SELECTING MECHANISM FOR CIRCULAR KNITTING MACHINES

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FIG. 1.

FIG. 2.

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SELECTING MECHANISM FOR CIRCULAR KNITTING MACHINES
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This invention is for improvements in or relating to selecting mechanism for circular knitting machines and has for an object to provide a particularly simple form of mechanism applicable to an existing machine for effecting patterning of selected groups of needles.

Certain known forms of circular knitting machines adapted for knitting seamless hose as commonly in use have no provision for variations of the knitting structure from a normal plain or rib fabric. With the modern tendency towards employment of a mesh fabric for ladies stockings such machines require the addition of some sort of needle selecting mechanism to adapt such machines to produce stockings of this kind. Selecting mechanisms as incorporated on other machines adapted to permit variation in the knitting structure are usually of a relatively complex nature and expensive to produce. The present invention aims at providing a relatively simple and inexpensive attachment which can readily be applied to existing machines of the first mentioned type, conveniently without unduly preventing normal operations of the machine, to enable them to produce hose of modified structure, for example mesh fabric structure as normally produced by selecting needles to tuck at appropriate intervals.

In accordance with the invention there is provided in or for a circular knitting machine, selecting mechanism comprising a rotatable disc adapted for mounting adjacent to a needle cylinder or other instrument cylinder to rotate about an axis arranged other than slantwise with respect to the cylinder axis and to be driven from the instruments or the tricks of the cylinder, which disc affords peripheral portions adapted to engage butts associated with certain instruments of the cylinder and to move said butts along the tricks, and intervening recesses into which butts associated with other instruments may enter so as not to be moved by the disc. Thus selecting mechanism of a particularly simple and inexpensive form is provided which can be applied to a circular knitting machine in such a way as to cause certain instruments (and particularly needles) to be selected for operation by appropriate cams for knitting, missing or tucking while others are not so selected, the order of selection being in a recurring sequence such as is suited, for example, for the production of a mesh fabric which may be produced by tucking on selected needles in a chosen sequence and knitting on the remaining needles. For knitting the mesh fabric the disc is conveniently arranged so that the number of needles concerned in the smallest repeated pattern sequence bears an appropriate relationship to the total number of needles around the cylinder to ensure that each needle causes one to tuck or miss at one course will knit at the next successive course. Preferably the arrangement is such that tuck stitches or missed stitches occur at each course substantially midway between succeeding tuck stitches or missed stitches in the next preceding course. A suitable arrangement for knitting a fine mesh stockinette fabric by periodic tucking in this manner is found to be one in which the butt controlling disc is arranged so that in each succeeding group of seven needles one is caused to tuck and the other six to knit so that every seventh needle tucks at one course, and in the next succeeding course the same sequence occurs but with the tuck stitches displaced by three and four needles wales respectively from tuck stitches in the preceding course.

The disc is preferably rotatable substantially tangentially of the cylinder. For example, its axis may be normal to the cylinder axis.

In order that the invention may be better understood reference will now be made to the accompanying drawing in which:

Figures 1 and 2 are diagrams illustrating three forms of selector disc and the manner in which they operate on butts;

Figures 3 and 4 show the selecting mechanism in relation to the knitting cams of a circular knitting machine;

Figure 3 showing the disc in the inoperative position and Figure 4 showing it in the operative position;

Figure 5 is a perspective view showing the knitting cam and the selecting mechanism, while

Figure 6 is a perspective view of a circular knitting machine for knitting seamless hose, showing the selecting mechanism in position and showing control mechanism for it.

In Figure 1 there is shown a selecting and dividing disc 1 which is to be understood as being rotatable, substantially tangentially of the needle cylinder 22 shown in Fig. 6, about an axis which is normal to the cylinder axis. This disc acts on instrument butts 2 to shift spaced butts from level T to level C. In this diagram the illustrated operation of the disc is that of raising the butts but it will be understood that the disc may be arranged to level the butts; in either case movement of the butts causes movement of the associated needles or other instruments along the tricks in which they are mounted in known manner. Specifically the disc may serve to raise butts from a level T at which the associated needles tuck, to a level C at which the needles clear their old loops preparatory to knitting. However, it will also be understood the division effected by the disc may be completed by a cam, the disc serving to bring selected butts to a level at which they are acted on and moved further (e.g. to clearing height) by the cam.

