Aug. 24, 1943. T. C. BROMLEY ET AL 2,327,398

CIRCULAR KNITTING MACHINE OF THE LINKS AND LINKS TYPE

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FIG. 2.

FIG. 1.

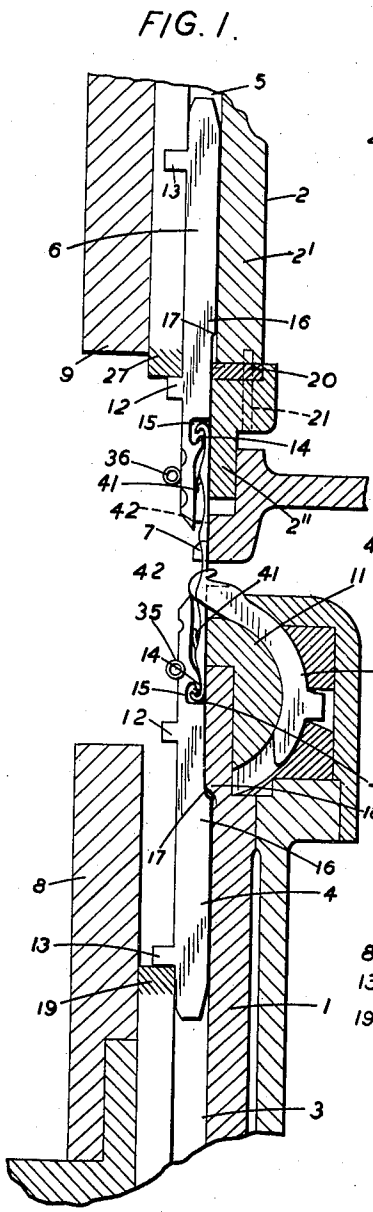
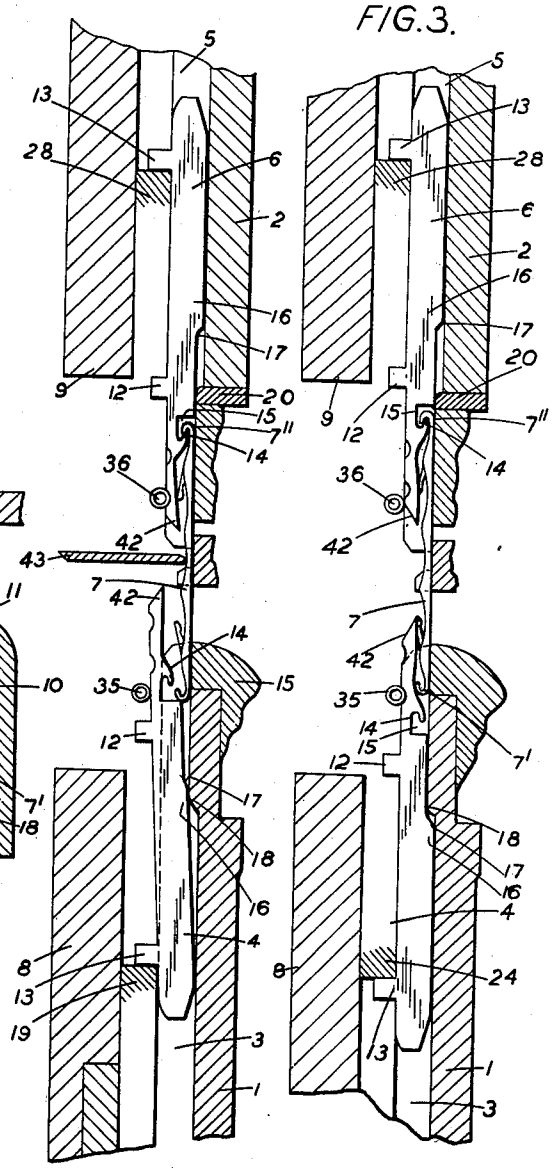


FIG. 3.



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FIG. 4.

