METHOD FOR KNITTING INTERCHANGED PLATING ON SINGLE FACE OF TECHNICAL FACE FOR FLAT BED KNITTING MACHINES

A method for knitting interchanged plating on a single face of technical face for a flat bed knitting machine (10) which includes at least one needle bed (50) that has a plurality of latch needles (60), a plurality of sinkers (70) and a carriage (20) above the needle bed (50) comprises the steps of: forming an indentation (72) and a nose projection (73) at a front end of each sinker (70); controlling the carriage (20) so that the latch needle (60) is moved in a staged stitching displacement (440) which includes at least a first stitching section (441), a second stitching section (442) and a delayed stitching section (443); feeding a first coloration yarn (91) and a second coloration yarn (92) at the same time to the flat bed knitting machine (10); pushing the yarns via the front edge of the nose projection (73) while the sinker (70) is at the second stitching section (442) to knit a standard plating (80) and continuing the knitting operation through the standard plating (80) to form a single face fabric; and controlling the carriage (20) to make the latch needle (60) to perform an interchanged stitching displacement (45), and ordering the sinker (70) during the interchanged stitching displacement (45) to pick up the yarns through the junction of the rear edge of the nose projection (73) and the indentation (72), then release the yarns to knit an interchanged plating (90).
The present invention relates to a plating method for flat bed knitting machines and particularly to a method for knitting interchanged plating on a single face of technical face for flat bed knitting machines.

FIELD OF THE INVENTION

[0001] The present invention relates to a plating method for flat bed knitting machines and particularly to a method for knitting interchanged plating on a single face of technical face for flat bed knitting machines.

BACKGROUND OF THE INVENTION

[0002] A conventional flat bed knitting machine generally has a front needle bed and a rear needle bed. During knitting operation one of the needle beds can be used to do single face knitting, or the front and rear needle beds also can be used at the same time interchangeably to do single face knitting or interlocked double faces knitting. The single face knitting also is called plain stitch. The knitting fabric it produced have a technical face to be used as the front face of the fabrics. Plating also is called yarn adding or yarn stacking, and is a process by feeding two yarns of different colors at the same time during the knitting operation to produce a fabric with different colors on the technical face and a technical back. In order to increase fabric color changes or pattern variations a technique of feeding two different colors of yarns at the same time and doing plain stitch at the front needle bed and reverse stitch at the rear needle bed to form plating to generate the color changes or pattern variations of the fabric also is available at present. Namely, the present knitting technique can produce fabrics with plating on the technical back interwoven in the plating on the technical face in a predetermined segment, and the plating of the technical back appeared on the technical face can be used as the front face of the fabric. The fabric with the plating formed via reverse stitch has a back side structure and different colors of plating on the technical back to form Jacquard effect on the plating of the technical face like a Jacquard fabric.

[0003] It is generally known that the market requires the knitted fabrics to have different color changes and pattern variations. However, the fabric producers, in order to save production time and reduce knitting cost and increase production yield, often adopt the foresaid conventional technique to produce single face plain stitch fabrics with plating on the technical back to meet market requirements. But the fabrics produced via the present technique cannot fully meet consumers’ requirements. The main reason is that the structural appearance of the plating on the technical back of the single face plain stitch fabric that adopted the present technique is different from that of the plating on the technical face. People with a general aesthetic sense can easily see the unmatched structural appearances of the two and feel it like the technical face of the fabric has been smeared by objects of different colors. Hence the fabric thus made has lost its appeal to the consumers. It urgently needs improvement to resolve this problem in the industry.

SUMMARY OF THE INVENTION

[0004] The primary object of the present invention is to solve the aforesaid problem of the conventional technique of forming unmatched structural appearance on the knitted fabric. The invention provides stitching operation through indentations and nose protrusions of sinkers to collaborate with different displacements of latch needles so that plating with change of different color of yarns can be accomplished through merely a same needle bed in plain stitch operation to get single face fabrics with different color changes and pattern variations totally on the technical face. The fabrics thus made not only can better meet market requirements, also can save knitting time and reduce knitting operation cost and increase production yield.

[0005] To achieve the foregoing object the present invention provides a method for knitting interchanged plating on a single face of technical face for flat bed knitting machines. Each flat bed knitting machine includes at least one needle bed which has a plurality of latch needles and a plurality of sinkers hinged on an upper end of the needle bed abutting respectively each latch needle. The invention also includes a carriage above the needle bed that is movable reciprocally and linearly. The method includes:

- forming an indented indentation at a front end of each sinker that is movable interactively with each latch needle and a nose protrusion abutting the indentation;
- controlling the carriage to move reciprocally and linearly above the needle bed so that the latch needle is moved in a staged stitching displacement which includes a pause stitching operation; the staged stitching displacement includes at least a first stitching section, a second stitching section and a delayed stitching section between the first and second stitching sections to generate the pause stitching operation;
- feeding a first coloration yarn and a second coloration yarn above the first coloration yarn at the same time to the flat bed knitting machine;
- moving the first coloration yarn and the second coloration yarn via a front edge of the nose protrusion to slide down for knitting while the latch needle is positioned at the second stitching section to form a standard plating in which the first coloration yarn below the second color yarn, and continuing the knitting operation through the standard plating to form a single face fabric; and
- controlling the carriage to make the latch needle to perform an interchanged stitching displacement when the single face fabric knitted via the standard plating has reached a predetermined position, and ordering the sinker during the latch needle is located in the interchanged stitching displacement to pick up the first coloration yarn above the second coloration...
In one aspect in the method of the invention a
proceeds with reference to the accompanying drawings.

apparent from the following detailed description, which
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duce knitting operation cost and increase production
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ments of the latch needle plating of the yarns of different
sinker with the stitching operation of different displace-
latch needle to move up and down, and the needle control
means has a needle track formed thereon that includes

In yet another aspect the carriage includes at
least a sinker control means and a needle control means
located below the sinker control means.

In yet another aspect the carriage is moved re-
ciprocally and linearly above the needle bed to drive a
distal end of the sinker to move up and down, and the
sinker control means has a sinker track formed thereon
that includes at least a yarn picking displacement to allow
the junction of the rear edge of the nose protrusion and
the indented indentation to pick up the first coloration yarn
above the second coloration yarn then release, and a yarn push-
ing displacement to push the first and second coloration
yarns to slide down at the same time through the front
distance of the nose protrusion; the yarn picking displace-
ment including a yarn picking up slope section and a yarn
picking down slope section, and the yarn pushing displace-
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In yet another aspect the carriage moves recip-
rocally and linearly above the needle bed to drive the
latch needle to move up and down, and the needle control
means has a needle track formed thereon that includes
the staged stitching displacement and the interchanged
stitching displacement that can be switched with each
other.

Through the technique set forth above, com-
pared with the conventional technique, the present in-
vension can provide many advantages, notably: 1. By col-
laborating the indentation and the nose protrusion of the
sinker with the stitching operation of different displace-
ments of the latch needle plating of the yarns of different
colorations can be changed via a same needle bed to
knit a single face fabric with different color changes and
pattern variations totally on the technical face, hence can
resolve the problem of unmatched structural appearance
of the fabric knitted via the conventional technique; 2. The fabric knitted via the invention not only can meet
market requirements, also can save knitting time and re-
duce knitting operation cost and increase production yield.

The foregoing, as well as additional objects, fea-
tures and advantages of the invention will be more readily
apparent from the following detailed description, which
proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary side view of a flat bed knit-
ing machine according to an embodiment of the invention.
FIG. 2 is a fragmentary schematic plane view of
the tracks of the sinker and the latch needle
to knit standard plating according to the in-
vention.
FIGS. 3 through 10 are fragmentary schematic
views of the moment positions of the sinker
and the latch needle in continuous operation
conditions according to FIG. 2.
FIG. 11 is a fragmentary schematic plane view of
the tracks of the sinker and the latch needle
to knit interchanged plating according to the in-
vention.
FIGS. 12 through 19 are fragmentary schematic
views of the moment positions of the sinker
and the latch needle in continuous operation
conditions according to FIG. 11.

DETAILED DESCRIPTION OF THE PREFERRED EMB-
BODIMENT

Please refer to FIGS. 1 through 3 for a flat bed
knitting machine in an embodiment of the invention. The
flat bed knitting machine 10 includes two needle beds 50
and a carriage 20 movable reciprocally and linearly
above the needle beds 50. Each needle bed 50 has a plurality of latch needles 60 and a plurality of sinkers 70
hinged on an upper end of the needle bed 50 abutting
respectively each latch needle 60 (location of the sinker
70 is known to those skilled in the art, hence is omitted
in the drawings). The latch needle 60 has a hook 601
and a latch 602 at an upper end thereof. The carriage 20
includes at least one sinker control means 30 and at least
one needle control means 40 located below the sinker
control means 30. The sinker 70 has an axle hole 71
hinged on the needle bed 50, and an indented indentation
72 at a front end thereof to form interactive movement
with the latch needle 60 and a nose protrusion 73 (referr-
ing to FIG. 3) abutting the indentation 72, and also a
throat holding portion 74 indented from a lower side of a
front edge of the nose protrusion 73. The sinker 70 has
a sinker foot (which also is known to those skilled in
the art, hence also is omitted in the drawings) at a distal end
thereof driven by the sinker control means 30 to move
up and down. When the sinker foot is moved up and down
the indentation 72, the nose protrusion 73 and the throat
holding portion 74 also are moved up and down at the
same time through the hinged relationship with the axle
hole 71.

In the method for knitting interchanged plating
on a single face of technical face for flat bed knitting ma-
chines of the invention the flat bed knitting machine 10

yarn through the junction of a rear edge of the nose
protrusion and the indentation, then releasing the
yarns to form an interchanged plating in which the
second coloration yarn located below the first coloration
yarn.