It will be observed that the disc 1 is cut with a plurality of recesses 3 (shown by way of example as four) which are conveniently equally spaced around its axis. In the case of a rotating needle cylinder machine the butts 2 travel from right to left, and in the case of a rotating cam box machine the disc 1 travels from left to right. In either case, relative travel between the butts 2 at level T and the disc 1 results in certain of the butts engaging those portions 4 of the disc periphery which extend between the recesses 3. The disc rotates about its own axis and as a result these butts are raised to level C. As this rotation of the disc occurs a recess 3 is periodically presented at level T in such manner that at least one of the butts 2 passes into that recess and remains therein during a portion of a revolution of the disc; as is clearly shown, such butt is not raised but remains at level T. The result therefore is that while the majority of the butts are raised by the disc 1 to level C, spaced butts are permitted to remain at level T. The spacing between the recesses 3 may be such as to permit each group of raised butts to comprise any desired number, and the size of the recesses 3 may be such as to permit any desired number of butts to remain in the lowered position. In the arrangement shown in Figure 1 every seventh butt remains in the lowered position and the intervening groups of six butts are raised. In the application of the invention to the production of fabric patterned by tuck stitches or miss-stitches this per-
mits tucked or missed stitches to be produced at every seventh wale in every course.

The spacing between the recesses 3 of the disc may be unequal.

It is preferred that matters should be so arranged that the operation of the disc exhibits a progressive gain or loss in relation to the rotation of the cylinder, whereby the butt selection progressively advances or recedes around the needle circle and different butts are permitted to remain at level T in successive courses. This results in a diagonal or chevron-like pattern.

The recesses in the disc may be of enlarged re-entrant form as shown at 3e in Fig. 2: thus the recesses may be of substantially triangular form.

The disc is driven by the engagement of the rising butts with the peripheral portions 4 on which there are ratchet teeth forming radial abutments and notches 5 to receive and engage the butts, the pitch of these notches 5 being appropriate to the pitch of the butts 2.

In Figures 3, 4 and 5 the conventional symmetrical knitting cams of a seamless base machines are indicated at 6 and it will be observed that the disc 1 is located in advance of these cams. Moreover, the disc 1 is capable of being raised and lowered between the inoperative position shown in Figs. 3 and 5 and the operative position shown in Fig. 4. Thus the disc may be brought into operation when it is desired to produce patterned fabric (e.g. in the leg of a stocking) and lowered out of operation when it is desired to produce non-patterned fabric (e.g. during the production of the heel, when the needle cylinder reciprocates).

During circular knitting, and during travel of the needle cylinder in one direction in reciprocatory knitting, the needles are normally raised to clearing height by cam 7a. Therefore when the disc 1 is brought into operation to raise groups of needles to clearing height but to permit intervening needles to continue at a tucking height, the cam 7a is lowered to a tucking position as shown in Fig. 4.

The wheel 1 is carried by an arm 8 on a rocking spindle 9 which is rotatably mounted in a bracket 10 so that by rocking the spindle 9 the wheel may be raised and lowered. Convenntely a spindle 11 of the wheel is mounted by means of an anti-friction bearing 12 clamped in the end of the arm 8 by means 13. The spindle 9 is provided at its outer end with a bell crank lever 14, one arm 14b of which is an operating arm and carries a roller 120 attached to it, this roller 120 serving to bias the arm 8 downwards.

The bracket 10 is provided with a base plate 27 whereby it may be fixed to a suitable stationary part 18 of the knitting machine and it is also provided with a pivot 19 for lever 20 which serves to raise and lower cam 7a. The bell crank lever 14 is rocked by a lever 21 which engages underneath the roller 15 and is pivoted at 22 to a further bracket 23 mounted on machine part 18.

A convenient manner of operating the levers 20 and 21 is illustrated in Fig. 6. This figure shows sufficient of a circular knitting machine, for knitting seamless stockings, to permit this machine to be identified. However, attention may be directed to the machine body 24, the tricked needle cylinder 25 carrying the usual needles, the main shaft 26 and driving mechanism 27, and the main cam shaft 28.

On the end of the main cam shaft 28 an auxiliary cam drum 29 is fixed. This drum carries cams 30 for controlling the disc 1 and cams 31 for controlling the clearing cam 7a. These cams 30 and 31 have such a length, number and position as to cause the disc 1 to be raised and the cam 7a to be lowered at the required times in the production of a stockinette, to remain in these positions for the desired periods of time, and to be shifted from these positions at the required times.

Cams 30 and 31 act respectively on cam levers 32, 33 drawn together by spring 34. Lever 33 is carried by a horizontal spindle 35 rotatably received in a tube 36 which carries lever 33, and tube 36 is rotatably mounted in a bearing bracket 37 secured to the body of the machine. At the end remote from levers 32, 33 the spindle 35 carries a lever 38, and tube 36 carries the lever 39. Lever 38 is connected to lever 21 by an upwardly extending link 40; lever 39 extends under a roller 120 on the push rod 41 and the latter has a slot 121 through the medium of which it is connected to existing mechanism 'indicated generally at 122 and which is part of existing picot control mechanism for the clearing cam 7a. The push rod 41 is adjustable in length and is biased downwardly by a tension spring 42. By virtue of the roller 121 and slot 122, the clearing cam 7a is controllable by the pattering mechanism without preventing its control by the picot mechanism and vice versa.

