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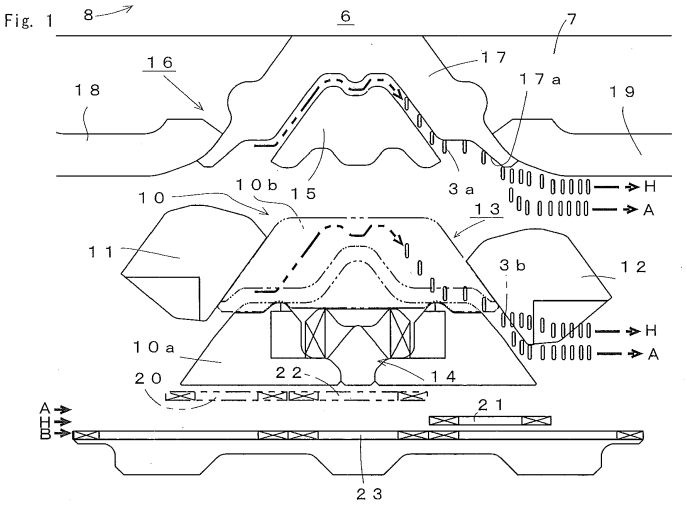
(54) METHOD FOR SPLIT- KNITTING

(57) [Problem to be solved] It is an object to provide a method for split- knitting capable of achieving stable knitting without deteriorating knitting efficiency with no risk of yarn breakage even when knit and split knit are mixed in the same knitting course.

[Solution] A cam system 6 is set for a stitch transfer operation and a knitting needle retaining an old stitch is made to advance to a needle bed gap 8 at a stitch sending side. For example, when a carriage runs leftward, an operation of the knit is performed in such a manner that the knitting needle is drawn into a needle bed by a stitch cam 12 with needle selection to an A position. An operation at a sending side of the split knit is performed in such a manner that drawing of the knitting needle by the stitch cam 12 is not made with pressing only by a half presser 21 for the following side with needle selection to a H position. A drawing amount when a sending-side stitch is formed on a knitting needle at the sending side can be reduced to be smaller than a drawing amount when a new stitch is formed in the knit, thereby reducing load on a knitting yarn.

Fig. 1



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Description

[Technical Field]

[0001] The present invention relates to a method for split-knitting-capable of being performed together with a stitch formation of a knit in the same knitting course when a knitted fabric is knitted with a flatbed knitting machine.

[Background Art]

[0002] Conventionally, a method for split-knitting to utilize a function of stitch transfer has been used for a stitch increasing method in which wales are increased on a middle portion of a knitting width when a fabric is knitted in a flatbed knitting machine capable of performing stitch transfer together with stitch formation (for example, see Patent Citation 1).

[0003] Fig. 6 shows a structure of a knitting needle 1 that is used for split-knitting as disclosed in Patent Citation 1 (for example, see Patent Citation 2). The knitting needle 1 is basically the same as that as shown in Fig. 7 of Patent Citation 2 but is shown with different reference numerals. The flatbed knitting machine includes at least a front and a rear needle bed and a large number of knitting needles 1. Needle grooves are arranged on each needle bed in parallel in the direction perpendicular to the running direction of a carriage. Each knitting needle 1 is housed in each needle groove so as to be slide-displaced in the front-rear direction in which the knitting needle 1 advances to or retreats from a needle bed gap. The knitting needle 1 is a latch needle and has a hook 2a on a leading end of a needle body 2, and the hook 2a is opened and closed by a latch 2b. A needle jack 3 is engaged with a rear portion of the needle body 2 and a select jack 4 and a selector 5 are combined. The needle body 2 includes a transfer clip 2c for inserting the hook 2a of the knitting needle 1 for the receiving side into a stitch when the stitch is transferred in stitch transfer at one lateral side of a rear portion of the latch 2b.

[0004] The needle jack 3 has a subsidiary butt 3a in the vicinity of an engagement portion and an operation butt 3b at the rear side of the subsidiary butt 3a with a space therebetween. A tail portion 3c of the needle jack 3 is an elastic leg and biases such that the operation butt 3b projects from the needle groove. The select jack 4 acts on a rear portion of the operation butt 3b. The select jack 4 has a pressing butt 4a causing the operation butt 3b to sink such that the operation butt 3b does not project from the needle groove when the pressing butt 4a receives pressure. A presser that is arranged at a needle selecting position to be selected by the selector 5 upon reception of a needle selecting action by a needle selection mechanism presses the pressing butt 4a. The selector 5 has a front butt 5a for returning the selector 5 to a non-needle selecting position, a rear butt 5b for causing the selector 5 to advance to the needle selecting position in a needle selection state, and a needle selection butt 5c for selecting whether the selector 5 is in the needle selection state or not at one position of eight positions as indicated by a dashed line on an intermediate portion.

[0005] Fig. 7 shows an operation of a cam system 6 that is mounted on a carriage as disclosed in Fig. 2 of Patent Citation 2 when split knit is performed with the knitting needle 1, although some names and reference numerals are changed. On a base plate 7 of the carriage facing the needle bed, is arranged a cam rock for stitch formation 13 which is provided with a needle raising cam 10 and stitch cams 11, 12 for driving the operation butt 3b such that the hook 2a advances to or retreats from a needle bed gap 8. A cam rock for stitch transfer 16 is also arranged on the base plate 7. The cam rock for stitch transfer 16 includes a transfer cam for stitch receiving 14 and a transfer cam for both sending and receiving 15. The cam rock for stitch transfer 16 also includes a transfer guide cam 17 provided at the front side at the needle bed gap 8 side of the transfer cam for both sending and receiving 15. Needle guide cams 18, 19 are provided at both sides of the transfer guide cam 17.

[0006] The respective stitch cams 11, 12 can be displaced along inclined surfaces facing the needle raising cam 10 and pulling down the operation butt 3b and can change the size of a stitch to be formed by changing a drawing amount of the operation butt 3b in the stitch formation. The needle raising cam 10 has a fixed portion 10a at the rear side and a movable portion 10b at the front side. The movable portion 10b projects and retracts from the base plate 7 in an alternate manner with the transfer cam for both sending and receiving 15 such that one of them projects when the other thereof retracts by a mechanism which is omitted to show. The split knit is performed by causing the transfer cam for both sending and receiving 15 to project.

[0007] Three positions of A, H, and B are set at the backward of the needle raising cam 10 as needle selecting positions through which the pressing butt 4a of the select jack 4 passes in accordance with needle selection. At the H position, movable half pressers 20, 21 and a tuck presser 22 capable of being switched between an operative state and an inoperative state are arranged. At the B position, a fixed presser 23 is arranged and presses the pressing butt 4a so as to cause the operation butt 3b to sink in the needle groove.

[0008] When the movable portion 10b of the needle raising cam 10 is made to project, setting for stitch formation is established and needle selection is made for each knitting needle 1 to the A, H, or B position so as to cause the knitting needle 1 to perform a basic knitting operation of knit, tuck, or miss. Note that only the tuck presser is made to operate at the H position. Furthermore, when the carriage is moved leftward, for example, 2nd stitch knitting can be performed at the H position by causing the half presser 21 at the right following side to operate such that the stitch cam 12 does not draw the operation butt 3b as in Fig. 3 of Patent Citation 2.