In one aspect in the method of the invention a
contacting point of two ends of the interchanged plating
also is the second coloration yarn located below the first
coloration yarn.

In another aspect the sinker has a throat holding
portion indented from a lower side of the front edge of
the nose protrusion.

In yet another aspect the carriage includes at
least a sinker control means and a needle control means
located below the sinker control means.

In yet another aspect the carriage is moved re-
ciprocally and linearly above the needle bed to drive a
distal end of the sinker to move up and down, and the
sinker control means has a sinker track formed thereon
that includes at least a yarn picking displacement to allow
the junction of the rear edge of the nose protrusion and
the indentation to pick up the first coloration yarn
above the second coloration yarn then release, and a yarn push-
ing displacement to push the first and second coloration
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distance of the nose protrusion; the yarn picking displace-
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ment including a yarn pushing up slope section and a yarn pushing down slope section.

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rocally and linearly above the needle bed to drive the
latch needle to move up and down, and the needle control
means has a needle track formed thereon that includes
the staged stitching displacement and the interchanged
stitching displacement that can be switched with each
other.

Through the technique set forth above, com-
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vension can provide many advantages, notably: 1. By col-
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of the fabric knitted via the conventional technique; 2. The fabric knitted via the invention not only can meet
market requirements, also can save knitting time and re-
duce knitting operation cost and increase production yield.

The foregoing, as well as additional objects, fea-
tures and advantages of the invention will be more readily
apparent from the following detailed description, which
proceeds with reference to the accompanying drawings.
The method includes the steps as follows:

1. Forming an indented indentation 72 at a front end of each sinker 70 that is movable interactively with each latch needle 60 and a nose protrusion 73 abutting the indentation 72;
2. Controlling the carriage 20 to move reciprocally and linearly above the needle bed 50 so that the latch needle 60 is moved in a staged stitching displacement 440 which includes a pause stitching operation; the staged stitching displacement 440 includes at least a first stitching section 441, a second stitching section 442 and a delayed stitching section 443 interposed between the first and second stitching sections 441 and 442 to generate the pause stitching operation;
3. Feeding a first coloration yarn 91 and a second coloration yarn 92 above (or "behind", in terms of the technical face of the fabric knitted by the flat bed knitting machine 10) the first coloration yarn 91 at the same time to the flat bed knitting machine 10; moving the first coloration yarn 91 and the second coloration yarn 92 via the front edge of the nose protrusion 73 of the sinker 70 to slide down for knitting while the latch needle 60 is positioned at the second stitching section 442 during a delayed stitching time generated when the latch needle 60 is located at the delayed stitching section 443, thereby forming a standard plating 80 by placing the first coloration yarn 91 below (or "in front of", in terms of the technical face of the fabric knitted by the flat bed knitting machine 10) the second color yarn 92 (as shown in FIGS. 9 and 10), and continuing the knitting operation through the standard plating 80 to form a single face fabric; and controlling the carriage 20 to make the latch needle 60 to perform an interchanged stitching displacement 45 when the single face fabric knitted via the standard plating 80 has reached a predetermined position, and ordering the sinker 70 during the latch needle 60 is located in the interchanged stitching displacement 45 to stitch and move the first coloration yarn 91 downward such that the junction of a rear edge of the nose protrusion 73 and the indentation 72 can pick up the first coloration yarn 91 and the second coloration yarn 92, then release the yarn to perform knitting and form an interchanged plating 90 with the second coloration yarn 92 below the first coloration yarn 91 (as shown in FIGS. 17 through 19). It is to be noted that when the carriage 20 is moving reciprocally and linearly above the needle bed 50 to drive the distal end of the sinker 70 to move up and down the distal end of the sinker 70 forms a sinker tack 31 (indicated by a phantom line, or called chain line) on the sinker control means 30, as shown in FIG. 2; the sinker track 31 includes at least a yarn picking displacement 32 in which the junction of the rear edge of the nose protrusion 73 and the indentation 72 picks up the first coloration yarn 91 above the second coloration yarn 92, then releases the yarn, and a yarn pushing displacement 33 to push the first and second coloration yarns 91 and 92 to slide down at the same time through the front edge of the nose protrusion 73; the yarn picking displacement 32 including a yarn picking up slope section 321 and a yarn picking down slope section 322, and the yarn pushing displacement 33 including a yarn pushing up slope section 331 and a yarn pushing down slope section 332 (as shown in FIG. 2 or 11).

