

Feb. 16, 1971

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3,563,059

CIRCULAR KNITTING MACHINE WITH MULTIPLE STRIPING MEANS

Filed April 2, 1969

2 Sheets-Sheet 1

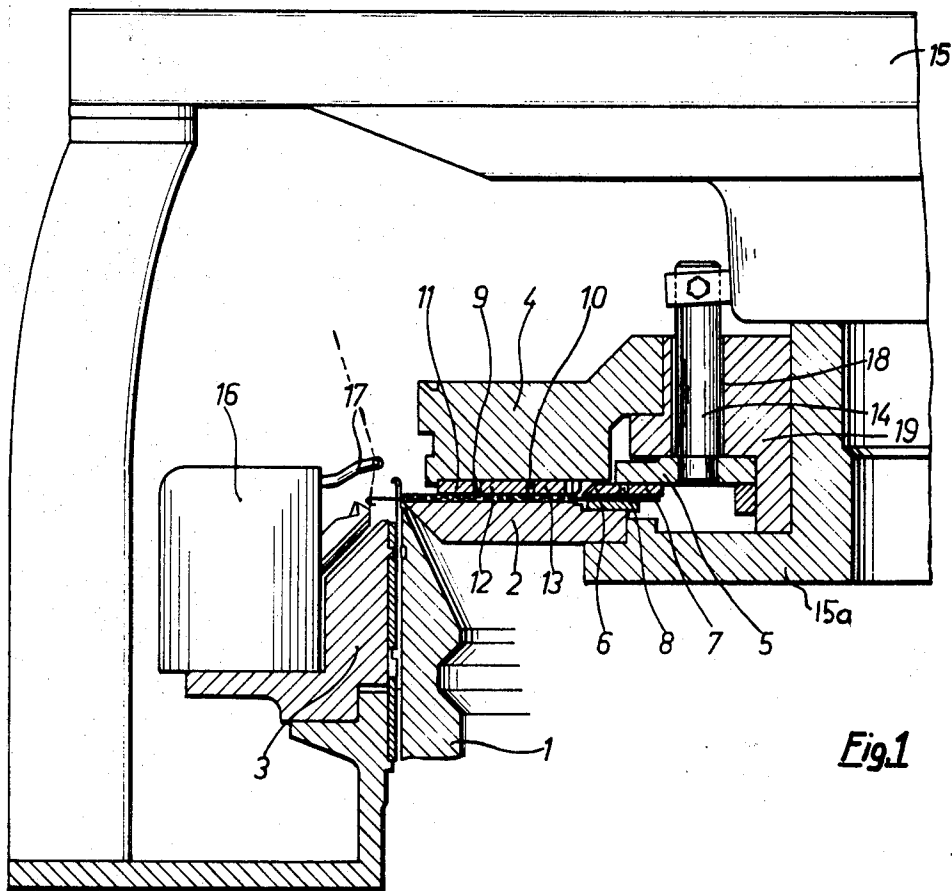


Fig. 1

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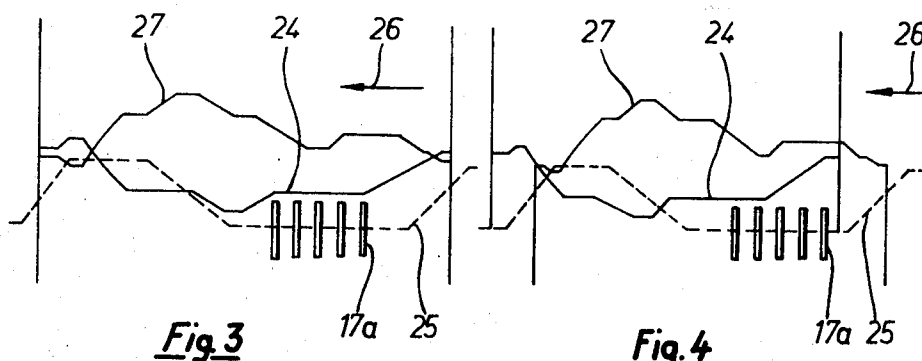
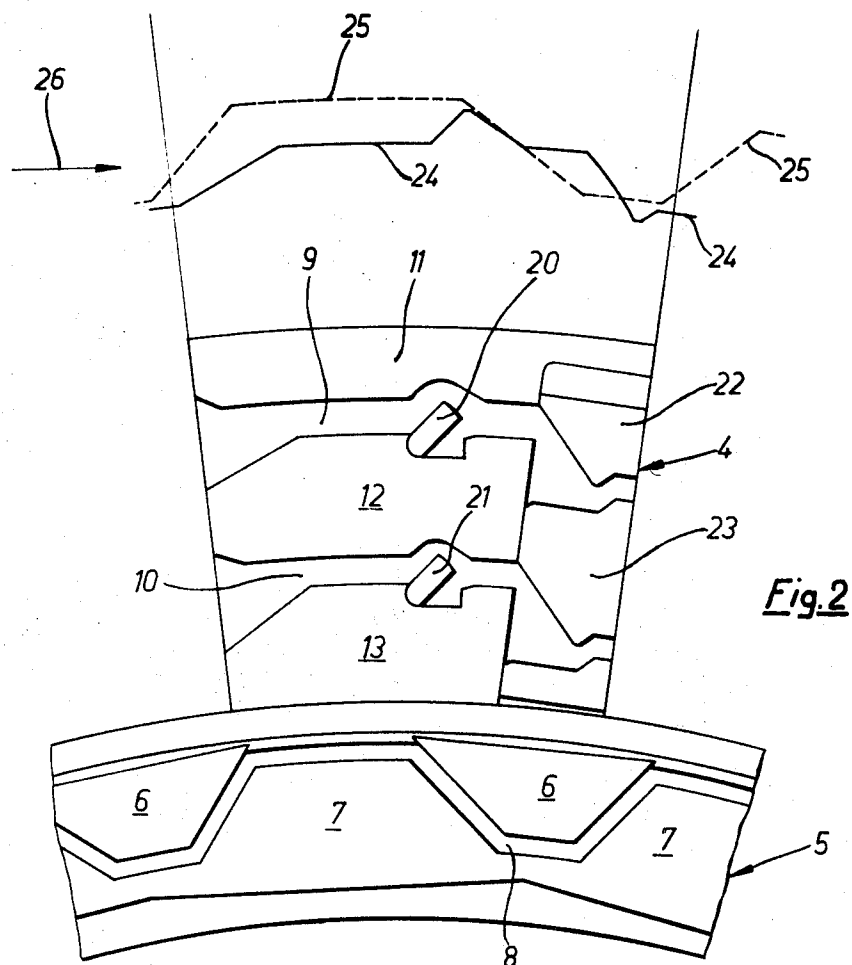
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CIRCULAR KNITTING MACHINE WITH MULTIPLE STRIPING MEANS

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Filed Apr. 2, 1969, Ser. No. 812,711

Claims priority, application Germany, Apr. 17, 1968,
P 17 60 196.6

Int. Cl. D04b 9/06, 15/48

U.S. Cl. 66—19

3 Claims

ABSTRACT OF THE DISCLOSURE

An improved arrangement for introducing striping threads into a circular knitting machine during the operation thereof. The arrangement comprises a plurality of thread insertion fingers which are operatively mounted adjacent to the cylinder cam box of the circular knitting machine. A preselected thread insertion finger is adapted to guide a striping thread into an operative position in which it can be engaged by a catch hook which is operatively mounted in the dial of the circular knitting machine. The movement of the catch hook is guidingly controlled by a cam member mounted on the dial of the circular knitting machine. This cam member is fixed with respect to the cylinder cam box, whereas the dial cam members which guide the dial needles are movably mounted in the dial cam box ring so that they may be moved from a normal knitting position to a delayed-timing knitting position. Consequently, the positions of the cam member for controlling the movement of the catch hook and the cam members of the cylinder cam box are fixed with respect to each other, whereas the cam members of the dial cam box, which control the movement of the dial needles, are movable with respect to the aforementioned two cam members.

BACKGROUND OF THE INVENTION

The striping arrangement, which includes a plurality of thread insertion fingers which are mounted adjacent to each other, must be able to securely guide the preselected striping thread to the dial or cylinder needles in such way that it can be engaged by these needles in a smooth and secure manner. In the prior art devices a catch hook has been operatively mounted into the circular knitting machine for providing such a secure guiding of the striping thread. However, in particular with circular knitting machines having a large number of knitting systems mounted around the periphery of the machine, one is faced with a twofold design problem. On the one hand, it is desirable to design the cams for each cam knitting system as compactly as possible so that they occupy a minimum peripheral space around the circular knitting machine. On the other hand, it is necessary to provide sufficient space for properly mounting the multiple striping arrangement, which includes a plurality of thread insertion fingers mounted adjacent to each other. The thread insertion fingers co-operate with the catch hook to provide a secure guiding for the striping thread during the knitting operation. The aforementioned design problem is aggravated by the requirement that the guiding means for the striping threads must operate during two different knitting operations, namely a synchronized-timing knitting operation and a delayed-timing knitting operation. As is well known in the art, the cam members of the dial cam box must be shifted relative to the cylinder cam box when the circular

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knitting machine is adjusted from one to the other of the aforementioned two knitting operations.

