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ERNST-DIETER PLATH
CIRCULAR KNITTING MACHINE HAVING A STRIPING APPARATUS
AND A YARN-ENGAGING HOOK
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3,557,577

Fig. 2

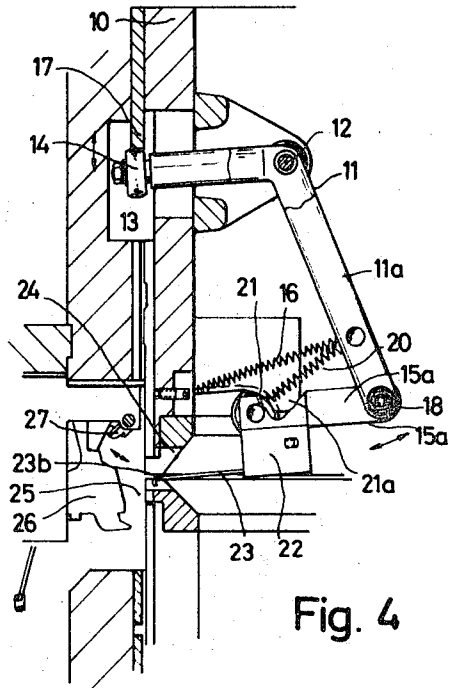
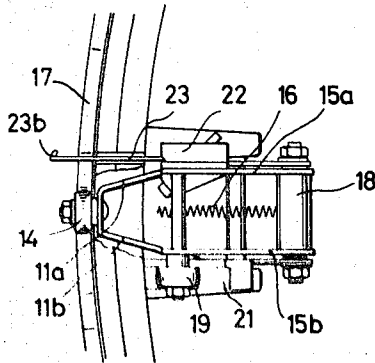


Fig. 4

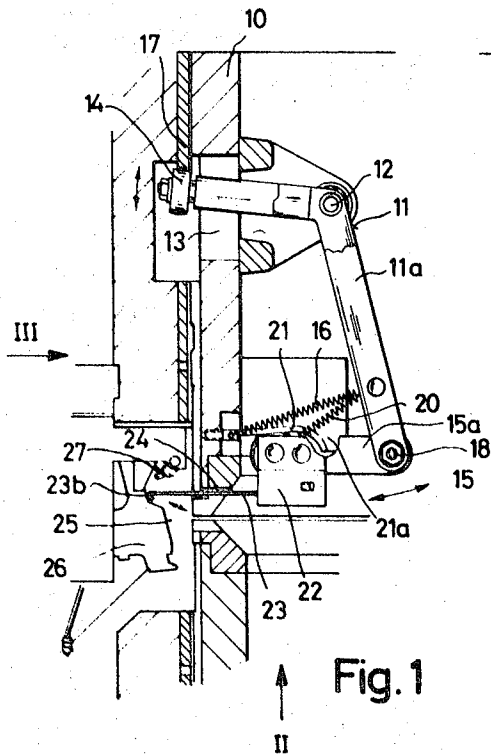


Fig. 1

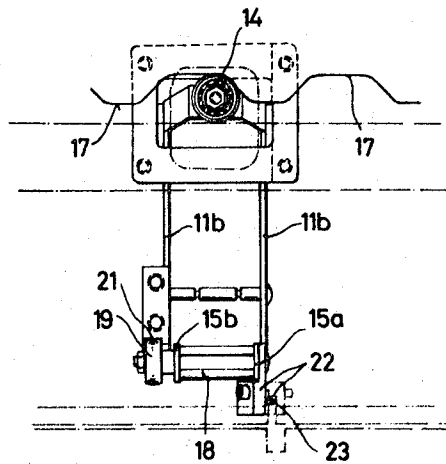


Fig. 3

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CIRCULAR KNITTING MACHINE HAVING A STRIPING APPARATUS AND A YARN-ENGAGING HOOK

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6 Claims

ABSTRACT OF THE DISCLOSURE

Structure for controlling the movement of a yarn-engaging hook of a circular knitting machine having a multiple striping apparatus. The machine includes at least one yarn-engaging hook for engaging and laying a yarn into the striping apparatus. A drive means is operatively connected with the hook for moving the latter along a predetermined path which does not extend along a straight line. The drive means on the one hand shifts the hook longitudinally and on the other hand swings the hook to a limited extent so as to turn the hook simultaneously with the longitudinal displacement thereof, the drive means including a lever system which carries the hook and which has follower rollers coacting with cams to bring about the movement of the hook.

BACKGROUND OF THE INVENTION

The present invention relates to circular knitting machines.

In particular, the present invention relates to circular knitting machines having multiple striping apparatus and at least one yarn-engaging hook which is driven so as to engage a yarn which is to be laid into the striping apparatus.

With circular knitting machines which have multiple striping apparatus there is the problem of directing the different yarns selectively to the needles of the machine so that the yarns will be reliably worked by the needles. In order to assure a proper guiding of the yarns, there have already been made different proposals for special constructions of the striping apparatus. In this connection it is also already known to use a yarn-engaging hook by means of which the yarn, which is to be laid into the apparatus, is directed to the region of the needle heads.