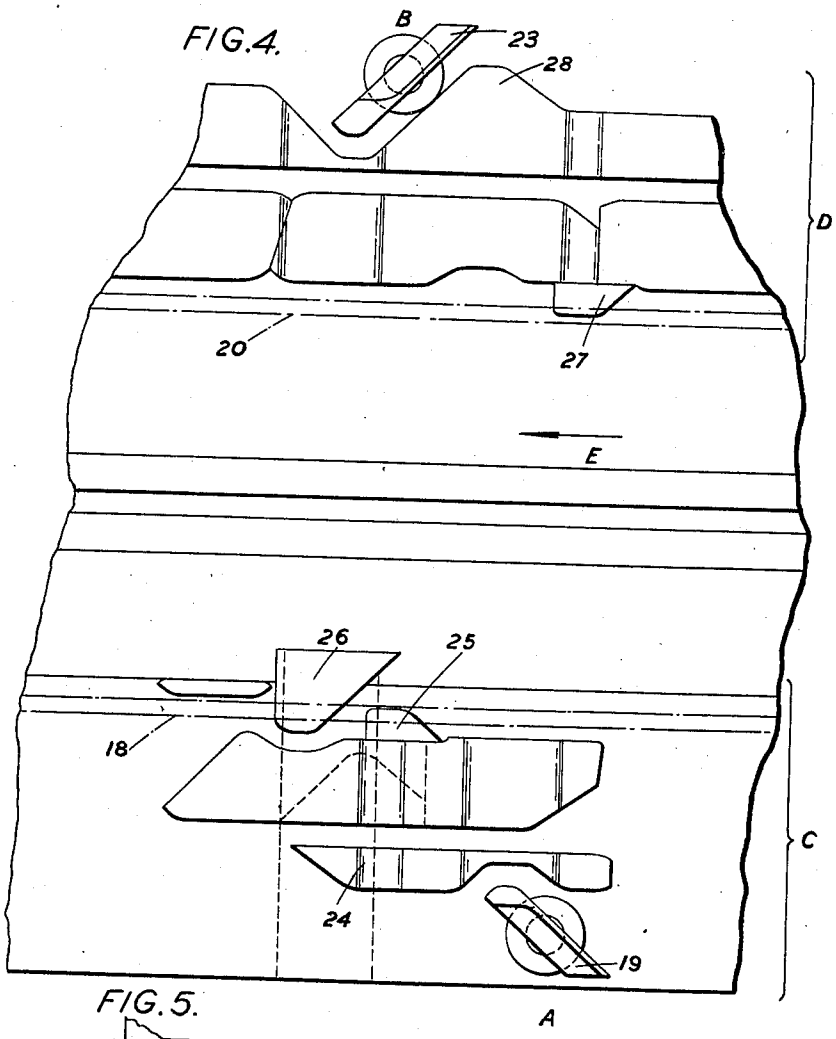
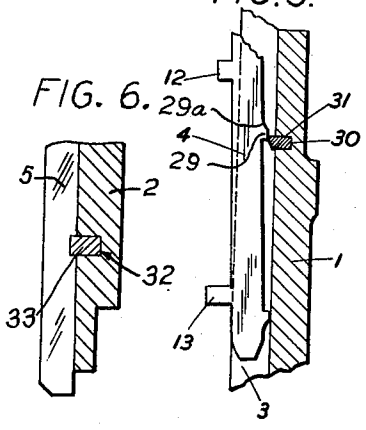


FIG. 5.

FIG. 6.



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Patented Aug. 24, 1943 2,327,398

UNITED STATES PATENT OFFICE

2,327,398

CIRCULAR KNITTING MACHINE OF THE LINKS AND LINKS TYPE

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Application October 1, 1941, Serial No. 413,204
In Great Britain October 5, 1940

2 Claims. (Cl. 66—14)

This invention has reference to circular knitting machines of the links and links type which, as is now well known, include two axially opposed, e. g. superimposed, needle cylinders, double ended needles and associated jacks or sliders whereby the needles are operated for knitting and can be transferred from one needle cylinder to the other so that plain, ribbed and purl fabric can be automatically produced according to requirements as exemplified in United Kingdom Specifications Nos. 15,008 of 1900 and 24,290 of 1912.

