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STROKE CONTROL DEVICE FOR THE NEEDLE BAR MECHANISM OF A WARP KNITTING MACHINE

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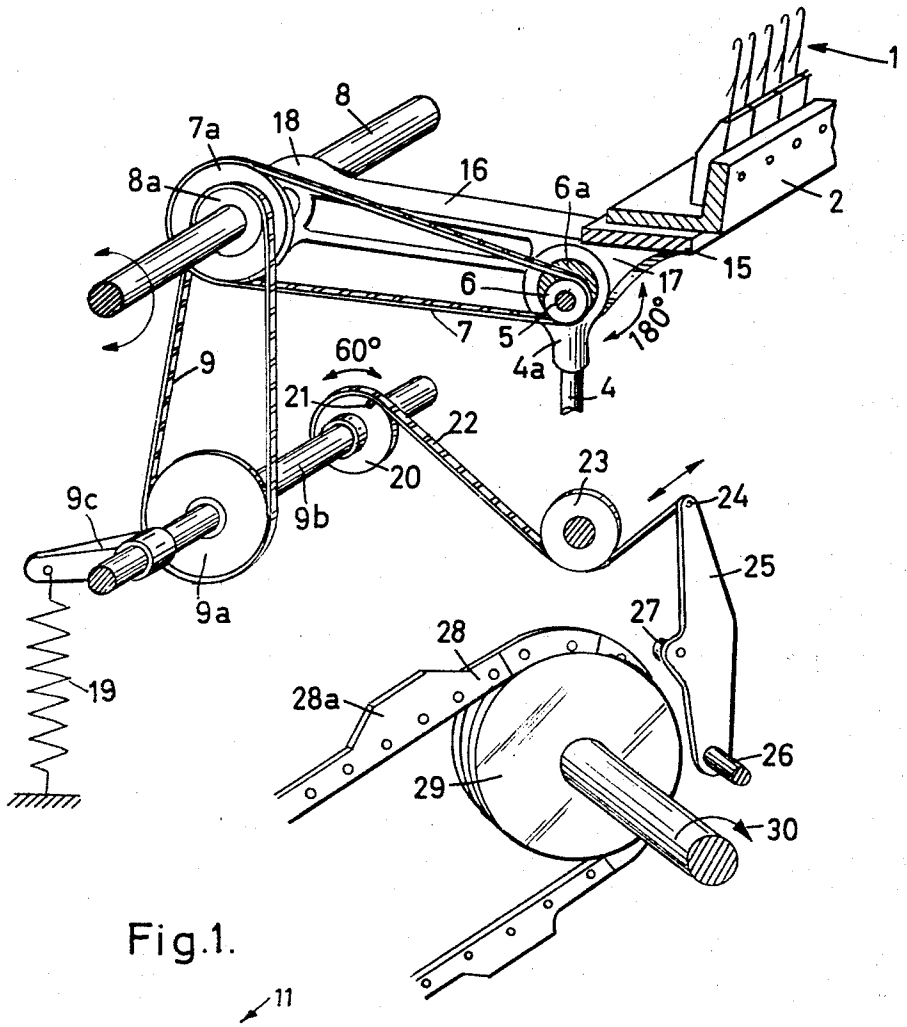


Fig.1.

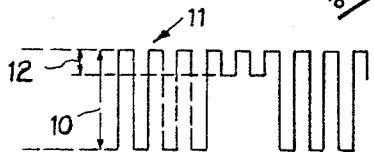
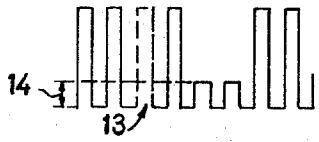


Fig.2

Fig.3



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STROKE CONTROL DEVICE FOR THE NEEDLE BAR MECHANISM OF A WARP KNITTING MACHINE

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U.S. Cl. 66—86 9 Claims

ABSTRACT OF THE DISCLOSURE

The needle bar of a warp knitting machine carries an eccentric to which the push rod of the needle bar mechanism is attached. A pattern mechanism is connected to the eccentric for turning the same in synchronization with the push rod movement, thereby permitting the effective stroke of the push rod to be shortened.

Background of the invention

This invention relates to needle bar motions in warp knitting machines, and particularly to apparatus for selectively preventing knocking off of yarn loops or the taking of yarn by the needles during the otherwise normal knitting cycle.

It is known that special pattern effects can be achieved by laying two or more yarn loops over the needles of a warp knitting machine without intervening knocking over of the loops. It is also known to increase the free length of laid-in yarns in warp knit nets, and thereby to increase the size of the mesh. The afore-described pattern effects were achieved heretofore by the use of double eccentrics which greatly increase the complexity and the cost of the knitting machine. The increase in mesh size was available heretofore only if the knitting machine was run at extremely low speed.