[0016] The method of the invention is further elaborated as follows to make operation more understandable: please refer to FIGS. 2 and 11 for the schematic views of the tracks of the sinker and latch needle to form the standard plating and the interchanged plating. In addition to the sinker 70 to form the sinker track 31 on the sinker control means 30, the latch needle 60 driven by the needle control means 40 to move up and down also forms a needle main track 44 on the needle control means 40 that includes the staged stitching displacement 440 and the interchanged stitching displacement 45 that can be switched with each other (indicated by the phantom line in the drawings). However, in FIG. 2, the staged stitching displacement 440 is abutted by the interchanged stitching displacement 45 (indicated by a hidden line) in the neighborhood; based on the interchanged stitching displacement 45, when the latch needle 60 is not being controlled by the carriage 20 to switch to the interchanged stitching displacement 45 it delays stitching in the staged stitching displacement 440 in normal conditions to knit the standard plating 80 by placing the second coloration yarn 92 above (or "behind", in terms of the technical face of the fabric knitted by the flat bed knitting machine 10) of the first coloration yarn 91, and the latch needle 60 forms the staged stitching displacement 440 on the needle control means 40 in the normal conditions. In FIG. 11, it also can be seen that the interchanged stitching displacement 45 is abutted by the staged stitching displacement 440 in the neighborhood (indicated by the hidden line); hence when the latch needle 60 is controlled by the carriage 20 to form the interchanged stitching displacement 45 it stitches directly the interchanged plating 90 by placing the second coloration yarn 92 below (or "in front of", in terms of the technical face of the fabric knitted by the flat bed knitting machine 10) the first coloration yarn 91, thereby forming the interchanged plating on the single face of the technical face.

[0017] Please also referring to FIGS. 2 through 10, in order to facilitate discussion of forming the standard plating 80 by collaborating the latch needle 60 in the staged stitching displacement 440 and the movement of the sink-
er 70, eight phantom lines with eight moment positions 1-8 are provided to show the interactive and continuous operation relationship between the latch needle 60 and the sinker 70 (referring to FIG. 2). First, as shown in FIG. 3, at the moment position 1, the distal end of the sinker 70 is not yet being moved to the yarn up slope section 321, the indentation 72 also has no movement, the solid line in the drawing indicates that the first coloration yarn 91 and the second coloration yarn 92 thereabove (indicated by the hidden line) are fed at the same time, and the latch needle 60 does not enter the first stitching section 441 yet, hence no stitching operation is performed. In FIG. 4, at the moment position 2, the distal end of the sinker 70 is at the moment of being driven to enter the yarn picking up slope section 321 and move upward, and the indentation 72 and the nose protrusion 73 also start to move downward, the latch needle 60 has entered the first stitching section 441 to perform first stage stitching operation, but not yet in contact with the first and second coloration yarns 91 and 92. In FIG. 5, at the moment position 3, the distal end of the sinker 70 has been positioned at the yarn picking up slope section 321 and moved upward, the indentation 72 and the nose protrusion 73 also have been moved downward at the same time, and the latch needle 60 is located at the delayed stitching section 443 and pauses stitching operation without in contact with the first and second coloration yarns 91 and 92. In FIG. 6, at the moment position 4, the distal end of the sinker 70 has been moved upward to the summit of the yarn picking up slope section 321, and the indentation 72 and the nose protrusion 73 also are moved to the lowest spot, meanwhile the latch needle 60 is still located at the delayed stitching section 443 to pause stitching operation without in contact with the first and second coloration yarns 91 and 92, while the distal end of the sinker 70 is ready to enter the yarn picking down slope section 322, and the latch needle 60 is preparing to enter the second stitching section 442 to perform stitching operation of a next stage. In FIG. 7, at the moment position 5, the distal end of the sinker 70 is moved downward to the lowest spot of the yarn picking down slope section 322, the indentation 72 and the nose protrusion 73 also stop moving upward at the same time, meanwhile the latch needle 60 is located at the second stitching section 442 to perform again the stitching operation, hence the first coloration yarn 91 indicated via the solid line and the second coloration yarn 92 indicated via the hidden line located thereabove are picked by the hook 61 at the same time to move downward, and the latch 602 also is driven by the standard plating 80 formed in the previous operation to close the hook 601. In FIG. 8, at the moment position 6, the distal end of the sinker 70 has passed through the yarn up slope section 331 to enter the yarn down slope section 332 and move downward, and the indentation 72 and the nose protrusion 73 also are moved downward first at the same time, then move upward, meanwhile the latch needle 60 is still located at the second stitching section 442 to continue the stitching operation, and the first coloration yarn 91 and the second coloration yarn 92 located thereabove that were pulled downward at the same time touch the indentation 72 first, then slide downward over the nose protrusion 73, then are pushed upward again by the nose protrusion 73, such operations aim to make the first coloration yarns 91 and the second coloration yarns 92 thereabove to form more secured relationship potential energy. In FIG. 9, at the moment position 7, the distal end of the sinker 70 has been moved downward and is going to enter the lowest spot of the yarn pushing down slope 332, and the indentation 72 and the nose protrusion 73 also are moved upward at the same time and going to enter a displacement movement stop stage, meanwhile the latch needle 60 has left the second stitching section 442 and stopped the stitching operation, and the first coloration yarn 91 below (i.e., in the front, when viewed upward from the technical face shown in the drawing) and the second coloration yarn 92 located thereabove (behind) have been pulled downward to form a loop (to form another standard plating 80), and the continuous downward movement is stopped; in addition, the first coloration yarn 91 extended from the standard plating 80 and the second coloration yarn 92 located thereabove are sliding into the throat holding portion 74 of the sinker 70. In FIG. 10, at the moment position 8, the distal end of the sinker 70 has fully escaped the yarn pushing down slope section 332, and the indentation 72 and the nose protrusion 73 also stop displacement movement, and the latch needle 60 has fully stopped the stitching operation, the standard plating 80 formed by the first coloration yarn 91 below (in the front) and the second coloration yarn 92 located thereabove (behind) has become a complete loop, the latch needle 60 is waiting to start a next cycle of continuous operation such as stitching, loop cleaning and yarn picking to finish the single face fabric. As previously discussed, during the latch needle 60 is located at the second stitching section 442 the nose protrusion 73 of the sinker 70 pushes the first and second coloration yarns 91 and 92 to slide down at the same time through its front edge to perform knitting operation and form the standard plating 80 with the first coloration yarn 91 below (in front of) the second coloration yarn 92, and the standard plating 80 can be formed continuously to knit the single face fabric. However, when the standard plating 80 has been knitted continuously to reach a predetermined position, the first coloration yarn 91 can be picked up by the junction of the rear edge of the nose protrusion 73 and the indentation 72 of the sinker 70 during the latch needle 60 is located in the interchanged protrusion 45 and moved above (behind) the second coloration yarn 92, then release to perform knitting operation to generate operation of forming the interchanged plating 90 with the second coloration yarn 92 located below (in front of) the first coloration yarn 91. Details are elaborated as follows:

Please referring to FIGS. 11 through 19, with FIGS. 12 through 19 showing the fragmentary schematic
views of continuous operating conditions of the sinker and latch needle in FIG. 11 at various moment positions. Similarly, in order to facilitate discussion of forming the interchanged plating 90 by the latch needle 60 in the interchanged stitching displacement 45 in collaborating with the yarn picking operation of the sinker 70, eight moment positions 1-8 represented by eight phantom lines are provided to show the interactive and continuous movement relationship between the latch needle 60 and the sinker 70 in FIG. 11. First, as shown in FIG. 12, at the moment position 1, the distal end of the sinker 70 is not yet being driven to enter the yarn up slope section 321, the indentation 72 also has no movement, the first coloration yarn 91 indicated via the solid line in the drawing and the second coloration yarn 92 thereabove (indicated by the hidden line) are fed at the same time, and the latch needle 60 does not enter the first stitching section 441 yet, hence no stitching operation is performed. In FIG. 13, at the moment position 2, the distal end of the sinker 70 is at the moment of being driven to enter the yarn picking up slope section 321 to move upward, and the indentation 72 and the nose protrusion 73 also start to move downward, the first coloration yarn 91 is moved above the indentation 72, meanwhile the latch needle 60 starts entering the interchanged displacement 45 to perform stitching operation without in contact with the first coloration yarn 91 (indicated by the solid line) and the second coloration yarn 92 (indicated by the hidden line), while the latch needle 60 performs the stitching operation rapidly. In FIG. 14, at the moment position 3, the distal end of the sinker 70 has been located at the yarn picking up slope section 321 and moves upward, and the indentation 72 and the nose protrusion 73 also are moved downward at the same time, meanwhile the latch needle 60 is still located in the interchanged displacement 45 to perform the stitching operation rapidly, while the first coloration yarn 91 located above the indentation 72 is pulled downward rapidly to touch the nose protrusion 73 and picked up by the junction of the rear edge of the nose protrusion 73 and the indentation 72 and moved above (behind) the second stitching section 442. In FIG. 15, at the moment position 4, the distal end of the sinker 70 has been moved upward to the summit of the yarn picking up slope section 321, and the indentation 72 and the nose protrusion 73 also are moved downward to the lowest spot, meanwhile the latch needle 60 is still located in the interchanged stitching displacement 45 and also continuously performs the stitching operation rapidly, hence the first coloration yarn 91 has already been picked and moved above the second coloration yarn 92 is caught by the hook 601 to move downward rapidly, and the latch 602 also is driven by the previous standard plating 80 to close the hook 601, and the second coloration yarn 92 is located below (in front of) the first coloration yarn 91 to form the interchanged plating 90; in addition, the first coloration yarn 91 extended from the interchanged plating 90 and the second coloration yarn 92 located therebelow (in front of) are released because the nose protrusion 73 has been moved downward to the lowest spot and starts to slide to the front edge of the nose protrusion 73. In FIG. 16, at the moment position 5, the distal end of the sinker 70 is moved downward to the lowest spot of the yarn picking down slope section 332, the indentation 72 and the nose protrusion 73 also stop at the same time after having moved upward, meanwhile the latch needle 60 is still located in the interchanged stitching displacement 45 to continue the stitching operation, but the interchanged plating 90 of the second coloration yarn 92 located below (in front of) the first coloration yarn 91 is continuously being pulled downward by the stitching operation of the latch needle 60, hence the first coloration yarn 91 extended from the interchanged plating 90 and the second coloration yarn 92 therebelow (in front of) have already slid to the front edge of the nose protrusion 73 and continuously slide downward. In FIG. 17, at the moment position 6, the distal end of the sinker 70 has moved upward through the yarn pushing up slope section 331 to enter the yarn pushing down slope section 332 and move downward, and the indentation 72 and the nose protrusion 73 also are moved downward at the same time, then move upward, meanwhile the latch needle 60 has left the interchanged stitching displacement 45 and stops the stitching operation, and the second coloration yarn 91 below (in the front) and the first coloration yarn 91 thereabove (behind) have already been pulled downward to form a ring (the interchanged plating 90), and the continuous pulling down operation is stopped; meanwhile, the first coloration yarn 91 extended from the interchanged plating 90 and the second coloration yarn 92 therebelow (in the front) have already slid into the throat holding portion 74 of the sinker 70. In FIG. 18, at the moment position 7, the distal end of the sinker 70 has been moved downward and is going to enter the lowest spot of the yarn pushing down slope section 332, and the indentation 72 and the nose protrusion 73 also are moved upward at the same time and are going to enter the lowest spot of the yarn pushing down slope section 332, while the indentation 72 and the nose protrusion 73 are moved upward at the same time and are going to enter the displacement movement stop stage, meanwhile the latch needle 60 has already left the interchanged stitching displacement 45 and stops stitching, and the second coloration yarn 92 below (in the front) and the first coloration yarn 91 thereabove (behind) have already been pulled downward to form a ring (the interchanged plating 90), and the continuous pulling down operation has already stopped. In addition, the first color-
In summary there is disclosed a method for knitting interchanged plating 90 and the second coloration yarn 92 therebelow (in the front) have already slid into the throat holding portion 74 of the sinker 70. In FIG. 19, at the moment position 8, the distal end of the sinker 70 has fully escaped the yarn pushing down slope section 332, and the indentation 72 and the nose protrusion 73 also stop displacement movement, and the latch needle 60 has fully stopped the stitching operation, meanwhile the latch needle 60 also has fully stopped the stitching operation, and the second coloration yarn 92 below (in the front) and the first coloration yarn 91 thereabove (behind) have formed a complete ring (the interchanged plating 90), and the latch needle 60 is waiting to start a next cycle of continuous operation such as stitching, loop cleaning and yarn picking to finish the single face fabric. As previously discussed, during the latch needle 60 is located in the interchanged stitching displacement 45 the junction of the rear edge of the nose protrusion 73 and the indentation 72 picks up the first coloration yarn 91 and moves it above the second coloration yarn 92, then release to perform knitting operation to form the interchanged plating 90 with the second coloration yarn 92 below the first coloration yarn 91. Through such a technique plating by changing different colors of yarns can be accomplished in plain stitching through a same needle bed, and a single face fabric with different color changes or pattern variations formed through the technical face also can be knitted.