[0009] When the transfer cam for both sending and

receiving 15 is made to project, setting for stitch transfer is established. At the A position, the knitting needle 1 is caused to operate as a stitch sending side by being guided to a selection path as indicated by chain double-dashed lines and trajectories of the subsidiary butt 3a and the operation butt 3b. At the needle selecting position of the H position, the knitting needle 1 is caused to operate as a stitch receiving side by causing the half pressers 20, 21 to operate. When the carriage is moved leftward, the operation butt 3b of the knitting needle 1 climbs over the fixed portion 10a of the needle raising cam 10 without being guided by the fixed portion 10a with an action by the half presser 20 at the left preceding side and is guided by the transfer cam for stitch receiving 14 at the inner side. With an action by the half presser 21 at the following side, the operation butt 3b climbs over the inclined surface of the stitch cam 12 at the following side so as not to be drawn. Also when the split knit is performed, the transfer cam for both sending and receiving 15 is made to project, a part of an old stitch retaining on the knitting needle 1 for the sending side is stitch-transferred as a split knit stitch to the knitting needle 1 for the receiving side, and a sending-side stitch is newly formed while a remaining portion of the old stitch is knocked over. It should be noted that when only the knitting needle 1 for the sending side is caused to operate and receive yarn feeding on the needle bed gap 8 while the opposing knitting needle 1 for the receiving side is caused to be inoperative, the knitting needle 1 for the sending side can be caused to operate as a knit for forming a new stitch.

[0010] Fig. 8 shows a state where one split knit is mixed in stitch formation by knit while Fig. 13 in Patent Citation 1 is simplified and reference numerals are changed. In an operation of the stitch formation by the knit, an old stitch 25 retained by the hook 2a of the knitting needle 1 on a FB is knocked over when a new stitch 28 is formed by yarn feeding of a knitting yarn 27 from a yarn feeder port 26. In an operation of the split knit, a portion 25a of the old stitch 25 retained by the knitting needle 1 on the FB for the sending side is stitch-transferred as a split knit stitch 29 to the hook 2a of the knitting needle 1 on the BB for the receiving side. A remaining portion 25b of the old stitch 25 is knocked over and a sending-side stitch 30 is newly formed on the hook 2a of the knitting needle 1 on the FB for the sending side of the split knit. Note that the knit and the split knit can be mixedly performed in the same knitting course only when setting for stitch transfer where the transfer cam for both sending and receiving 15 is made to project is established, the knit is performed by an operation of only the knitting needle 1 for the sending side, and the split knit is performed by operations of both the knitting needles 1 for the sending side and the receiving side.

[Citation List]

[Patent literature]

[0011]

Patent Citation 1: Japanese Examined Patent Application Publication No. 62-52063
Patent Citation 2: Japanese Patent No. 4977383

[Summary of Invention]

[Technical Problem]

[0012] In the cam system 6 as shown Fig. 7, setting of the knitting needle 1 forming a stitch by knit cannot be switched to setting for stitch formation and setting of the knitting needle 1 for split knit cannot be switched to setting for stitch transfer on halfway of the same knitting course where a plurality of knitting needles 1 are sequentially guided. The knitting needle 1 for the sending side can be caused to perform a knitting operation of the knit even with the setting for stitch transfer by causing the knitting needle 1 to operate as the sending side and causing the knitting needle 1 for the receiving side, which opposes the former knitting needle 1, to be inoperative as described above. The knitting needle 1 for the sending side is selected to the A position in Fig. 7 in order to realize the above-mentioned knitting operation of the knit. In the split knit, the knitting needle 1 is selected to the A position and is caused to operate as the sending side while the knitting needle 1 on the opposing needle bed is selected to the H position and is made to operate as the receiving side. With this configuration, the split knit and the stitch formation by the knit can be mixedly performed in the same knitting course. The sizes of the new stitch 28 that is formed by the knit and the sending-side stitch 30 that is newly formed by the split knit are determined by stitch determination by the same stitch cams 11, 12 and they have the same loop length because the knitting needles 1 are selected to the same A position.

[0013] However, as shown in Fig. 8, the knitting yarn 27 that is supplied to the sending-side stitch 30 to be newly formed from the side of the new stitch 28 formed in advance is drawn while passing through a portion on which the portion 25a of the old stitch 25 of the knit is stitch-transferred as the split knit stitch 29 to the side of the opposing needle bed. Resistance that the knitting yarn 27a receives in passage increases load thereon and there arises a risk of yarn breakage if the sending-side stitch 30 is drawn to have the same loop length as the new stitch 28 of the knit. In order to prevent the yarn breakage from occurring, a method in which a drawing amount of the knitting needle by the stitch cams 11, 12 is reduced so as to make the loop length of the sending-side stitch 30 smaller than that of the new stitch 28 of the knit by using different knitting courses without performing the knit and the split knit in the same knitting course is

effective. Note that knitting efficiency is deteriorated unless the knit and the split knit are mixedly performed in the same knitting course. Although an effect of preventing the yarn breakage from occurring is expected by decreasing a running speed of the carriage, the knitting efficiency is deteriorated.

[0014] It is an object of the present invention to provide a method for split-knitting capable of achieving stable knitting without deteriorating knitting efficiency with no risk of yarn breakage even when knit and split knit are mixed in the same knitting course.

[Solution to Problem]

[0015] The present invention is a method for split-knitting, with a flatbed knitting machine which is provided with at least a front and a rear needle bed being opposed to each other and interposing a needle bed gap, knitting needles, at leading end of which a hook is provided to be opened and closed by a latch, being arranged on each needle bed in parallel along a lengthwise direction in a state capable of causing the hooks to advance to and retreat from the needle bed gap,

using a cam system being mounted on a carriage, which runs back and forth in a lengthwise direction of the needle beds, and including a stitch cam which draws a knitting needle advanced to the needle bed gap into the needle bed and a stitch transfer cam which is used for a stitch transfer operation between a sending side and a receiving side, and

enabling for knitting needles retaining old stitches on one needle bed to select a knit or a split knit by needle selection in the same knitting course, when the knit being selected, a new stitch being formed by knocking over a retained old stitch, and when the split knit being selected, a knitting needle for a sending side of the split knit forming a sending-side stitch newly by stitch-transferring a part of the old stitch and remaining part of the old stitch being knocked over by the newly formed sending-side stitch,

characterized by

providing a presser to face a position at which the knitting needle receives an action by the stitch cam on a selection path for the sending side of stitch transfer and to press the knitting needle;

guiding both of one knitting needle which is selected for the knit and other knitting needle which is selected for the sending side of the split knit to a selection path on the one needle bed, the selection path is used for the sending side of the stitch transfer until a hook of each knitting needle is made to retreat from the needle gap after the hook has been made to advance to the needle gap;

drawing the knitting needle, which is selected for the knit by the stitch cam using a needle selecting position at which the knitting needle receives no pressing by the presser; and

causing the knitting needle, which is selected for the sending side of the split knit by using a needle selecting position at which the knitting needle receives pressing by the presser and which is different from the needle selecting position for the knit, not to draw at all or to draw by a reduced drawing amount smaller than a drawing amount for the knit if drawing by the stitch cam is made.