SUMMARY OF THE INVENTION

It is a primary object of this invention to provide multiple striping means for securely guiding striping threads during a synchronized timing knitting operation as well as during a delayed timing knitting operation of the circular knitting machine.

It is another and more specific object of this invention to provide multiple striping means in a circular knitting machine which include a catch hook, the movement of which is controlled by cam members mounted in the dial cam box of the circular knitting machine. The cam members for the catch hook are independently mounted from the other cam members in the dial cam box, the latter being shiftable from a synchronized timing knitting operation to a delayed timing knitting operation and vice versa, whereas the cam members for the catch hook are fixed in position in relation to the cam members of the cylinder cam box.

Another more specific object of this invention is to provide multiple striping means which securely guide the striping threads during a single-face fabric knitting operation in which only the cylinder needles operate.

The striping arrangement of the instant invention comprises the usual plurality of juxtapositioned thread insertion fingers which form part of the striping means in each knitting system and the usual catch hook which co-operates with the thread insertion fingers. The catch hook, however, is guided in a separate track of the dial cam box and, consequently, is not acted on by the cam members which control the movement of the dial needles. Such an arrangement makes it possible to guide the catch hook in such a manner that it provides a secure guiding of the striping threads in the same manner during a synchronized-timing knitting operation, a delayed-timing knitting operation and a knitting operation wherein the cylinder needles operate only, i.e. a single-face fabric knitting operation. For this purpose, the guide track for the catch hook is advantageously positioned in a special dial cam race ring portion which can be adjusted with respect to the cam members for controlling the movement of the dial needles. The special dial cam race ring portion is fixed with respect to the cylinder cam box, thereby providing for a secure guiding of the striping threads in co-operation with the thread insertion fingers, both in the synchronized timing knitting operation and in the delayed-timing knitting operation. Consequently, the dial cam race ring portion for the catch hook causes the catch hook to operate in the same manner regardless of whether the dial cam members for the dial needles are positioned in the dial cam box in the synchronized-timing knitting position or in the delayed-timing knitting position. The special dial cam box ring portion causes the catch hook to move into its operative position prior to the corresponding movement of the dial needles, so that each striping thread which has been moved forwardly by its corresponding thread insertion finger, can be securely grasped and guided to the knitting needles.

BRIEF DESCRIPTION OF THE DRAWING

The drawing illustrated diagrammatically one embodiment of the multiple striping arrangement of this invention as incorporated in a circular knitting machine.

FIG. 1 is a diagrammatic sectional view through the dial and cylinder cam boxes of a circular knitting machine including a multiple striping arrangement in accordance with this invention;

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FIG. 2 is a plan schematic view of the dial cam races for the dial needles and the catch hook; and

FIGS. 3 and 4 are illustrations of the knitting curves of the cylinder and dial needles as well as of the guide curve for the catch hook, respectively for a synchronized and delayed-timing knitting operation.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the figures there is illustrated in FIG. 1, the rotating needle cylinder 1 and the rotating dial disc 2 in a circular knitting machine. The cylinder 1 co-operates with a stationary cylinder cam box 3 also mounted in the circular knitting machine. The dial disc 2 cooperates with a stationary dial cam box ring 4 which is adjustably mounted in the circular knitting machine, and is operatively connected to an adjusting mechanism (not illustrated), which is adapted to move the stationary cam box ring 4 from a synchronized timing knitting position to a delayed-timing knitting position and vice versa.

As can be noted from FIG. 2, the catch hook co-operates with a special dial cam race portion 5 which has the cams 6 and 7 mounted therein.

The guide track 8, formed by the cams 6 and 7, forms a special guide track for guiding the catch hook (not shown in the drawing). The guide tracks for the short and long dial needles (not shown in the drawing) are defined by the cams 11, 12, 13 which form the guide tracks 9 and 10. As can be noted from FIG. 1 of the drawing, the cams 11, 12, 13 are mounted in the dial cam box ring 4.

As can be noted from FIG. 1, the circular knitting machine comprises a fixed frame 15 on which there is mounted a supporting shaft 14 for supporting the dial-cam-ring-portion 5 so that the latter is fixed with respect to the stationary cylinder cam box 3. As can be noted from FIG. 1, the striping arrangement comprises a box 16 for each knitting system in which there are mounted a plurality of thread insertion fingers 17. The box 16 is securely mounted on the cam box ring 3. The circular knitting machine is further provided with a suitable angular flange portion 15a which supports a ring 19 which has a semicircular passage 18 through which the shaft 14 extends. The ring 19 is secured to the dial cam box ring 4 and, when angularly adjustably shifted from one limit-position to another by means of the shifting of the support ring 19, causes the required angular adjustment of the dial cam box ring 4 relative to the cylinder cam box ring 3 so that the necessary shifting from the synchronized-timing knitting position to the delayed-timing knitting position can be effected and vice versa. During this angular shifting of the dial cam box ring 4, the special dial cam box ring portion 5 remains stationary.