[0018] In summary there is disclosed a method for knitting interchanged plating on a single face of technical face for a flat bed knitting machine 10 which includes at least one needle bed 50 that has a plurality of latch needles 60, a plurality of sinkers 70 and a carriage 20 above the needle bed 50 comprises the steps of: forming an indented indentation 72 and a nose protrusion 73 at a front end of each sinker 70; controlling the carriage 20 so that the latch needle 60 is moved in a staged stitching displacement 440 which includes at least a first stitching section 441, a second stitching section 442 and a delayed stitching section 443; feeding a first coloration yarn 91 and a second coloration yarn 92 at the same time to the flat bed knitting machine 10; pushing the yarns via the front edge of the nose protrusion 73 while the sinker 70 is at the second stitching section 442 to knit a standard plating 80 and continuing the knitting operation through the standard plating 80 to form a single face fabric; and controlling the carriage 20 to make the latch needle 60 to perform an interchanged stitching displacement 45, and ordering the sinker 70 during the interchanged stitching displacement 45 to pick up the yarns through the junction of the rear edge of the nose protrusion 73 and the indentation 72, then release the yarns to knit an interchanged plating 90.

[0019] While the preferred embodiment of the invention has been set forth for the purpose of disclosure, it is not the limitation of the invention, modifications of the disclosed embodiment of the invention as well as other embodiments thereof may occur to those skilled in the art. Accordingly, the appended claims are intended to cover all embodiments which do not depart from the spirit and scope of the invention.