The invention aims at a simple modification of known warp knitting machines which permits both variations of the knitting operation to be achieved without significant increase in cost and without reduction in the output of the machine.

Summary of the invention

According to this invention, at least two sequential strokes of the needle bar between its normal fixed lowermost position and the normal fixed position of maximum needle height are shortened to substantially less than the spacing of the two positions, the shortened strokes terminating at one of the two normal fixed positions and extending therefrom toward the other fixed positions.

If the shortened strokes terminate at the position of maximum needle height, several loops of yarn are wound about the needles without intervening knocking-over. If the shortened strokes terminate at the lowermost position, long free lengths of yarn may be laid-in in a coursewise direction.

One modification of the known needle bar mechanism contemplated for performing the method briefly outlined above involves the provision of an eccentric and of engaging means in motion transmitting engagement with the eccentric respectively arranged on two sequential elements of the motion transmitting linkage which normally connects a source of driving power to the needle bar for moving the latter back and forth during knitting. Actuating means are provided for angularly moving the eccentric on the corresponding linkage element while motion is being transmitted from the source of power to the needle bar by the engaged eccentric and engaging means.

It will be appreciated that the terms "lowermost," "maximum height," and the like, as employed in this specification and the appended claims, relate merely to locations spaced in the direction of normal needle movement which has a major vertical component in most warp knitting machines in practical use at this time, but the invention is not limited to a specific orientation of the knitting machine in the field of terrestrial gravity, and the aforecited terms do not necessarily relate to such field.

The exact nature of this invention as well as other objects and advantages thereof will be readily apparent from consideration of the following detailed description of a preferred embodiment relating to the annexed drawing.

Brief description of the drawing

In the drawing:

FIG. 1 shows a Raschel warp knitting machine of the invention in fragmentary perspective view;

FIG. 2 is a conventional needle bar displacement diagram of the machine of FIG. 1; and

FIG. 3 diagrammatically shows another pattern of needle bar displacement which can be achieved on the machine of FIG. 1.

Description of the preferred embodiment

FIG. 1 shows only as much of an otherwise conventional Raschel warp knitting machine as is necessary for an understanding of the invention, the conventional elements including a row of latch needles **1** mounted on a needle bar **2** and a push rod **4** which is the only illustrated portion of the otherwise conventional needle bar mechanism of the machine and is reciprocated longitudinally by a non-illustrated cam operated by the main drive shaft of the knitting machine, a suitable cam mechanism being shown, for example, in "Warp Knitting Technology" by D. F. Paling, page 243 (Columbine Press, Manchester, England, 1965).

The needle bar **2** is supported on the free ends **15** of guide arms **16** whose other ends **18** are pivotally mounted on a shaft **8** journaled in the machine frame in a manner not illustrated, only one guide arm being seen in FIG. 1.

A depending lug **17** on the arm **16** provides a bearing for a pin **5** on which a small sprocket **6** and an eccentric **6***a* are fixedly fastened. The cylindrical outer face of the eccentric **6***a* is rotatably engaged by a conforming bearing ring **4***a* fixedly mounted on the push rod **4**.

A chain **7** is trained over the sprocket **6** and over a larger sprocket **7***a* fixedly fastened to the shaft **8**. The shaft also carries a smaller sprocket **8***a* which is connected to a larger sprocket **9***a* on a shaft **9***b* by a chain **9**. The shaft **9***b* is journaled in the non-illustrated knitting machine frame and is provided with a radial arm **9***c*, a helical tension spring **19** being interposed between the arm **9***c* and the knitting machine frame and urging the shaft **9***b* to turn counterclockwise, as viewed in FIG. 1.

A wheel **20** is fixedly mounted on the shaft **9***b*. One end of a chain, cable, or other tension member **22** is attached to the circumference of the wheel **20** by a fastener **21** whereas the other end of the tension member **22** is attached to the free end of a rocker arm **25** by a fastener **24**, a central portion of the member **22** being retained over a guide pulley **23**.

The rocker arm **25** is pivotally mounted on the machine frame by means of a pin **26** and carries a steel roller **27** which is biased by the spring **19** into engagement with a pattern chain **28** on a pattern drum **29** connected to the knitting machine drive in a manner conventional in itself and not illustrated, which causes the drum to rotate in the direction of the arrow **30**. Projecting links **28***a* in the chain **28**, when passing under the roller **27**, pivot the rocker **25** against the restraint of the spring **19**. The dimensions of the links **28***a*, the rocker **25**, and the wheel **20** are chosen in such a manner that the shaft **9***b* is pivoted 60° by each passage of a link **28***a* under the roller **27**,

and the ensuing angular movement of the eccentric *6a* is 180°.