[0016] In the present invention,

said presser causes the knitting needle to sink in the needle bed so that the knitting needle receives no action by the stitch cam when the presser presses the knitting needle.

[0017] In the present invention,

said stitch cam is a 2nd stitch cam, which draws said knitting needle in accordance with a sinking amount of the knitting needle in said needle bed upon reception of pressing,

drawing the knitting needle when the knitting needle does not sink,

not drawing the knitting needle when the knitting needle largely sinks, and

drawing the knitting needle by a reduced drawing amount smaller than a drawing amount for the knitting needle that does not sink when the knitting needle sinks at an intermediate extent, and

said presser causes the knitting needle to sink in the needle bed to the intermediate extent at which the knitting needle is drawn by the reduced drawing amount by the 2nd stitch cam when the presser presses the knitting needle.

[Advantageous Effects of Invention]

[0018] According to the present invention, in the operation as the sending side of the split knit, the needle selecting position is made different from that for the knit, and the knitting needle can be made to receive pressing by the presser and receive no action by the stitch cam. When the knitting needle is selected for the sending side of the split knit, the knitting needle is not drawn by the stitch cam or is drawn by the reduced drawing amount by the stitch cam, which is smaller than that for the knitting needle that is selected for the knit, in formation of a new sending-side stitch. This can reduce the load on a knitting yarn when the sending-side stitch is formed and eliminate a risk of yarn breakage without deteriorating the knitting efficiency by mixing the knit and the sending side of the split knit in the same knitting course, so that stable knitting can be performed.

[0019] Furthermore, according to the present invention, the knitting needle for the sending side of the split knit is caused to sink in the needle bed with an action of pressing by the presser and is not drawn, so as to reduce the load on the knitting yarn when the sending-side stitch is formed and so as to eliminate the risk of yarn breakage.

[0020] Moreover, according to the present invention, the 2nd stitch cam that can reduce the drawing amount with an action on the knitting needle by pressing the knitting needle is used. The knitting needle for the sending side of the split knit can be drawn by the reduced drawing

amount smaller than that for the knit by pressing the knitting needle by the presser, so as to reduce the load on the knitting yarn when the sending-side stitch is formed and so as to eliminate the risk of yarn breakage.

[Brief Description of Drawings]

[0021]

[Fig. 1] Fig. 1 is a cam arrangement view showing an operation of the cam system 6 with a method for split-knitting according to an example 1 of the present invention.

[Fig. 2] Fig. 2 is a view showing needle selection states of knit and split knit that are mixed in the same knitting course in the operation of Fig. 1.

[Fig. 3] Figs. 3 are views showing other examples where the knit and the split knit are mixed in the same knitting course.

[Fig. 4] Fig. 4 is a cam arrangement view showing an operation of a cam system 36 with a method for split-knitting according to an example 2 of the present invention.

[Fig. 5] Fig. 5 is a view showing needle selection states of knit and split knit that are mixed in the same knitting course in the operation of Fig. 4.

[Fig. 6] Fig. 6 is a side view showing a structure of a knitting needle 1 that is used for split-knitting.

[Fig. 7] Fig. 7 is a cam arrangement view showing a structure of a cam system 6 that is used for a method for split-knitting in a prior art.

[Fig. 8] Fig. 8 is a simplified perspective view showing a state where split knit is mixedly performed in stitch formation of knit.

[Description of Embodiments]

[0022] Hereinafter, a method for split-knitting according to an example 1 of the present invention will be described with reference to Fig. 1, Fig. 2, and Figs. 3. A method for split-knitting according to an example 2 of the present invention will be described with reference to Fig. 4 and Fig. 5. In the example 1, the same reference numerals as those in a prior art denote corresponding parts and overlapped description thereof is omitted in some case. The same reference numerals denote corresponding parts in the example 1 and the example 2. In description of the example 2, overlapped description of parts corresponding to those in the example 1 is omitted. Furthermore, parts that are not shown in the drawing as a description target are referred by using reference numerals as shown in other drawings in some cases.

[Example 1]

[0023] Fig. 1 shows an example 1 of the present invention as an operation by a method for split-knitting to perform knit and split knit mixed in the same knitting course using the cam system 6 as shown in Fig. 7. In a flatbed knitting machine performing the split knit, at least a front and a rear needle bed are provided so as to oppose each other with the needle bed gap 8 interposed therebetween, and needle grooves extending in the direction of advancing to and retreating from the needle bed gap 8 along the lengthwise direction are arranged in parallel on each needle bed. The knitting needle 1 having the hook 2a at a leading end, which is opened and closed by the latch 2b, is housed in each needle groove in a state capable of causing the hook 2a to advance to and retreat from the needle bed gap 8. The cam system 6 is mounted on a carriage running back and forth in the lengthwise direction of the needle beds and includes stitch cams 11, 12 drawing the knitting needle 1 advanced to the needle bed gap 8 into the needle bed and a stitch transfer cam that is used for a stitch transfer operation between the sending side and the receiving side. A cam rock for stitch transfer 16 including a transfer cam for stitch receiving 14 and a transfer cam for both sending and receiving 15 is provided as the stitch transfer cam. The cam rock for stitch transfer 16 also includes a transfer guide cam 17.

[0024] Although not shown in the drawing, the cam system 6 includes a needle selection mechanism that selects the respective knitting needles 1 and assigns them to A, H, and B positions as a plurality of selection paths. The cam system 6 includes the half pressers 20, 21 and the tuck presser 22 that press the pressing butt 4a of the knitting needle 1 as pressers facing a part of the selection path at the H position. The knitting needle 1 has the operation butt 3b to receive a guide from the cam system 6. A guide state of the operation butt 3b with actions by the needle raising cam 10 and the stitch cams 11, 12, which are provided in the cam system 6, can be switched based on presence and absence of pressing of the pressing butt 4a by the half pressers 20, 21 or the tuck presser 22 at the H position or by the fixed presser 23 at the B position. When the pressing butt 4a is pressed so as to cause the operation butt 3b to sink in the needle groove, the operation butt 3b is made into a state to receive no guide from the cam system 6. When the pressing butt 4a is not pressed so as to cause the operation butt 3b to project to the outside of the needle groove, the operation butt 3b is made into a state to receive a guide from the cam system 6.

[0025] In the present example 1, the knitting needles 1 retaining the old stitch 25 on one needle bed can be selected to be assigned to different needle selecting positions in the same knitting course, whether the knit or the sending side of the split knit. Concerning the knitting needle 1 for the knit, the retained old stitch 25 is knocked over so as to form the new stitch 28. Concerning the knitting needle 1 for the split knit, the portion 25a of the old stitch 25 is stitch-transferred as the split knit stitch 29 to the knitting needle 1 on the other needle bed, and the remaining portion 25b of the old stitch 25 is knocked over so as to form the sending-side stitch 30. The cam system

6 is set for a stitch transfer operation and one needle bed is set as the sending side whereas the other needle bed is set as the receiving side. Needle selection for the sending side is performed by assigning the knitting needle 1 for the knit to the A position and assigning the knitting needle 1 for the split knit to the H position different from the A position. Although a presser pressing the pressing butt 4a if acting on it is not arranged at the A position in the present example 1, the presser may be arranged and be made inoperative. When the carriage is moved leftward, for example, only the half presser 21 at the right following side is made to operate among the half pressers 20, 21 and the tuck presser 22 arranged at the H position. For the receiving side, the knitting needle 1 is selected to the H position and the half pressers 20, 21 at both sides are made to operate. The knitting needle 1 for the receiving side climbs over the fixed portion 10a of the needle raising cam 10 with an action by the half presser 20 for the preceding side, receives an action by the transfer guide cam 17, and climbs over the stitch cam 12 with an action by the half presser 21 for the following side. Therefore, the knitting needle 1 for the receiving side receives no drawing action by the stitch cam 12.

