent upon which of the cam-engaging surfaces is intercepted by the cam surface, said jack being adapted to be inserted as an independent removable element into a slot of a knitting machine.

13. A knitting jack adapted to be mounted for sliding movement on a portion of a knitting machine and to be swung between a multiplicity of positions thereon and formed to provide along its length a plurality of cam-engaging surfaces each adapted when the jack is in one of said positions to be intercepted by a single cam surface, said cam-engaging surfaces being so disposed on said jack that the cam surface will impart to the jack sliding movements in one direction of different extent dependent upon which of the cam-engaging surfaces is intercepted by the cam surface, and said cam-engaging surfaces being so disposed that all of them may be moved out of the path of such cam surface by a complete swinging movement of the member, said jack being adapted to be inserted as an independent removable element into a slot of a knitting machine.

14. In a knitting machine, in combination with a slotted bed and actuating means mounted for relative movement, said actuating means including a cam, yarn-manipulating members carried in the slots of said bed, knitting jacks likewise mounted in said slots and arranged for movement along the slots to impart movement to said yarn-manipulating members and also for swinging movement in said slots between a multiplicity of positions, each of said jacks being formed with a plurality of shoulders facing generally away from the yarn-manipulating member and adapted to be engaged by a single surface of said cam when swung to various of said positions whereby movements of different extent may be imparted to said jack and said yarn-manipulating member by said cam, each jack being separable from said yarn-manipulating member without removal of the yarn-manipulating member from its slot.

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