As can be noted from FIG. 2, which illustrates in plan view the dial cam ring 4 as well as the special dial cam ring 5 for guiding the catch hook, there are provided in the dial cam ring 4 separate cam tracks 9 and 10, respectively guiding the short and long dial needles of the circular knitting machine. The guide cam track 8 guides the catch hook. The guide tracks 9 and 10 are defined by the cam portions 11, 12, 13, whereas the guide track 8 is defined by the cam portions 6 and 7. In addition thereto there are movably operatively mounted in the dial cam box 4 clearing cams 20, 21, respectively cooperating with the short and long dial needles, as well as the stitch cam members 22 and 23. As has already been mentioned, in the description of FIG. 1, the dial cam ring 4 is shiftable relative to the cam ring 5.

There is diagrammatically illustrated by means of a solid line 24 the knitting curve for the dial needles of the circular knitting machine. Furthermore, the path described by the catch hook is illustrated by the dashed line 25 in FIG. 2. The movement of the catch hook is, of course, controlled by the guide track 8. The dial needles move in the direction of the guide track 8. The dial

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needles move in the direction of the arrow 26. It can be noted from FIG. 2 that the guide hook is projected to its most forward position earlier and ahead in relation to the projection of the dial needles. As can be clearly noted from FIGS. 3 and 4, this arrangement assures that the catch hook is located in its most forward position before the first thread insertion finger 17a of a multiple striping arrangement has been passed, both during a synchronized-timing knitting operation and a delayed-timing knitting operation. Thus, the secure guiding of the striping thread and the secure engagement thereof by a catch hook is assured both during the synchronized as well as the delayed-timing operation. There is, furthermore, illustrated in FIGS. 3 and 4 in addition to the knitting curve 24 for the dial needles the knitting curve 27 for the cylinder needles. A comparison of FIGS. 3 and 4 shows that, due to the fixed relationship between the cam ring 5 which supports the cams 6 and 7 for the guiding of the catch hook and the cylinder cam box ring 3, no change of the relative positions of the knitting curve 27 and the guide curve 25 of the catch hook occurs when the dial cam ring box 4 is shifted from a synchronized-timing knitting operation position to a delayed-timing knitting operation position. The only change that can be noted in FIGS. 3 and 4 is that the relative position of the knitting curve 24 for the dial needles changes in respect to the knitting curve 27 and the guide curve 25 as well as with respect to the thread insertion fingers 17 of the striping arrangement 16.

Thus, by providing the special cam ring for the guiding of the catch hook, which is fixed in position relative to the cylinder cam box ring, it is possible to provide an arrangement which securely engages the striping threads of a multiple striping arrangement even in a circular knitting machine having synchronized as well as delayed-timing knitting operations, without unduly increasing the annular space of the individual knitting systems in the circular knitting machine. Since the guide track for the catch hook is completely independent from the relative positions of the guide tracks of the dial needles and consequently from the movement of the dial needles, it is possible to obtain the aforementioned advantages even when the operation performed by a circular knitting machine is a single-face knitting operation in which only the cylinder needles of the machine operate.

Although my invention has been illustrated and described with reference to the preferred embodiment thereof, I wish to have it understood that it is in no way limited to the details of such embodiment but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. A multiple striping mechanism in a circular knitting machine having a dial disc and cylinder, butts on said needles in said dial disc and cylinder, butts on said needles, and a plurality of juxtaposed thread guide members, operatively mounted in said machine, comprising in combination, a dial cam race having a plurality of guide tracks for controlling the movement of the dial needle butts and being adjustably movable between a synchronized-timing knitting position and a delayed-timing knitting position, a cylinder cam race mounted in said circular knitting machine and having guide track means for controlling the movement of the cylinder needle butts, a cam race fixedly mounted in said circular knitting machine adjacent to and spaced inwardly radially of said movable dial cam race, and being adapted to control the movement of a butt of a catch hook and such that said hook functions to grasp a thread made active by a guide member to guide the thread to the needles.

2. A multiple striping mechanism in a circular knitting machine according to claim 1, including means operatively connected to said dial cam race for selectively moving the latter relative to said cam race for controlling the movement of said catch hook.

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3. A multiple striping mechanism in a circular knitting machine according to claim 1, wherein said plurality of juxtaposed thread guide members are mounted adjacent to said cylinder cam race.

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U.S. Cl. X.R.

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