[0026] By setting of the cam system 6 like this, the subsidiary butt 3a of the knitting needle 1 retaining the old stitch 25 on the needle bed for the sending side is guided between the upper edge of the transfer cam for both sending and receiving 15 and the lower surface of the transfer guide cam 17. The operation of causing the hook 2a to advance to the needle bed gap 8 and to retreat therefrom to a position of the transfer clip 2c as a needle shank while the latch 2b is opened by the old stitch 25 until the hook 2a receives yarn feeding of the knitting yarn 27 is performed in the same manner for the knit and the split knit. That is to say, on one needle bed, the knitting needle 1 that is selected for the knit and the knitting needle 1 that is selected for the sending side of the split knit are guided to the selection path that is used for the sending side of stitch transfer until the hooks 2a of the knitting needle 1 are made to retreat from the needle bed gap 8 after they have advanced thereto. The knitting needle 1 that is selected for the knit is not pressed by the half presser 21 but is drawn by the stitch cams 11, 12, so that when the knitting needle 1 is drawn, the knitting needle 1 is caused to form the new stitch 28 with the drawn knitting yarn 27 by closing the latch 2b with the old stitch 25 that relatively advances and knocking over the old stitch 25. In an operation of the split knit, the knitting needle 1 on the other needle bed is selected to the H position, the hook 2a thereof is made to advance to the needle bed gap 8 by guiding the operation butt 3b by the transfer cam for stitch receiving 14 so as to receive, as the split knit stitch 29, the portion 25a of the old stitch 25 that has retreated to the vicinity of the transfer clip 2c of the knitting needle 1 for the sending side. Although the remaining portion 25b of the old stitch 25 is knocked over and the sending-side stitch 30 is newly formed on the knitting needle 1 for the sending side, drawing by the stitch cams 11, 12 is not performed in formation thereof.

[0027] In the present example 1, the half presser 21 for the following side, which faces a position at which the operation butt 3b of the knitting needle 1 for the sending side receives an action by the stitch cam 12 for the following side, is used as a presser that is provided for pressing the knitting needle 1 for the sending side. When the operation butt 3b reaches a drawing inclined cam surface of the stitch cam 12, the half presser 21 presses the pressing butt 4a so as to cause the knitting needle 1 for the sending side to sink in the needle bed. The guiding of the knitting needle 1 for the sending side is changed such that it climbs over the stitch cam 12 by pressing by the half presser 21 so as not to be drawn as indicated by an upper trajectory of the operation butt 3b corresponding to the H position. As indicated by a lower trajectory corresponding to the A position, the operation butt 3b is drawn to the bottom of the drawing inclined cam surface of the stitch cam 12 in the knit. Thus, the knitting needle 1 is drawn by the stitch cam 12 when the new stitch 28 is formed with the knit whereas the knitting needle 1 is not drawn by the stitch cam 12 when the sending-side stitch 30 is formed with the split knit, so that load on the knitting yarn 27a forming the sending-side stitch 30 is not increased so as to eliminate a risk of the yarn breakage. Although the sending-side stitch 30 is formed while drawing by the stitch cam 12 is not made, there arises no problem because drawing can be performed in formation of the new stitch 28 with the knit in a subsequent course.

[0028] Even when the half presser 21 presses the pressing butt 4a of the knitting needle 1 for the sending side, which is used in the present example 1, the subsidiary butt 3a projects to the outside of the needle groove. Therefore, the knitting needle 1 is drawn through the subsidiary butt 3a with an action by the inclined cam surface 17a of the transfer guide cam 17 until the operation butt 3b faces a position at which it receives an action by the stitch cam 12.

[0029] Fig. 2 schematically shows needle selection states of the knit and the split knit that are mixed in the same knitting course in the operation of Fig. 1. For example, it is supposed that on the front needle bed FB, knitting of the knit is performed by the plurality of knitting needles 1 and the split knit is performed by one knitting needle 1 in a section formed by the plurality of knitting needles 1. In the present example, the knitting needle 1 for the sending side in the split knit is selected to the H position and the knitting needles 1 forming the new stitches 28 with the knit are selected to the A position. In the split knit, the sending-side stitch 30 is formed at the sending side and the split knit stitch 29 is also formed at the receiving side. The pressing butts 4a of the knitting needles 1 are not pressed at the A position, so that the stitch cam 12 acts on the knitting needles 1 which have received yarn feeding of the knitting yarn 27 by causing the hook 2a to advance to the needle bed gap 8 and the knitting needles 1 are drawn to the needle bed. The loop length of the new stitches 28 that are formed corresponds

to the drawing amount set for the stitch cam 12. The split knit operation of newly forming the sending-side stitch 30 on the knitting needle 1 for the sending side is performed such that the stitch cam 12 does not draw the operation butt 3b by the pressing of the pressing butt 4a by the half presser 21. This can reduce the drawing amount to be smaller than that in the knit and reduce the load on the knitting yarn 27a.

[0030] The split knit that is mixedly performed with the knit in the same knitting course can be used for a stitch increasing method as disclosed in Patent Citation 1.

[0031] Figs. 3 show other examples where the knit and the split knit are mixed in the same knitting course. Fig. 3(a) shows an example where the split knit is performed on an edge stitch of a section of the knit. Fig. 3(b) shows an example where a stitch of 3 x 3 rib at the FB side is split-knitted to the BB side. Although the split knit by the cam system 6 can be performed from one needle bed to the other needle bed only, for example, from the FB to the BB only, the formation of the new stitches 28 with the knit can be performed on both of the FB and the BB.

[Example 2]

[0032] Fig. 4 shows an operation of a cam system 36 by a method for split-knitting as an example 2 of the present invention. The cam system 36 in the present example 2 includes a cam rock for stitch formation 43. 2nd stitch cams 41, 42 having a variable 2nd stitch function capable of changing drawing amount of the knitting needle 1, as disclosed in JP Patent Publication No.4016031 B, for example, are used in the cam rock for stitch formation 43 instead of the stitch cams 11, 12 of the cam system 6. 2nd stitch cams having a 2nd stitch function with a fixed difference in the drawing amount as disclosed in JP Patent Publication No.3306763 B can be also used in the same manner. The 2nd stitch cams 41, 42 can reduce the drawing amount when the operation butt 3b receives pressing with actions by 2nd stitch pressers 50, 51. That is to say, each of the 2nd stitch cams 41, 42 draws the knitting needle 1 when the knitting needle 1 does not sink, does not draw the knitting needle 1 when the knitting needle 1 largely sinks, and draws the knitting needle 1 by a reduced drawing amount smaller than the drawing amount for the knitting needle 1 that does not sink when the knitting needle 1 sinks at an intermediate extent, in accordance with a sinking amount of the knitting needle 1 in the needle bed upon reception of pressing.