The invention, moreover, is applicable to machines of this particular type employing bearded needles as well as to machines employing latch needles.

The invention concerns the operation of the jacks or sliders with respect to the division of jacks or sliders and needles in one needle cylinder and engagement of the divided needles with the complementary jacks or sliders in the other cylinder during transfer actions.

The leading ends of the jacks or sliders advanced under the action of the transfer cams customarily engage dividing cams shaped and arranged to effect outward deflection of the jacks or sliders in relation to the needle cylinders in order to liberate the hooks of the needles from the jacks or sliders in the cylinder from which the needles are being transferred, and to position the complementary jacks or sliders in the opposite cylinder favourably to receive the said needles. The defect with such an arrangement is that the dividing cams are liable to breakage and, not infrequently, to slight displacement with the result that they fail to effect proper deflection of the jacks or sliders. It may thus happen that transfer is not achieved so that the machine is "boxed up" as it is sometimes termed, or that jacks or sliders in one cylinder fail to release the associated needles before they are engaged by the corresponding jacks or sliders in the opposite cylinder, so that the needles are subjected to a pulling action in opposite directions when the jacks or sliders in the two cylinders are retracted under the action of the return cams, whereby the hooks may be stripped off the needles or/and the transfer butts on the jacks or sliders may be broken. In any event, faulty knitted fabric is produced and the machines must be stopped for repairs.

The object of the present invention, therefore, is to provide improved means for effecting the requisite outward deflection of appropriate jacks or sliders during transfer actions.

In order that the invention may be carried into practical effect, some specific examples thereof as applied to a rotary superimposed needle cylinder machine furnished with latch needles will hereinafter be described with reference to the accompanying diagrammatic drawings, wherein,

Figure 1 is a vertical sectional view of so much of said machine, including a double ended latch needle and its associated sliders, as is necessary to illustrate one example of the invention,

Figures 2 and 3 are views somewhat similar to Figure 1 showing the needle and sliders at respectively different stages of a transfer action,

Figure 4 is a developed view of so much of the plain and rib cam systems of the machine as is necessary to show the transfer and associated cams, and

Figures 5 and 6 are detail sectional views depicting portions of plain and rib needle cylinders provided with inserted members constituting sectional rings.

Like parts are designated by similar reference characters throughout the drawings.

In the drawings, the reference numerals 1 and 2 designate the superimposed bottom or plain and top or rib needle cylinders of the machine. The plain cylinder 1 is formed with tricks or grooves such as 3 each of which is adapted to accommodate a bottom slider 4, whereas the rib cylinder 2 is similarly formed with tricks or grooves such as 5 each for accommodation of a top slider 6 (see Figures 1, 2 and 3). One of the double ended needles of the machine—associated with a pair of opposed sliders—is indicated at 7. The aforesaid cylinders are arranged to rotate within stationary bottom and top cam boxes 8 and 9 respectively. In Figure 1, one of the customary holding down sinkers or web holders is also shown at 10, this being mounted for movement in the usual way within a sinker bed or ring 11 associated with the plain cylinder 1.

Each of the sliders 4 and 6 is of conventional form to the extent that it is provided on its frontal or outer edge with spaced knitting and transfer butts 12 and 13 respectively and with a hooked formation 14 and an associated recess 15 at the back, for purposes now well known to those acquainted with the art concerned. Each of said sliders also has a cam formation 16 the leading edge 17 of which is inclined towards the back of the stem. The plain cylinder 1 has formed therein projections 18 which are located at the backs, and at an appropriate position lengthwise, of the tricks or grooves 3. These projections are produced by cutting the lower portions of the tricks or grooves 3 to a greater

