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NEEDLE SELECTION STRUCTURE FOR A CIRCULAR KNITTING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to a needle selection structure
5 for a circular knitting machine, and more particularly to such a
needle selection structure which is suitable for use in a rib knitting
machine or interlocking knitting machine for a yarn into a ribbed or
interlocking fabric.

A ribbed fabric has a certain flexibility and thickness, and
10 is suitable for making clothes. When using a ribbed fabric to
make clothes, it is not necessary to iron or calender the ribbed
fabric because the rib border of a ribbed fabric does not curve.
Because a ribbed fabric can easily be cut subject to the desired
pattern, it is widely accepted by overcoat manufacturers. Because
15 a rib-knitting machine is comprised of two sets of needles, it is
superior over a plain knitting machine in pattern variation. A rib
knitting machine is practical for knitting elastic fabric for making
clothes, as well as for knitting a rib collar, rib cuff, rib trim, rib top,
etc. Further, an interlocking knitting machine is similar to a rib-
20 knitting machine. In early days, interlock fabrics were used for
making underwear. Nowadays, interlock fabrics have been
intensively used for making clothes. When a rib knitting machine
or interlocking knitting machine is operated to knit a fabric,
cylinder needles are lifted by cylinder cam, and plate needles are
25 pushed outwards by a needle cam at a cover plate. The pattern

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formed by the knitting operation of the plate needles and the cylinder needles is determined subject to the paths of the cylinder cam and the needle cam. When changing to another pattern, the paths of the cylinder cam and the needle cam must be changed. It is
5 time and labor consuming to change the path of the cylinder cam and the needle cam.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. The present invention provides an
10 electromagnetic valve type needle selection unit installed in the knitting machine. The needle selection unit is controlled by an external control device to drive the plate needles, causing the plate needles to make full-stitch, half-stitch and idle course operations, so as to match with the cylinder needles in knitting a yarn into a ribbed
15 or interlocking fabric. According to the present invention, the needle selection structure comprises a needle selection unit arranged on a cover plate above the needle dial, which carries plate cylinders, a needle cam arranged on the cover plate at a bottom side behind the needle selection unit, and a pushing-up device driven by
20 the needle cam. The needle selection unit comprises a selecting device, and a set of selection jacks driven by the selecting device. The selecting device comprises a first attractive force generating unit and a second attractive force generating unit controlled by a control signal from the external control device to attract the
25 selection jack. The selection jack is arranged below the selecting

device, having a fulcrum on the middle, two attractive force receiving faces at two opposite lateral sides of said fulcrum, and a butt at a rear end thereof. The pushing-up device is arranged on the upper needle dial behind the selection jack in a needle cam at the cover plate, having a front push end and a butt on the middle for pushing by the needle cam.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1A is a schematic drawing showing the position of the needle selection unit during a full-stitch knitting cycle according to the present invention.

Figure 1B is a schematic drawing showing the position of the needle selection unit during a half-stitch knitting cycle according to the present invention.

Figure 2A is similar to Figure 1A but showing a plate needle selected and pushed outwards.

Figure 2B is similar to Figure 1B but showing a plate needle selected and pushed outwards.

Figure 3A is similar to Figure 1A but showing the needle selection unit run idle.

Figure 3B is similar to Figure 1B but showing the needle selection unit run idle.

Figures 4A~4C are schematic drawings showing the yarn hooking operation of the plate needle and the cylinder needle according to the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figures 1A and 1B, a needle selection unit is designed for use in a rib-knitting machine or interlocking knitting machine. The knitting machine comprises a needle dial 1, a set of plate needles 2 arranged on the needle dial 1, a needle cylinder 3, and a set of cylinder needles 4 arranged on the needle cylinder 3. During knitting, the cylinder needles 4 are lifted by a needle lifting cam (not shown), and plate needles 2 are pushed outwards by a needle push jack at a cover plate 5, therefore loop-forming knitting are simultaneously or alternatively achieved. However, this knitting method can only produce a single ribbed or interlocking texture. In order to provide the ribbed or interlocking texture with a jacquard pattern, the present invention adds a needle selection unit 6 to the cover plate 5 above the upper needle dial 1.

The needle selection unit 6 comprises a selecting device 61, and a set of selection jacks 62 driven by the selecting device 61. The selecting device 61 is an electromagnetic valve means comprised of two attractive force generating units 611 and 611', each attractive force generating unit comprising two attractive force generating elements 611a and 611b. The attractive force generating elements 611a and 611b are controlled by a control signal from an external control device to produce an attractive force, and attract the selection jack 62. The selection jacks 62 are arranged below the selecting device 61, each comprising a fulcrum

621 on the middle, two attractive force receiving faces 622 and 623 at two opposite lateral sides of the fulcrum 621 corresponding to the attractive force generating elements 611a and 611b, and a butt 624 at the rear end thereof for pushing by a pushing-up device 7.

5 The aforesaid pushing-up device 7 is arranged on the upper needle dial 1 behind the selection jack 62 in a needle cam 8 at the cover plate 5, having a front push end 71 aimed at the butt 624 at the selection jack 62, and a butt 72 on the middle for pushing by the needle cam 8.