[0033] When the knitting needle 1 receives pressing with the actions by the 2nd stitch pressers 50, 51, it does not sink in the needle bed and the operation butt 3b is at a half height with a small projecting amount to the outside of the needle groove. On the other hand, when the knitting needle 1 does not receive the pressing, the operation butt 3b is at a full height with a large projecting amount. As for the 2nd stitch cams 41, 42, stitch determination portions 41b, 42b; 41a. 42a as bottom portions of inclined cam surfaces for drawing the knitting needle 1 into the needle bed are selected in accordance with the projecting amount of the operation butt 3b. The upper stitch determination portions 41b, 42b corresponding to the half height cause the drawing amount of the operation butt 3b to be smaller than that by the lower stitch determination portions 41a, 42a corresponding to the full height so as to form a stitch having a small loop length.

[0034] In the present example 2, the 2nd stitch pressers 50, 51 that face positions at which the operation butt 3b of the knitting needle 1 receives actions by the 2nd stitch cams 41, 42 and presses the pressing butt 4a of the knitting needle 1 are provided. The 2nd stitch pressers 50, 51 are arranged at the A position different from the H position at which the half pressers 20, 21 and the tuck presser 22 are arranged. The 2nd stitch cams 41, 42 can change the drawing amounts by the lower stitch determination portions 41a, 42a with the entire displacement. Furthermore, the 2nd stitch cams 41, 42 can change the drawing amounts by the upper stitch determination portions 41b, 42b so as to be smaller than those by the lower stitch determination portions 41a, 42a with relative displacement of cam members 41c, 42c by displacement mechanisms 41d, 42d, respectively.

[0035] The cam system 36 can cause the knit and the split knit to be mixedly performed in the same knitting course. When they are mixed, the operation of the knit is performed in such a manner that the knitting needle is selected to the H position, all the half pressers 20, 21 and the tuck presser 22 provided at the H position are made inoperative so as not to press the pressing butt 4a, and the operation butt 3b is made at the full height. The operation as the sending side of the sprit knit is performed in such a manner that the knitting needle is selected to the A position. For example, when the carriage runs leftward, with the pressing by the 2nd stitch presser 51 provided at the following side at the A position, the drawing amount of the knitting needle 1 by the 2nd stitch cam 42 is reduced to be smaller than that in the case of the knit with no pressing.

[0036] Fig. 5 schematically shows the needle selection states of the knit and the split knit that are mixed in the same knitting course in the operation of Fig. 4. The knitting needle 1 for the sending side in the split knit is selected to the A position and the knitting needle 1 that performs stitch formation in the knit is selected to the H position. In the knit, the operation butt 3b is drawn to the lower stitch determination portion 42a of the 2nd stitch cam 42 for the following side so that the new stitch 28 having a large loop length is formed. For the sending side of the split knit, the operation butt 3b is drawn to the upper stitch determination portion 42b of the 2nd stitch cam 42, so that the sending-side stitch 30 having a loop length smaller than that of the new stitch 28 in the knit is formed. Also in the present example 2, as shown in Figs. 3, the knit and the split knit can be mixedly performed.

[0037] In the present example 2, the sending-side stitch 30 can be formed to have a loop length at some extent, so as to be applied to the case where a plurality

of split knits are continuous, for example, the case where a multilayer knitted fabric is knitted including formation of a pocket or the like on a knitted fabric as a base.

[0038] In the above-mentioned respective examples, the carriage runs leftward. When the carriage runs rightward, the operation can be symmetrically performed only by mirror-reversing the preceding side and the following side from the case where the carriage runs leftward. The operations as shown in Fig. 2, Figs. 3, and Fig. 5 can be performed in the same manner when the carriage runs leftward and rightward. Furthermore, on the needle bed at the sending side, the knit and the sending side of the split knit are switched at the A and H positions as two of the three needle selecting positions of the A, H, and B positions and a miss operation is performed at the B position, so that on the needle bed for the sending side, the knitting needle cannot be operated as the receiving side. A needle selecting position capable of operating as the receiving side could be also added by making a large number of needle selecting positions selectable with a needle selection mechanism.

[Reference Signs List]

[0039]

1 Knitting needle
2 Needle body
2a Hook
2b Latch
3 Needle jack
3b Operation butt
4 Select jack
4a Pressing butt
6, 36 Cam system
8 Needle bed gap
11, 12 Stitch cam
14 Transfer cam for stitch receiving
15 Transfer cam for both sending and receiving
16 Cam rock for stitch sending
20,21 Half presser
22 Tuck presser
25 Old stitch
28 New stitch
29 Split knit stitch
30 Sending-side stitch
41, 42 2nd stitch cam
50, 51 2nd stitch presser

Claims

1. A method for split-knitting, with a flatbed knitting machine which is provided with at least a front and a rear needle bed being opposed to each other and interposing a needle bed gap (8), knitting needles (1), at leading end of which a hook (2a) is provided to be opened and closed by a latch (2b), arranged on each needle bed in parallel along a lengthwise direction in a state capable of causing the hooks (2a) to advance to and retreat from the needle bed gap (8),

using a cam system (6, 36) being mounted on a carriage, which runs back and forth in a lengthwise direction of the needle beds, and including a stitch cam (11, 12; 41, 42) which draws a knitting needle advanced to the needle bed gap into the needle bed and a stitch transfer cam (14, 15, 16, 17) which is used for a stitch transfer operation between a sending side and a receiving side, and

enabling for knitting needles (1) retaining old stitches (25) on one needle bed to select a knit or a split knit by needle selection in the same knitting course, when the knit being selected, a new stitch (30) being formed by knocking over a retained remaining part (25b) of the old stitch (25), and when the split knit being selected, a knitting needle (1) for a sending side of the split knit forming a sending-side stitch (30) newly by stitch-transferring a part (25a) of the old stitch (25) and remaining part (25b) of the old stitch (25) being knocked over by the newly formed sending-side stitch (30),

characterized by

providing a presser (20, 21; 50, 51) to face a position at which the knitting needle (1) receives an action by the stitch cam (11, 12; 41, 42) on a selection path for the sending side of stitch transfer and to press the knitting needle (1);

guiding both of one knitting needle (1) which is selected for the knit and other knitting needle (1) which is selected for the sending side of the split knit to a selection path on the one needle bed, the selection path is used for the sending side of the stitch transfer until a hook (2a) of each knitting needle (1) is made to retreat from the needle gap (8) after the hook has been made to advance to the needle gap (8);

drawing the knitting needle (1), which is selected for the knit by the stitch cam (11, 12; 41, 42) using a needle selecting position at which the knitting needle (1) receives no pressing by the presser (20, 21; 50, 51); and

causing the knitting needle (1), which is selected for the sending side of the split knit by using a needle selecting position at which the knitting needle (1) receives pressing by the presser (20, 21; 50, 51) and which is different from the needle selecting position for the knit, not to draw at all or to draw by a reduced drawing amount smaller than a drawing amount for the knit if drawing by the stitch cam (11, 12; 41, 42) is made.