depth than the adjoining upper portions. Consequently, whenever a bottom slider 4 is advanced, that is to say raised, under the action of the bottom transfer cam 19, the cam formation 16 on said slider makes contact with the projection 18 and, by reason of the edge 17 riding over this projection, the slider is deflected outwards in the manner shown in Figure 2. The construction so far described is similar to that in a prior machine of which we are aware, and accordingly no claim is made thereto. In accordance with one example of the present invention, however, the rib cylinder 2 is initially made in two separate parts, i. e. an upper main part 2^{I} and a smaller lower part 2^{II} (see Figure 1), and an element in the form of a complete ring 20 is inserted between these two parts and secured by dowel pins such as 21—or any other suitable securing means. The pins 21 also serve to secure the cylinder parts rigidly together in proper axial alignment. A portion of the ring 20 protrudes somewhat from the backs of the tricks or grooves 5 and therefore provides a projection which is for all practical purposes the equivalent of the integral projection 18 in the plain cylinder 1. When a top slider 6 is advanced, that is to say depressed, under the action of the top transfer cam (Figure 4), the corresponding cam formation 16 makes contact with the dividing ring 20, so that the said slider is deflected outwards for the intended purpose.

Figure 4 shows the various cams at the two transfer locations A and B of the machine—as seen from the insides of the cam boxes. For convenience in representation the cams in the plain system are bracketed together at C, while the corresponding cams in the rib system are similarly bracketed together at D. The plain cam system includes the aforesaid bottom transfer cam 19, an associated transfer guard cam 24, and bottom slider-advancing and retracting cams 25 and 26 for purposes presently to be described. The rib cam system, on the other hand, includes the top transfer cam 23, a top slider-advancing cam 27 and an uptake cam 28. The projection 18 in the plain cylinder and the top dividing ring or annular member 20 in the rib cylinder are each represented by a pair of parallel dash-and-dot lines in Figure 4. The direction of rotation of the cylinders is indicated by the arrow E.

By way of example, the transference of a needle 7 from the corresponding bottom slider 4 to the opposing top slider 6 will now be briefly described. First of all the bottom transfer cam 19 and the top slider-advancing cam 27 (which are of the spring-influenced bolt type) are sprung into their operative positions. The bottom slider 4, with the lower edge of its recess 15 in contact with the adjacent needle hook 7^{1}, will thereupon be partially advanced, i. e. raised, to the position shown in Figure 1 by reason of engagement of its transfer butt 13 with the cam 19. At the same time the knitting butt of the empty top slider 6 will engage the cam 27 with the result that said slider will also be advanced, i. e. depressed, somewhat until it engages the needle to be transferred thereto in the now well known manner shown in Figure 1. The bottom slider 4, in continuing its advancing movement under the action of the transfer cam 19, is deflected outwards by contact of the appropriate cam formation 16 with the corresponding projection 18 aforesaid. As a result, the bottom slider is divided from the needle 7 (see Figure 2). Meanwhile the transfer butt 13 of the top slider 6 engages the uptake cam 28 whereby withdrawal of said slider commences so that it takes full possession of the needle; that is to say, the hooked formation 14 of the withdrawing top slider interengages with the hook 7^{II} of the needle. The transfer butt 13 of the empty bottom slider 4 now engages the transfer guard cam 24 so that the last mentioned slider is withdrawn, whilst at the same time the corresponding butt of the top slider 6 rides further up the uptake cam 28 to effect completion of the transfer action. It is convenient to mention here that the cam 25 performs a similar function to the cam 23—during transference of a needle from a top slider to a bottom slider.

Instead of being formed as shown in Figures 1, 2, 3 and 6, each of the sliders may be provided with a butt 29 for contact with the projecting means, this butt having an upper edge 29*a* which is rounded, or partly or wholly inclined towards the back of the slider stem (see Figure 5). The butt 29 is, of course, a form of cam formation.

According to the example illustrated in Figure 5, the plain needle cylinder 1 is formed with a circumferential groove or recess 30 into which are inserted segmental or arcuate elements such as 31 arranged so as to form a complete sectional ring around the cylinder. This rigid ring projects from the backs of the needle tricks or grooves 3 suchwise as to provide a projection for the purpose in view. A similar construction may be adopted in respect of the rib cylinder 2. Thus, as depicted in Figure 6, the said cylinder is formed with a circumferential recess or groove 32 for reception of elements 33 arranged to provide slider-deflecting means of circular form which project from the backs of the tricks or grooves 5.