The butts associated with the needles which are adapted to be influenced by the selecting mechanism may be butt needles or on sliders or jacks or similar instruments associated with the needles.

In a further application of the selecting mechanism as aforesaid it may be employed in association with an arrangement of cam or feeder control for picking purposes such as band or welt patterning or patterning on a few wales in the leg or foot portion of a hose. The disc aforesaid may in this case be so arranged that its recesses receive the same butts at successive courses for tucking or missing and the selecting effect of the disc being utilised or neutralised as required by a further control exerted by adjustment of a clearing cam or feeder by means of a control drum or chain to suit patterning dictates.

What we claim is:

1. Selecting means for needles in a circular knitting machine having a row of butts projecting from the needle cylinder, comprising in combination a selector disk having peripheral teeth forming radial abutments and notches therebetween, a spindle on one end of which the disk is fixed, an anti-friction bearing on the other end of the spindle, an arm carrying said bearing, and a bracket carrying said arm pivotally and adapted to be fixed to the machine with the disk on an axis radially of the cylinder and close to the periphery of the cylinder projecting upwards into the row of butts, whereby in operation of the machine some of the butts are raised by their engagement with the hollows between the teeth in the disk, the disk is rotated by these butts positively pushing against said radial abutments of the disk, and the remaining butts remain at a low level having free entry and exit into and out of the recesses in the disk.

2. A circular knitting machine comprising in combination, a rotatable tricked cylinder, instruments in the tricks and carried round with the cylinder, butts on the instruments, and selecting means comprising a rotatable disc, peripheral teeth on the disc, hollows between the teeth at the same pitch spacing as the butts to be selectively displaced, circumferentially spaced recesses in the disk adapted for accommodating others of said butts freely between predetermined numbers of the teeth, and mounting means mounting said disc projecting to the required extent into the path of the travelling butts for the butts to be selectively displaced by the hollows between the teeth to a clearing height, the disc to be rotated by the being-selectively-displaced butts pushing against the teeth, and said others of the butts to ride at a lower level than clearing height with free entry and exit in and out of the recesses in the disk, said mounting means comprising a bracket for attachment to the machine, a rocking spindle carried by the bracket, an arm on the spindle, bearing means whereby the disc is rotatably supported on the arm, and a lever on the spindle for locking the latter.

3. A circular knitting machine having in combination a rotatable tricked cylinder, needles in the tricks, a row
of spaced butts on the instruments, knitting cams including a movable clearing cam, pattern control means for moving the clearing cam into and out of operative position, selecting means comprising a selecting disc having peripheral teeth with hollows between the teeth, and large recesses between predetermined numbers of the teeth, means mounting the disc comprising a spindle on one end of which the disc is fixed, an anti-friction bearing on the other end of the disc, a pivoted arm carrying said bearing, pattern control means for moving said arm to carry the disc into and out of operative position in cooperation with the movement of the clearing cam whereby the clearing cam is out of operation when the disc is in operation, and the disc when in operation projecting upwardly into the row of spaced butts in such manner that some of the butts engage the hollows between the teeth and are thereby selectively raised to clearing height, the disc is rotated by pushing of the being-selectively-raised butts against the teeth of the disc, and the remaining butts in the row have free entry and exit in and out of the recesses in the disc thereby to remain at lower than clearing height.

4. A circular knitting machine comprising in combination a rotatable tricked cylinder, instruments in the tricks and carried round with the cylinder, butts on the instruments, and selecting means comprising a rotatable disc, peripheral teeth on the disc, hollows between the teeth at the same pitch spacing as the butts to be selectively displaced, circumferentially spaced recesses in the disc adapted for accommodating others of said butts freely between predetermined numbers of the teeth, and mounting means mounting said disc projecting to the required extent into the path of the travelling butts for the butts to be selectively displaced by the hollows between the teeth to a clearing height, the disc to be rotated by the being-selectively-displaced butts pushing against the teeth, and said others of the butts to ride at a lower level than clearing height with free entry and exit in and out of the recesses in the disc and having knitting cams which include a movable clearing cam, pivot control mechanisms for the clearing cam, control means to move the selecting disc into and out of operative position, pattern control mechanism to move the clearing cam into and out of clearing position, and a lost motion connection between the pattern control mechanism and the pivot control mechanism to allow operation of each mechanism without preventing operation of the other.

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