10 The needle selection unit 6 can be arranged on the cover plate 5 in two ways. According to the first way, the needle selection unit 6 is arranged on the cover plate 5 near the plate needles 2, and controlled to drive the plate needles 2, causing the plate needles 2 to achieve a half stitch operation. According to the
15 second way, the needle selection unit 6 is arranged on the cover plate 5 at a location relatively farther from the plate needles 2, and controlled to drive the plate needles 2, causing the plate needles 2 to achieve a full stitch operation.

Referring to Figures 2A and 2B, and Figures from 4A
20 through 4C, during loop knitting, the cylinder needles 4 are lifted by the needle cam (not shown) at the needle cylinder 3, and the plate needles 2 are pushed outwards by the needle cam 9 at the front side of the cover plate 5, thereby causing the plate needles 2 and the cylinder needles 4 to alternatively hook up the yarn 10, then the
25 plate needles 2 are retracted and the cylinder needles 4 are lowered,

thereby causing loops to be alternatively or simultaneously formed (see Figures 4B and 4C).

When one attractive force generating unit **611** is controlled by the external control signal during knitting, one attractive force generating element **611a** is energized to attract one attractive force receiving face **622** of the selection jack **62**, causing the butt **624** of the selection jack **62** to be moved with the selection jack **62** to the elevation equal to the front push end **71** of the pushing-up device **7**, for enabling the pushing-up device **7** to push the butt **624** of the selection jack **62** upon movement of the needle cam **8**, to further drive the corresponding plate needle **2** to knit the yarn into a full-stitch loop (see Figure 2A).

When the attractive force generating unit **611** is controlled by the external control signal again, the other attractive force generating element **611b** is energized to attract the other attractive force receiving face **623** of the selection jack **62**, causing the butt **624** of the selection jack **62** to be moved with the selection jack **62** to the elevation equal to the rear end of the corresponding plate needle **2**, and at the same time the butt **624** is tilted with the selection jack **62** over the elevation of the front push end **71** of the pushing-up device **7**, therefore the pushing-up device **7** does not push the butt **624** of the selection jack **62** upon movement of the needle cam **8**, and the corresponding plate needle **2** runs an idle course (see Figure 3A).

When the other attractive force generating unit **611'** is

controlled by the external control signal during knitting, one attractive force generating element **611a'** is energized to attract one attractive force receiving face **622** of the selection jack **62**, causing the butt **624** of the selection jack **62** to be moved with the selection
5 jack **62** to the elevation equal to the front push end **71** of the pushing-up device **7**, for enabling the pushing-up device **7** to push the butt **624** of the selection jack **62** upon movement of the needle cam **8**, to further drive the corresponding plate needle **2** to knit the yarn into a half-stitch loop (see Figure 2B).

10 When the attractive force generating unit **611'** is controlled by the external control signal again, the other attractive force generating element **611b'** is energized to attract the other attractive force receiving face **623** of the selection jack **62**, causing the butt **624** of the selection jack **62** to be moved with the selection jack **62**
15 to the elevation equal to the rear end of the corresponding plate needle **2**, and at the same time the butt **624** is tilted with the selection jack **62** over the elevation of the front push end **71** of the pushing-up device **7**, therefore the pushing-up device **7** does not push the butt **624** of the selection jack **62** upon movement of the
20 needle cam **8**, and the corresponding plate needle **2** runs an idle course (see Figure 3B).

As indicated above, the selecting device **61** comprises two attractive force generating units **611** and **611'** controlled by the external control device to run full-stitch, half-stitch, and idle course
25 knitting, so as to achieve ribbed or interlocking texture.



What is claimed is:

1. A needle selection structure arranged on an upper needle dial in a rib knitting machine or interlocking knitting machine for driving plate needles at the upper needle dial to act with cylinder
5 needles on a needle cylinder to produce a ribbed or interlocking fabric, the needle selection structure comprising:

a needle selection unit arranged on a cover plate above said needle dial;

a needle cam arranged on said cover plate at a bottom side
10 behind said needle selection unit; and

a pushing-up device driven by said needle cam; wherein said needle selection unit is controlled by an external control device to run full-stitch, half-stitch and idle course knitting operations, causing said plate needles and said cylinder needles to knit a yarn
15 into a ribbed or interlocking fabric.

2. The needle selection structure of claim 1 wherein said needle selection unit is an electromagnetic valve-operated needle selection means.

3. The needle selection structure of claim 1 wherein said
20 needle selection unit comprises a selecting device, and a set of selection jacks driven by said selecting device.

4. The needle selection structure of claim 3 wherein said selecting device comprises a first attractive force generating unit and a second attractive force generating unit, said first attractive
25 force generating unit and said second attractive force generating



unit each comprising a first attractive force generating element and a second attractive force generating element.

5 5. The needle selection structure of claim 3 wherein said selection jacks each comprise a fulcrum on the middle, two attractive force receiving faces at two opposite lateral sides of said fulcrum, and a butt at a rear end thereof.

6. The needle selection structure of claim 1 wherein said pushing-up device comprises a front pus end, and a butt on the middle.