As long as the eccentric *6a* stands still while the push rod **4** moves back and forth in a longitudinal direction, the needle bar **2** is lifted and lowered in the conventional manner, and its stroke is represented by the distance **10** in the needle bar displacement diagram of FIG. 2.

If a chain link *28a* engages the roller **27** when the rod **4** and the needle bar **2** begin their downward stroke, as shown at **11** in FIG. 2, the eccentric *6a* is turned clockwise 180° during the downward movement of the rod **4**, and reverts counterclockwise to its original position during the lifting stroke of the push rod **4**, the lengths of the links *28a* being suitably selected in accordance with the relationship between the circumferential speed of the drum **29** and the rotary speed of the non-illustrated cam which operates the rod **4**, the cam and drum being synchronized by the common machine drive. The downward stroke of the needle bar **2** is thereby shortened to the distance **12**, and an additional loop of yarn is laid over the needles **1** by the non-illustrated yarn guides without intervening knocking-over motion.

FIG. 3 illustrates a mode of operation of the needle bar mechanism of FIG. 1 in which the normal position of the eccentric *6a* is angularly offset 180° from that shown in FIG. 1, and the engagement of a link *28a* with the roller **27** is timed to coincide with incipient upward movement of the push rod **4** indicated at **13** in FIG. 3. While the push rod **4** is moved upward by the associated cam mechanism, the rotation of eccentric *6a* by the chain **28** causes the pin **5** to be moved downward into the illustrated position, thereby shortening the upward stroke of the pin and of the attached needle bar **2** to the distance **14**. This permits long lengths of net-inlay threads to be inserted in a coursewise direction.

As is evident from FIGS. 2 and 3, several links *28a* may be arranged one directly behind the other so that several short downward or upward strokes of the needle bar **2** may follow each other. In the several short strokes illustrated in FIG. 2, the yarn loops cannot slide downward over the opened needle latches to the needle shaft. In the short lifting strokes shown in FIG. 3, the needle hooks cannot engage a yarn during the movements of the yarn guides, not themselves shown in the drawing.

The illustrated apparatus thus permits the aforedescribed pattern effects to be produced in a very simple manner without limiting the capacity of the knitting machine to less than the highest rate at which it can normally be operated.

It should be understood, of course, that the foregoing disclosure relates only to a preferred embodiment of the invention, and that it is intended to cover all changes and modifications of the example of the invention chosen for the purpose of the disclosure which do not constitute departures from the spirit and scope of the invention set forth in the appended claims.

What is claimed is:

1. In a method of operating a warp knitting machine in which a needle bar carrying elongated knitting needles is cyclically moved back and forth substantially in the direction of elongation of the needles between a normally fixed lowermost position and a normally fixed position of maximum height, the improvement in controlling movement of the needle bar which comprises shortening at least two sequential strokes of said back and forth movement to substantially less than the spacing of said fixed positions.

2. In a method as set forth in claim **1**, said shortened strokes terminating at one of said fixed positions and extending therefrom over only a small portion of said spacing toward said other fixed position.

3. In a method as set forth in claim **2**, said one fixed position being said position of maximum height.

4. In a method as set forth in claim **2**, said one fixed position being said lowermost position.

5. In a warp knitting machine having a needle support member, a plurality of elongated needles mounted on said support member in fixed spatial relationship, a source of driving power, and motion transmitting means drivingly interposed between said source and said support member for moving said needles back and forth in the direction of elongation of the same, said motion transmitting means including a rod member and a linkage connecting said rod member to said support member, the improvement in the linkage which comprises:

(a) an eccentric mounted on one of said members for angular movement;

(b) engaging means on the other member in motion transmitting engagement with said eccentric; and

(c) actuating means for angularly moving said eccentric and for thereby moving said rod member relative to said support member while motion is being transmitted from said source to said support member by the engaged eccentric and engaging means.

6. In a machine as set forth in claim **5**, said actuating means including means for angularly moving said eccentric back and forth in timed sequence with the back-and-forth movement of said needles.

7. In a machine as set forth in claim **5**, said one member being said support member.

8. In a machine as set forth in claim **5**, said rod member being elongated and being moved in the direction of elongation thereof relative to said support member when said actuating means moves said eccentric.

9. In a machine as set forth in claim **5**, said eccentric having an outer face of circular cross section, said engaging means rotatably engaging said face.

References Cited

UNITED STATES PATENTS

2,428,405	10/1947	Young	66—86
2,451,498	10/1948	Lambach	66—86
2,476,344	7/1949	Young	66—86
2,562,034	7/1951	Hannay	66—86
2,650,486	9/1953	Hartung	66—86
3,006,170	10/1961	Chapuis	66—86

FOREIGN PATENTS

495,036	11/1938	Great Britain.

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