Claims

1. A method for knitting interchanged plating on a single face of technical face for a flat bed knitting machine (10) which includes at least one needle bed (50) that comprises a plurality of latch needles (60) and a plurality of sinkers (70) hinged on an upper end of the needle bed (50) abutting respectively each latch needle (60), and a carriage (20) movable reciprocally and linearly above the needle bed (50), the method comprising the steps of:

- forming an indented indentation (72) at a front end of each sinker (70) that is movable interactively with each latch needle (60) and a nose protrusion (73) abutting the indentation (72);
- controlling the carriage (20) to move reciprocally and linearly above the needle bed (50) so that the latch needle (60) is moved in a staged stitching displacement (440) which includes a pause stitching operation; the staged stitching displacement (440) including at least a first stitching section (441), a second stitching section (442) and a delayed stitching section (443) between the first stitching section (441) and the second stitching section (442) to generate the pause stitching operation;
- feeding a first coloration yarn (91) and a second coloration yarn (92) above the first coloration yarn (91) at the same time to the flat bed knitting machine (10);
- moving the first coloration yarn (91) and the second coloration yarn (92) via a front edge of the nose protrusion (73) to slide down at the same time for knitting while the latch needle (60) is positioned at the second stitching section (442) to form a standard plating (80) in which the first coloration yarn (91) below the second color yarn (92), and continuing the knitting operation through the standard plating (80) to form a single face fabric; and
- controlling the carriage (20) to make the latch needle (60) to perform an interchanged stitching displacement (45) when the single face fabric knitted via the standard plating (80) has reached a predetermined position, and ordering the sinker (70) during the latch needle (60) is located in the interchanged stitching displacement (45) to pick up the first coloration yarn (91) above the
second coloration yarn (92) through a junction of a rear edge of the nose protrusion (73) and the indentation (72), then releasing the yarns to form an interchanged plating (90) in which the second coloration yarn (92) below the first coloration yarn (91).

2. The method of claim 1, wherein the interchanged plating (90) includes two ends to form a contacting point on which the second coloration yarn (92) locates below the first coloration yarn (91).

3. The method of claim 1 or 2, wherein the sinker (70) includes a throat holding portion (74) indented from a lower side of the front edge of the nose protrusion (73).

4. The method of claim 2, wherein the sinker (70) includes a throat holding portion (74) indented from a lower side of the front edge of the nose protrusion (73).

5. The method of one of the preceding claims, wherein the carriage (20) includes at least one sinker control means (30) and at least one needle control means (40) located below the sinker control means (30).

6. The method of claim 2, wherein the carriage includes at least one sinker control means (30) and at least one needle control means (40) located below the sinker control means (30).

7. The method of claim 3, wherein the carriage (20) includes at least one sinker control means (30) and at least one needle control means (40) located below the sinker control means (30).

8. The method of claim 4, wherein the carriage (20) includes at least one sinker control means (30) and at least one needle control means (40) located below the sinker control means (30).

9. The method of claim 5, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive a distal end of the sinker (70) to move up and down to form a sinker track (31) on the sinker control means (30); the sinker track including at least a yarn pushing displacement (32) to pick up the first coloration yarn (91) through the junction of the rear edge of the nose protrusion (73) and the indentation (72) above the second coloration yarn (92) to slide down at the same time through the front edge of the nose protrusion (73); the yarn pushing displacement (33) including a yarn pushing up slope section (331) and a yarn pushing down slope section (332).

10. The method of claim 6, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive a distal end of the sinker (70) to move up and down to form a sinker track (31) on the sinker control means (30); the sinker track including at least a yarn pushing displacement (32) to pick up the first coloration yarn (91) through the junction of the rear edge of the nose protrusion (73) and the indentation (72) above the second coloration yarn (92) to slide down at the same time through the front edge of the nose protrusion (73); the yarn pushing displacement (33) including a yarn pushing up slope section (331) and a yarn pushing down slope section (332).

11. The method of claim 7, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive a distal end of the sinker (70) to move up and down to form a sinker track (31) on the sinker control means (30); the sinker track including at least a yarn pushing displacement (32) to pick up the first coloration yarn (91) through the junction of the rear edge of the nose protrusion (73) and the indentation (72) above the second coloration yarn (92) then release, and a yarn pushing displacement (33) to push the first coloration yarn (91) and the second coloration yarn (92) to slide down at the same time through the front edge of the nose protrusion (73); the yarn pushing displacement (32) including a yarn picking up slope section (321) and a yarn picking down slope section (322), and the yarn pushing displacement (33) including a yarn pushing up slope section (331) and a yarn pushing down slope section (332).

12. The method of claim 8, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive a distal end of the sinker (70) to move up and down to form a sinker track (31) on the sinker control means (30); the sinker track including at least a yarn pushing displacement (32) to pick up the first coloration yarn (91) through the junction of the rear edge of the nose protrusion (73) and the indentation (72) above the second coloration yarn (92) then release, and a yarn pushing displacement (33) to push the first coloration yarn (91) and the second coloration yarn (92) to slide down at the same time through the front edge of the nose protrusion (73); the yarn pushing displacement (32) including a
yarn picking up slope section (321) and a yarn picking down slope section (322), and the yarn pushing displacement (33) including a yarn pushing up slope section (331) and a yarn pushing down slope section (332).