SUMMARY OF THE INVENTION

It is a primary object of the invention to provide for a yarn-engaging hook a drive which will achieve a simple and secure control of the yarn-engaging hook to provide a wide range of use thereof.

Thus, for example, it is an object of the invention to provide a structure which can be used in a double-cylinder circular knitting machine where the operation of the yarn-engaging hook is normally rendered difficult because of the relatively wide yarn guide which serves at the same time to cover the latches of the needles.

The above objects are achieved with the structure of the invention by providing for the yarn-engaging hook a drive means which moves the yarn-engaging hook along a path which does not extend along a straight line. For this purpose the hook is longitudinally shiftable and at the same time swingable to a limited extent, with the support means which carries the drive means being formed with a space in which the hook can freely move. The drive means which moves the hook includes levers which are controlled by cams.

With a preferred structure of the invention the drive means for the yarn-engaging hook includes a pair of levers which are pivotally connected to each and which are situated in the same or in parallel planes and are urged by suitable springs, which form a spring means, toward cams engaged by follower rollers carried by the levers. The knitting machine has stationary and rotary parts, and one of the cams is connected to a stationary part of the machine while another cam is connected to a rotary part of the machine.

By providing movement of the yarn-engaging hook along a path which does not extend along a straight line, the reliable operation of the hook is rendered to a very large extent independent of the shape and size of the yarn guide of the machine. A yarn-engaging hook with the drive according to the invention can also be used with very wide yarn guides, for example in the region above the yarn guide, so that a selected yarn which is situated at the latter region can be engaged by the hook and then pulled around the yarn guide down into the region of the knitting needles.

As a result of providing the drive means of the invention which includes the cams and levers which have follower rollers engaging these cams, the path along which the yarn-engaging hook moves can very easily be corrected by changing the configuration of the cams as required and by exchanging one cam-carrying assembly for another. The limited extent of swinging movement of the yarn-engaging hook in a guide passage provided therefor reduces the danger of breaking of the hook if it should happen that it engages an obstruction.

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a fragmentary schematic partly sectional elevation of a needle cylinder and a stationary cam assembly which coacts therewith at the region of the knitting location, FIG. 1 showing a yarn-engaging hook and drive means therefor of the invention, and the hook of FIG. 1 is shown in an outwardly driven position;

FIG. 2 is a fragmentary schematic upwardly directed plan view of the drive means of FIG. 1 as seen in the direction of arrow II of FIG. 1;

FIG. 3 is a front elevation of the structure as seen in the direction of arrow III of FIG. 1, the cylinder wall structure being omitted from FIG. 3 and indicated only in phantom lines so as to more clearly show the details of the invention; and

FIG. 4 is a view corresponding to FIG. 1 but showing the yarn-engaging hook in the position it takes when it has been drawn inwardly to a position opposed to that of FIG. 1.

DESCRIPTION OF A PREFERRED EMBODIMENT

The drawings illustrate a yarn-engaging hook with a drive means according to the present invention operatively connected thereto. The illustrated structure is designed to be used with a circular knitting machine having a rotary needle cylinder and a stationary cam assembly. Thus, the illustrated structure includes the rotary needle cylinder 10 to which the structure of the invention is connected, this cylinder 10 being for example the upper cylinder of a double-cylinder circular knitting machine.

The drive means operatively connected to the yarn-engaging hook includes a two-armed swingable lever 11 having the configuration of a bell crank and pivotally supported by a pin 12 carried by a bracket which is fixed to the cylinder 10. The upper arm of the lever 11 of the

drive means extends through an opening 13 of the cylinder 10 and terminates in a cam-follower roller 14 supported for rotary movement by a ball bearing, for example. The other end of the lever 11 is situated in the interior of the cylinder 10 and is pivotally connected with a second, one-armed lever 15 of the drive means of the invention.

In order to increase the rigidity and stability of the drive means both of the levers 11 and 15 are formed of a pair of members extending substantially parallel to each other, so that the lever 11 has a pair of such members 11a and 11b, while the lever 15 has a pair of elongated substantially parallel members 15a and 15b. These members of each lever are fixed to each other by suitable cross rods so that each lever has a relatively rigid construction. The details of this structure are particularly apparent from FIGS. 2 and 3.

The follower roller 14 at the end of the arm of lever 11 which extends through the opening 13 of the cylinder 10 is urged upwardly, as viewed in FIGS. 1 and 4, by a spring means in the form of a tensioned coil spring 16 connected between the other arm of the lever 11 and a pin fixed to the cylinder 10. Thus, the spring means 16 acts to urge the follower roller 14 against the camming edge of a cam 17 which also forms part of the drive means and which is carried by the cam support structure which is stationary and surrounds the needle cylinder 10.