It is to be clearly understood that any of the improved constructions herein described may be adopted in respect of either of the needle cylinders: that is to say, any one of such constructions may be applied to one of the cylinders of the machine while a different construction is applied to the other cylinder, or a similar construction may be employed in each cylinder of the same machine.

The portions of the inserted rings opposed to the cam formations or butts on the sliders may be bevelled or rounded so as to facilitate the outward deflection of the sliders.

As will be understood, the complementary means are positioned lengthwise of the tricks or grooves suchwise that the transfer sliders are not affected thereby during normal knitting movements, but only when advanced to the extent necessary to effect transfer of needles.

The sliders in the examples described are kept in position circumferentially in the usual way by means of spiral springs 35 and 36.

In connection with machines such as that shown equipped with latch needles transfer cannot be effected if the latch 41 of a needle 7 to be engaged by an opposite jack or slider is closed. Accordingly the jacks or sliders provided by this invention are also formed with pointed, wedge-shaped or like leading ends 42 produced by bevelling, mitring or rounding the said ends between their front and back edges, from front to back, in order to form comparatively thin rearwardly disposed extremities for insertion, during transfer actions, between the opposing hooks of needles to be engaged and the spoons

or free ends of the corresponding latches 41, if closed, whereby the latter are engaged and turned back by the pointed, wedge-shaped or like ends 42 of the jacks or sliders so as to be completely opened preparatory to engagement of the needle hooks by the clutches of such jacks or sliders. It follows, of course, that partly open latches will also be engaged and fully opened.

Means may be provided at each transfer location for holding the needles thereat back in their tricks or grooves during outward deflection of the associated jacks or sliders to divide them from the said needles. As shown in Figure 2, these means may conveniently consist of plates or like elements such as 43 suitably mounted adjacent to the needle cylinders. Such plates or elements may, for instance, be mounted on brackets attached to an appropriate cam box.

The hereinbefore described improvements may be applied to machines with stationary cylinders as well as to machines with revolving cylinders, and to machines with a single feeder as well as to multi-feeder machines.

Moreover, the said improvements are applicable to circular knitting machines of the type described for producing seamless hose, half-hose, socks and other knitted articles, and to larger machines of the same type adapted to produce body fabric and consequently known as body machines, the expression "body fabric" being used in a generic sense intended to include fabric knitted in continuous lengths to be cut up subsequently in the manufacture of garments, as well as garment lengths such as for jackets, jumpers, pullovers and slipovers, for outerwear, and underwear.

What we claim then is:

1. In a circular knitting machine, in combination, axially opposed plain and rib needle cylinders each having therein axially extending grooves, double ended needles in said grooves, a series of needle-operating sliders in the grooves of the plain cylinder, an opposed series of similar sliders in the grooves of the rib cylinder, each of the sliders having on the back thereof a cam formation, cam means for action on the sliders whereby needles can be transferred from one cylinder to the other according to requirements, and, inserted in at least one of the needle cylinders, a rigid ring which projects from the backs of the grooves in said cylinder so that when sliders are advanced during a transfer action the cam formations thereon co-operate with the inserted ring to effect outward deflection of said sliders whereby needles and sliders previously in engagement are divided, for the purpose specified.

2. In a circular knitting machine, in combination, a plain needle cylinder which has therein axially disposed grooves, a rib needle cylinder which is axially opposed with respect to the aforesaid plain cylinder and has grooves therein, at least one of said cylinders also being divided lengthwise into two parts, a rigid ring which is inserted between the said two parts suchwise as to project from the backs of the grooves in said cylinder, means for securing the ring in position between the appropriate cylinder parts, double ended needles in the grooves, a series of needle-operating sliders in the grooves of the plain cylinder, an opposed series of similar sliders in the grooves of the rib cylinder, each of the sliders in the aforesaid divided cylinder, having on the back thereof a cam formation, and cam means for action on the sliders whereby needles can be transferred from one cylinder to the other according to requirements, the construction and arrangement being such that when sliders in the divided cylinder are advanced during a transfer action the cam formations thereon co-operate with the projecting portion of the inserted rigid ring to effect outward deflection of said sliders, for the purpose herein specified.

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