2. The method for split-knitting according to claim 1, wherein

said presser (20, 21) causes the knitting needle (1) to sink in the needle bed so that the knitting needle (1) receives no action by the stitch cam (11, 12) when

the presser (20, 21) presses the knitting needle (1).

3. The method for split-knitting according to claim 1, wherein
said stitch cam (41, 42) is a 2nd stitch cam, which draws said knitting needle (1) in accordance with a sinking amount of the knitting needle (1) in said needle bed upon reception of pressing,
drawing the knitting needle (1) when the knitting needle (1) does not sink,
not drawing the knitting needle (1) when the knitting needle (1) largely sinks, and
drawing the knitting needle (1) by a reduced drawing amount smaller than a drawing amount for the knitting needle (1) that does not sink when the knitting needle (1) sinks at an intermediate extent, and
said presser (50, 51) causes the knitting needle (1) to sink in the needle bed to the intermediate extent at which the knitting needle (1) is drawn by the reduced drawing amount by the 2nd stitch cam (41, 42) when the presser (50, 51) presses the knitting needle (1).

Fig. 1

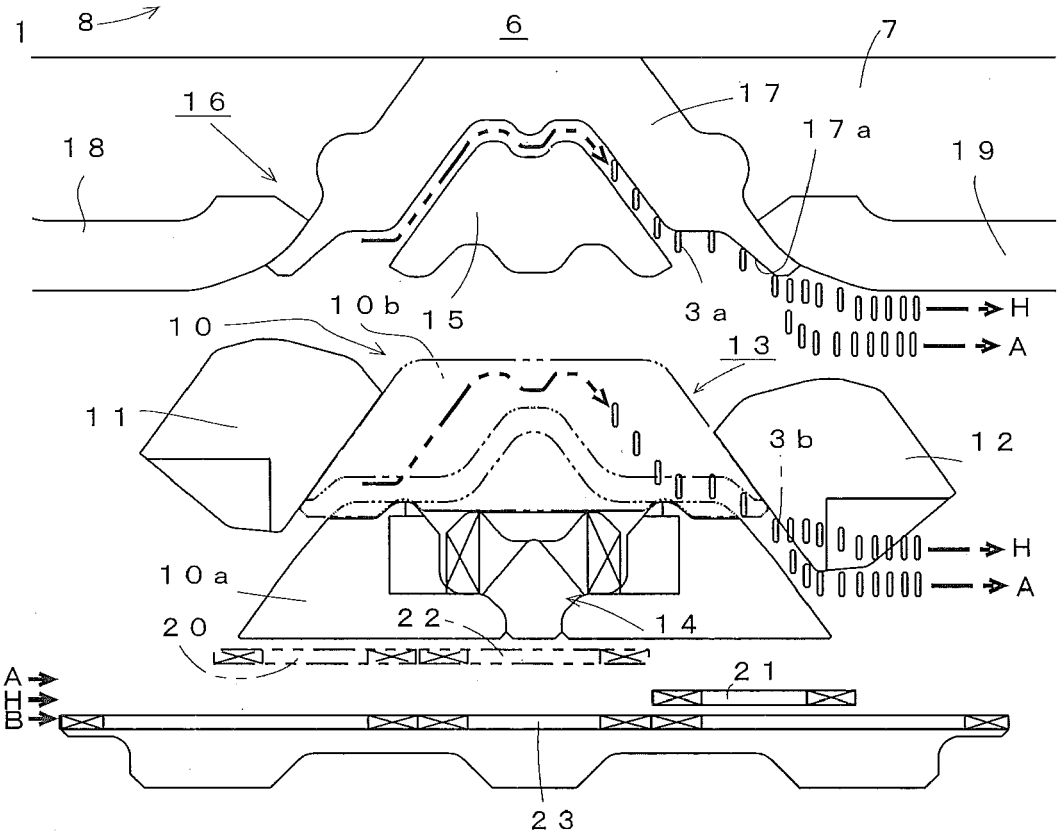


Fig. 2

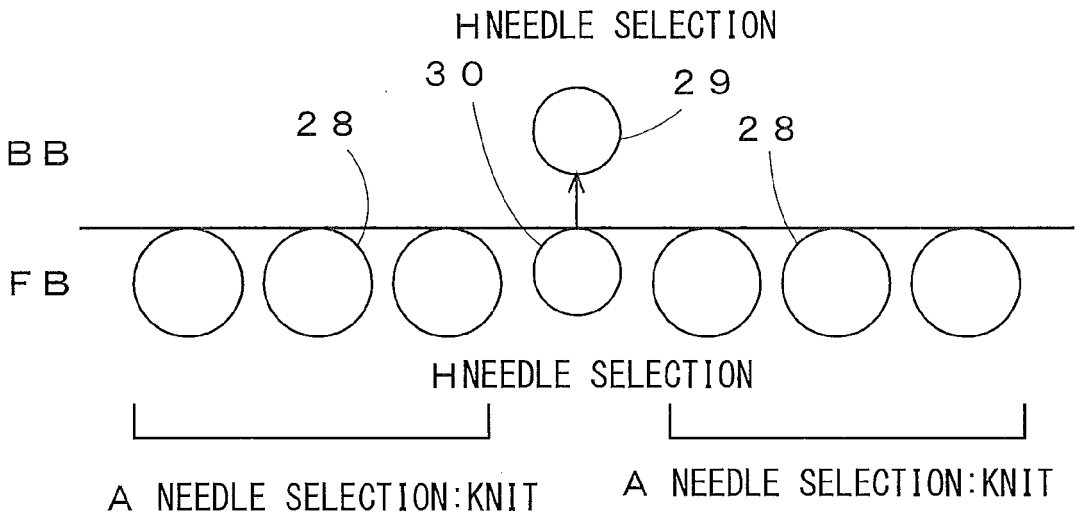
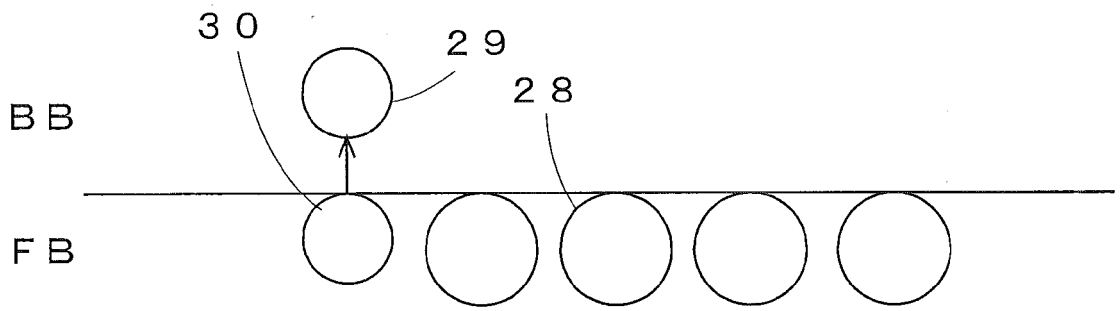