At the free end of the second lever 15, which is pivotally connected to the lever 11 by the elongated pivot pin 18, there is a second follower roller 19 carried by the free end of the lever 15 and shown most clearly in FIGS. 2 and 3. The axis of the follower roller 19 is perpendicular to the axis of the follower roller 14. The second follower roller 19 is urged by a spring 20 of the spring means into engagement with the camming edge of a cam 21 which is fixedly mounted on the cylinder 10 in the interior thereof. Thus, the spring 20 of the spring means, which is connected between the levers 15 and 11, serves to urge the follower roller 19 into engagement with the camming edge of the cam 21. This cam 21 is provided at its end portion which is directed toward the interior of the cylinder 10 with an outwardly stamped camming projection 21a.

Moreover, the second lever 15 of the drive means is provided with a holder 22 which carries the yarn-engaging hook 23, this holder 22 being carried by the lever 15 and supporting the rear end 23a of the hook 23 so that at its rear end 23a the hook 23 is swingable. In addition, the hook 23 extends through an opening or space 24 which is formed in the wall of the cylinder 10 and which forms a passage for guiding the hook 23 so that it is longitudinally shiftable with respect to the needle cylinder 10 as well as swingable with respect thereto to a limited extent.

In FIG. 1 the yarn-engaging hook 23 is shown in its outwardly driven position where the hook end 23b thereof is in the region of a yarn 25 situated at the location indicated in FIG. 1 by the striping apparatus. This striping apparatus of the knitting machine is schematically indicated in FIG. 1 only by a yarn guide 26 having a clamping device 27 for the yarn 25.

The above-described drive means of the invention, composed primarily by the levers 11 and 15 and the cams 17 and 21 which coast therewith, drive the yarn-engaging hook from the outwardly driven position thereof shown in FIG. 1, which is the yarn "attaching" or engaging position, first through a turning movement of the lever 11 in a counterclockwise direction, as viewed in FIG. 1, achieved by way of the cam 17, in a longitudinal direction inwardly through the guide passage 24 of the needle cylinder 10 radially toward the axis of the cylinder 10. As a result of this swinging of the lever 11 and radial longitudinal movement of the hook 23 inwardly toward the axis of the cylinder, the follower roller

19 of the second lever 15 moves along the camming edge of the cam 21 also inwardly toward the axis of the cylinder. As soon as the follower roller 19 reaches the camming projection 21a, the second lever 15 is swung around the pivot 18 also in a counterclockwise direction, as viewed in FIG. 1, so that the hook 23 now swings together with the lever 15. As a result the hook 23, guided by the passage 24 of the cylinder, is given a limited swinging movement resulting in a downward displacement of the hook end 23b of the hook until the latter reaches the position indicated in FIG. 4 which is the inwardly drawn end position of the hook opposed to its outwardly driven end position shown in FIG. 1.

In this way it is possible for a yarn to be engaged by the hook end 23b of the hook 23 while providing this hook end 23b with a movement along a path, different from a straight line, which in the illustrated example extends around the edge of the relatively wide yarn guide in a downward direction until the yarn has been placed in this way into the operating region of the unillustrated knitting needles guided for movement by the needle cylinder 10, the inwardly drawn yarn then being in a position to be knitted into the fabric.

The drive means for the yarn-engaging hook according to the present invention can be changed in various constructive manners. Thus, the cam 17 and 21 of which the cam 17 is connected to a stationary part of the machine and the cam 21 with a rotary part of the machine can, for example, be interchanged so that the cam 21 is connected to a stationary part of the machine while the cam 17 is connected to a rotary part of the machine.

Although this invention is illustrated and described with respect to one preferred embodiment thereof, it is to be understood that it is in no way limited to one such preferred embodiment but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. In a double-cylinder circular knitting machine having rotary needle cylinders and stationary actuating cams and multiple striping means, comprising in combination, at least one yarn-engaging hook for engaging a yarn thread when it is moved into an operative position by said striping means, a pair of levers pivotally mounted in each needle cylinder for joint movement therewith, said yarn-engaging hook being supported on one lever of said pair of levers, a pair of cams coasting with said pair of levers to control the movement thereof, spring means coasting with said pair of levers for maintaining the latter in operative relationship with respect to said pair of cams, said one supporting lever of said pair of levers moving said yarn-engaging hook along a path which does not extend along a straight line.
2. The combination of claim 1 and wherein one of said cams of said pair of cams being connected to the stationary actuating cams of the machine and the other of said pair of cams being connected to the rotary needle cylinders of the machine.
3. The combination of claim 2 and wherein each one of said levers respectively terminates in follower rollers which respectively engage said pair of cams, and said rollers respectively having axes which are perpendicular to each other.
4. The combination of claim 3 and wherein one of said levers is a two-armed lever which at one end carries one of said follower rollers to coast with one of said cams, said two-armed lever being pivotally connected at its other end to the other of said levers.
5. The combination of claim 4 and wherein said other lever is a one-armed lever.
6. The combination of claim 5 and wherein each of said levers includes a pair of elongated members spaced from and connected to each other, and the pivotal connec-

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tion between said levers including a transverse member extending between and pivotally connecting the elongated members of one lever with the elongated members of the other lever.

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