13. The method of claim 5, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive the latch needle (60) to move up and down and form a needle track (44) on the needle control means (40) that includes the staged stitching displacement (440) and the interchanged stitching displacement (45) that are switchable.

14. The method of claim 6, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive the latch needle (60) to move up and down and form a needle track (44) on the needle control means (40) that includes the staged stitching displacement (440) and the interchanged stitching displacement (45) that are switchable.

15. The method of claim 7, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive the latch needle (60) to move up and down and form a needle track (44) on the needle control means (40) that includes the staged stitching displacement (440) and the interchanged stitching displacement (45) that are switchable.

16. The method of claim 8, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive the latch needle (60) to move up and down and form a needle track (44) on the needle control means (40) that includes the staged stitching displacement (440) and the interchanged stitching displacement (45) that are switchable.

17. The method of claim 9, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive the latch needle (60) to move up and down and form a needle track (44) on the needle control means (40) that includes the staged stitching displacement (440) and the interchanged stitching displacement (45) that are switchable.

18. The method of claim 10, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive the latch needle (60) to move up and down and form a needle track (44) on the needle control means (40) that includes the staged stitching displacement (440) and the interchanged stitching displacement (45) that are switchable.

Amended claims in accordance with Rule 137(2) EPC.

1. A method for knitting interchanged plating on a single face of technical face for a flat bed knitting machine (10) which includes at least one needle bed (50) that comprises a plurality of latch needles (60) and a plurality of sinkers (70) hinged on an upper end of the needle bed (50) abutting respectively each latch needle (60), and a carriage (20) movable reciprocally and linearly above the needle bed (50), characterized in that the method comprises the steps of:

- providing an indented indentation (72) at a front end of each sinker (70) that is movable interactively with each latch needle (60) and a nose protrusion (73) abutting the indentation (72);
- controlling the carriage (20) to move reciprocally and linearly above the needle bed (50) so that the latch needle (60) is moved in a staged stitching displacement (440) which includes a pause stitching operation; the staged stitching displacement (440) including at least a first stitching section (441), a second stitching section (442) and a delayed stitching section (443) between the first stitching section (441) and the second stitching section (442) to generate the pause stitching operation;
- feeding a first coloration yarn (91) and a second coloration yarn (92) above the first coloration yarn (91) at the same time to the flat bed knitting machine (10);
- moving the first coloration yarn (91) and the second coloration yarn (92) via a front edge of the nose protrusion (73) to slide down at the same time for knitting while the latch needle (60) is positioned at the second stitching section (442) to form a standard plating (80) in which the first coloration yarn (91) below the second color yarn (92), and continuing the knitting operation through the standard plating (80) to form a single face fabric; and
- controlling the carriage (20) to make the latch needle (60) to perform an interchanged stitching displacement (45) when the single face fabric knitted via the standard plating (80) has reached a predetermined position, and ordering the sinker (70) during the latch needle (60) is located in the interchanged stitching displacement (45) to pick up the first coloration yarn (91) above the second coloration yarn (92) through a junction of a rear edge of the nose protrusion (73) and the indentation (72), then releasing the yarns to form an interchanged plating (90) in which the second coloration yarn (92) below the first coloration yarn (91).

2. The method of claim 1, wherein the interchanged
plating (90) includes two ends which are contact each other and forms a contacting point (900), and the second coloration yarn (92) locates below the first coloration yarn (91) at the contacting point.

3. The method of claim 1 or 2, wherein the sinker (70) includes a throat holding portion (74) indented from a lower side of the front edge of the nose protrusion (73).

4. The method of one of the preceding claims, wherein the carriage (20) includes at least one sinker control means (30) and at least one needle control means (40) located below the sinker control means (30).

5. The method of claim 4, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive a distal end of the sinker (70) to move up and down to form a sinker track (31) on the sinker control means (30); that the sinker track including at least a yarn picking displacement (32) to pick up the first coloration yarn (91) through the junction of the rear edge of the nose protrusion (73) and the indentation (72) above the second coloration yarn (92) then release, and a yarn pushing displacement (33) to push the first coloration yarn (91) and the second coloration yarn (92) to slide down at the same time through the front edge of the nose protrusion (73); the yarn picking displacement (32) including a yarn picking up slope section (321) and a yarn picking down slope section (322), and the yarn pushing displacement (33) including a yarn pushing up slope section (331) and a yarn pushing down slope section (332).

6. The method of claim 4, wherein the carriage (20) moves reciprocally and linearly above the needle bed (50) to drive the latch needle (60) to move up and down and form a needle track (44) on the needle control means (40) that includes the staged stitching displacement (440) and the interchanged stitching displacement (45) that are switchable.
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