H NEEDLE SELECTION
30
29
28
28
BB
FB
H NEEDLE SELECTION
A NEEDLE SELECTION:KNIT
A NEEDLE SELECTION:KNIT

Fig. 3

(a)



(b)

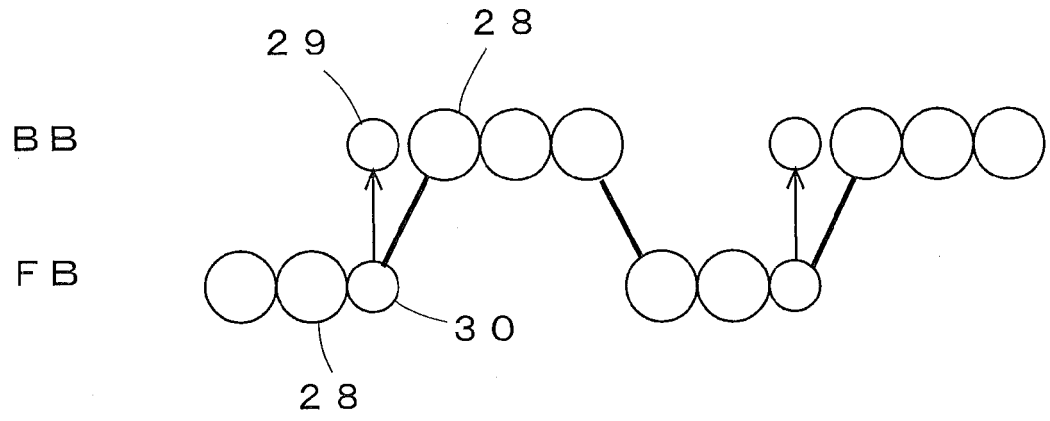


Fig. 4

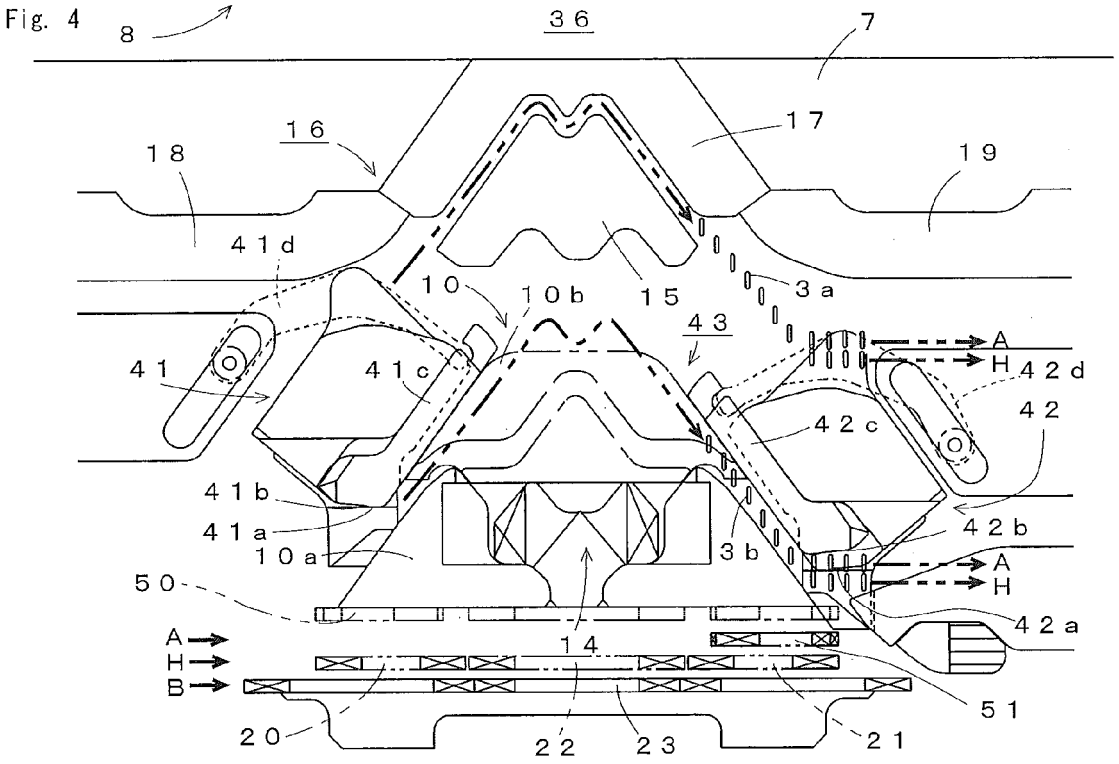

8
36
7
16
17
18
19
41d
10
10b
15
3a
43
41
41c
A
H
42d
42
42c
41b
41a
10a
3b
42b
50
A
H
42a
14
A
H
B
51
20
22
23
21

Fig. 5

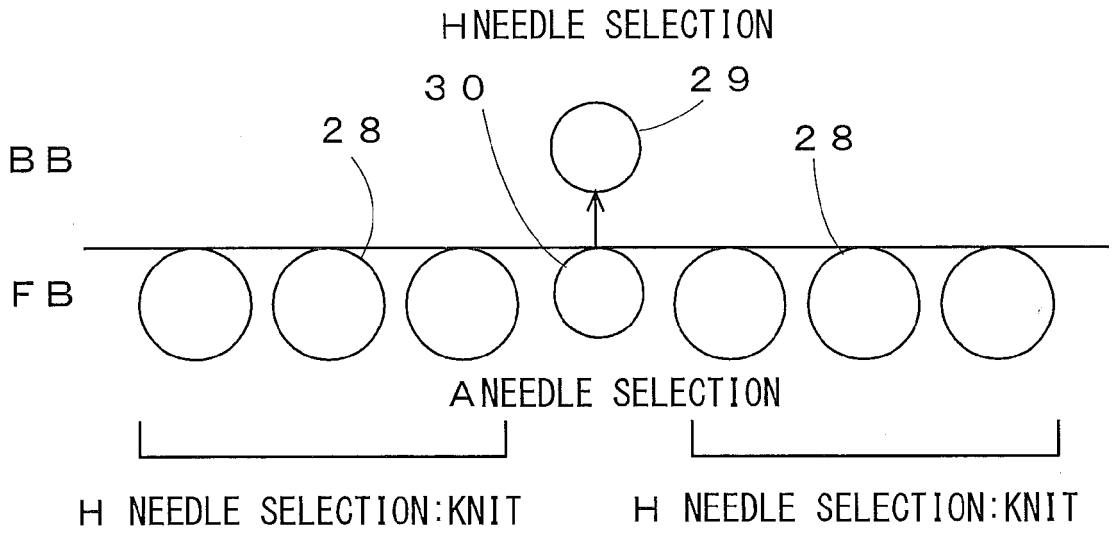

HNEEDLE SELECTION
30
29
28
28
BB
FB
ANEEDLE SELECTION
H NEEDLE SELECTION:KNIT
H NEEDLE SELECTION:KNIT

Fig. 6

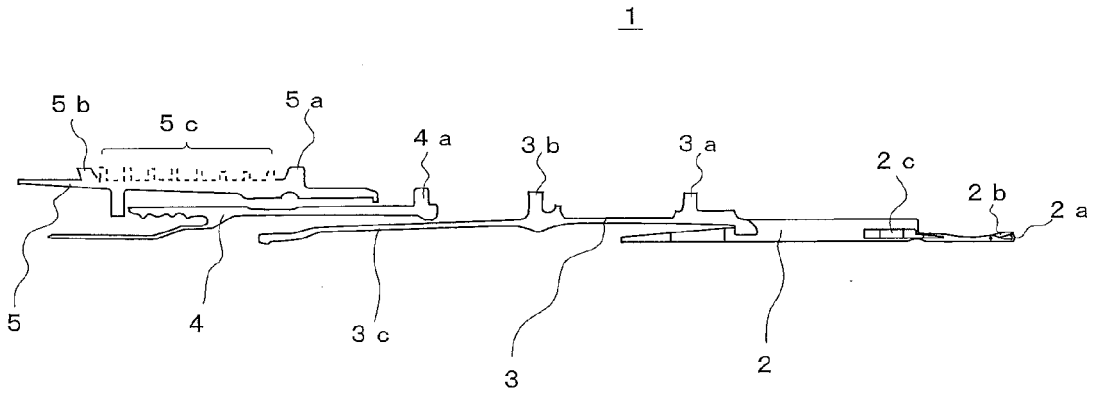


Fig. 7

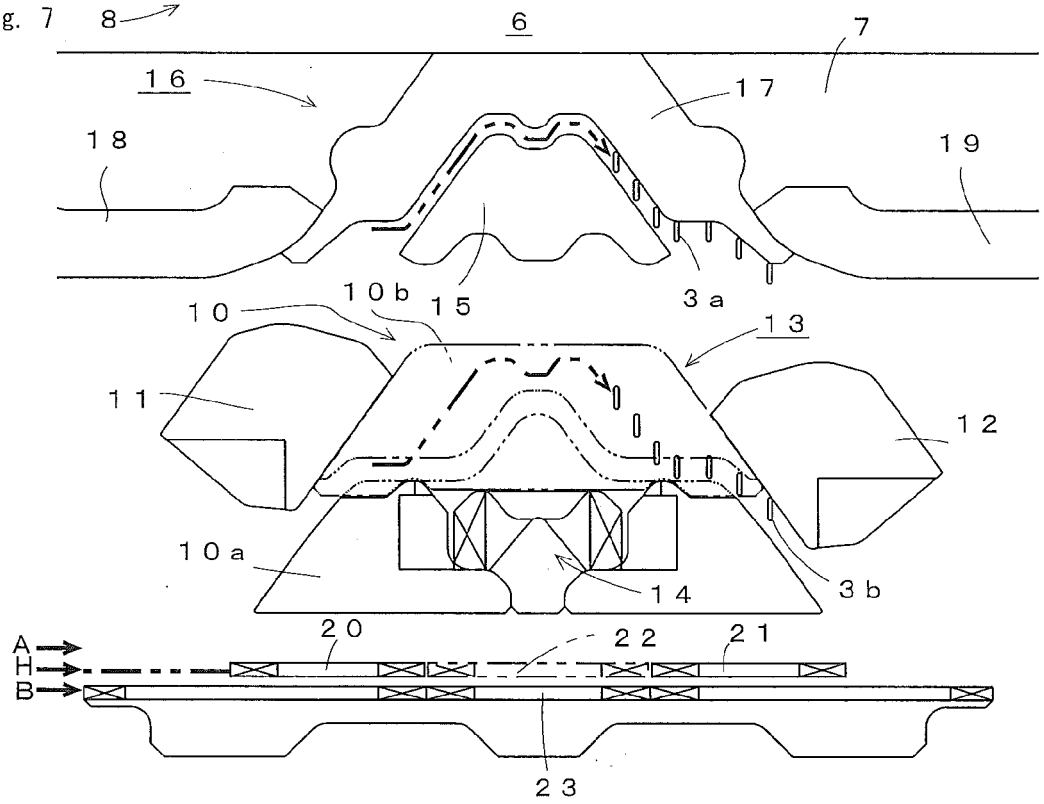
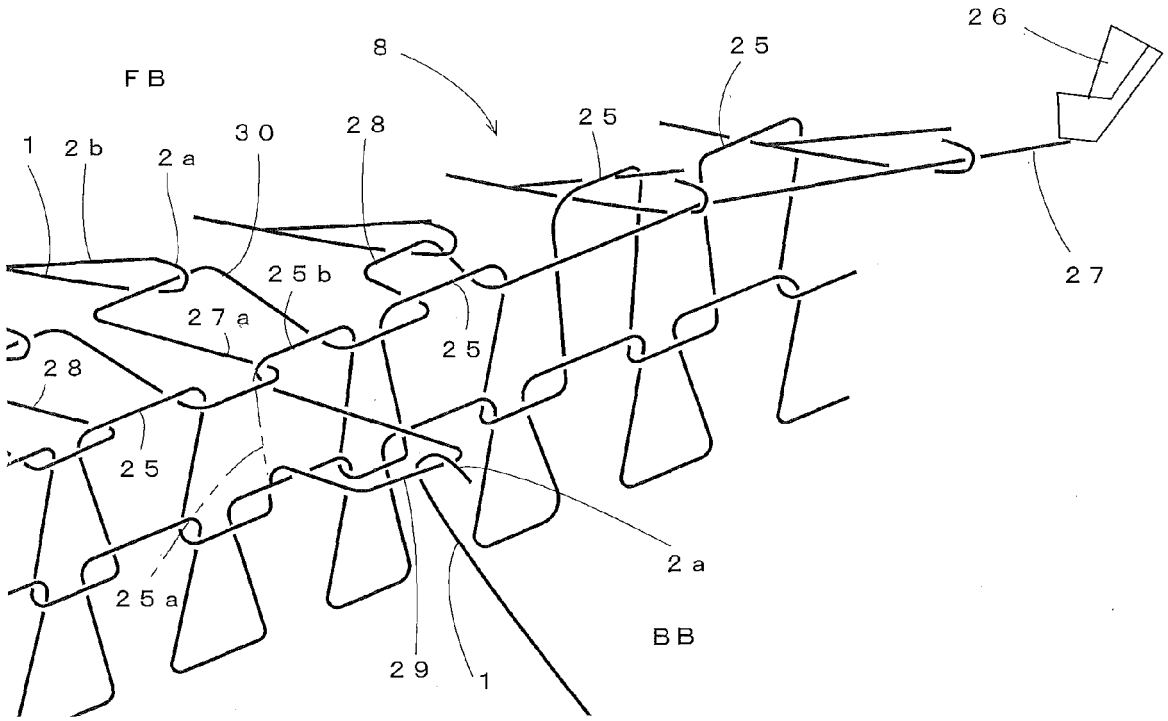


Fig. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 15 16 6396

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 995 363 A1 (SHIMA SEIKI MFG [JP]) 26 November 2008 (2008-11-26) * paragraph [0024] - paragraph [0033]; figures 2, 5 *	1-3	INV. D04B7/10 D04B15/36
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TECHNICAL FIELDS SEARCHED (IPC)

D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 June 2015	Braun, Stefanie

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