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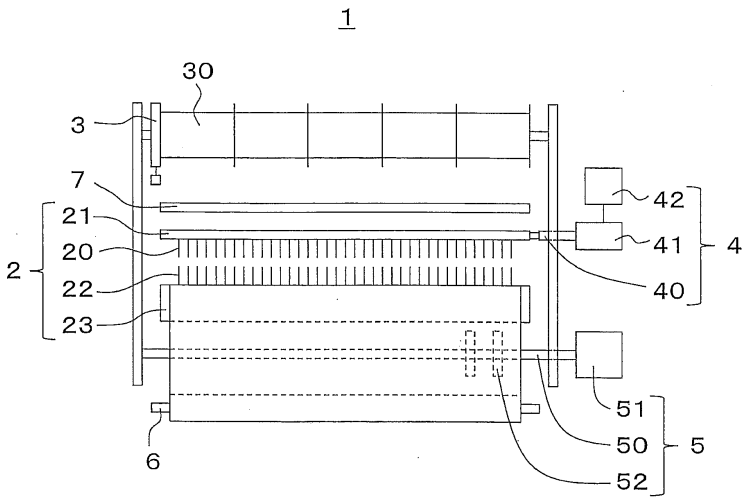
(54) METHOD OF KNITTING WARP KNITTED FABRIC

(57) Provided is a method of knitting a warp knitted fabric by which a knitted fabric with more variations may be knitted.

The method of knitting a warp knitted fabric according to an embodiment includes performing single knitting using two front and rear integrated jacquard bars PJB which are lined up and each of which has a full gauge in which two half-gauge jacquard bars JB are paired, and displacing a jacquard guide 20j included in each of the jacquard bars JB by allowing a jacquard mechanism of a selected gauge position to act at a time of selected lapping during the single knitting.

Fig. 1



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Description

[0001] The present invention relates to a method of knitting a warp knitted fabric.

[0002] Each of a plurality of jacquard guides provided in a jacquard bar can be displaced independently in the left-and-right direction during knitting. Accordingly, it is possible to make a partial change in a basic texture. For example, in the knitting of a closed-stitch dembigh texture as a basic texture illustrated in (1) of FIG. 14, a part of jacquard guides may be displaced at the time of underlapping, so that textures in which changes are made may be obtained as illustrated in (2) to (4) of FIG. 14. Also, in the knitting of a closed-stitch dembigh texture as a basic texture illustrated in (1) of FIG. 15, a part of jacquard guides may be displaced at the time of overlapping, so that textures in which changes are made may be obtained as illustrated in (2) to (4) of FIG. 15. Also, "H" in the drawing indicates that the position of a jacquard guide is set as the same position (a basic texture knitting position) as that at the time of knitting of a basic texture, and "T" indicates that the position of a jacquard guide is displaced to the left of the basic texture knitting position.

[0003] As a warp knitting method using this, there is known a knitting method by a single raschel machine described in Kogi No. 2000-3816 of Journal of Technical Disclosure of Japan Institute of Invention and Innovation. In this method, a jacquard guide may be displaced from a basic texture knitting position at the time of both overlapping and underlapping. Then, all jacquard guides may be operated to knit a basic texture while some jacquard guides may be displaced either or both of at the time of overlapping or/and underlapping, thereby making a change in the basic texture. Also, in this method, knitting is performed using a single integrated jacquard bar (a piezo acquard reed) and a plurality of ground guide bars. Here, the integrated jacquard bar refers to one including a pair of two half-gauge jacquard bars, and provided with a full-gauge needle as a whole.

[0004] However, in this method, there is a limitation in a variation of a knitted fabric that can be knitted. For example, by an integrated acquard bar, only a partial area within the entire texture may be a net texture, and the other area may be a texture with no hole. In contrast, by a ground guide bar, the entire area becomes one texture. Therefore, in order to make a net form in a partial area of a knitted fabric in which the texture by the integrated acquard bar and the texture by the ground guide bar are superimposed, the entire texture by the ground guide bar needs to be a net texture and its positions of the holes need to match with the positions of the holes of the net texture by the integrated acquard bar, or the entire texture by the ground guide bar needs to be a chain stitch texture. However, in doing so, in a knitted fabric in which the texture by the integrated acquard bar and the texture by the ground guide bar are superimposed, a texture of an area other than a net-like area is limited, so that the appearance of this area is limited. Also, even when a rubber yarn is allowed to pass through the ground guide bar in order to obtain a stretchable knitted fabric, in a case where the texture by the ground guide bar is a chain stitch texture, the knitted fabric has stretchability only in the course direction.

[0005] Accordingly, an object of the present invention is to provide a method of knitting a warp knitted fabric which hardly has such limitations and allows a knitted fabric having more variations to be knitted.

[0006] The method of knitting a warp knitted fabric according to an embodiment includes performing single knitting using two front and rear integrated jacquard bars which are lined up and each of which has a full gauge in which two half-gauge jacquard bars are paired, and displacing a jacquard guide included in each of the jacquard bars by allowing a jacquard mechanism of a selected gauge position to act at a time of selected lapping during the single knitting.

[0007] According to the method of knitting a warp knitted fabric according to the embodiment having the above characteristics, a knitted fabric with many variations may be knitted.

[0008] Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a front view of a warp knitting machine 1;
FIG. 2 is a view illustrating an array of integrated jacquard bars PJB1 and PJB2;
FIG. 3 is a front view of a jacquard guide 20j;
FIG. 4 is a view illustrating an array of guide bars in an array example (A);
FIG. 5 is a view illustrating an array of guide bars in an array example (B);
FIG. 6 is a view illustrating a closed-stitch dembigh texture, and a changed texture obtained by an action of a jacquard mechanism on the closed-stitch dembigh texture in the present embodiment;
FIG. 7 is a view illustrating an opened-stitch dembigh texture, and a changed texture obtained by an action of a jacquard mechanism on the opened-stitch dembigh texture in the present embodiment;
FIG. 8 is a view illustrating an opened-stitch chain texture, and a changed texture obtained by an action of a jacquard mechanism on the opened-stitch chain texture in the present embodiment;
FIG. 9 is a view illustrating a two-needle underlap insertion texture, and a changed texture obtained by an action of a jacquard mechanism on the two-needle underlap insertion texture in the present embodiment;
FIG. 10 is a view illustrating a one-needle underlap insertion texture, and a changed texture obtained by an action of a jacquard mechanism on the one-needle underlap insertion texture in the present embodiment;
FIG. 11 is a view illustrating a closed-stitch reversed dembigh texture, and a changed texture obtained by

an action of a jacquard mechanism on the closed-stitch reversed dembigh texture in the present embodiment;

FIG. 12 is a view illustrating a counter wrapping texture, and a changed texture obtained by an action of a jacquard mechanism on the counter wrapping texture in the present embodiment;

FIG. 13 is a view illustrating a counter wrapping texture, and a changed texture obtained by an action of a jacquard mechanism on the counter wrapping texture in the present embodiment;

FIG. 14 is a view illustrating a closed-stitch dembigh texture, and a texture obtained by displacing jacquard guides at the time of underlapping; and

FIG. 15 is a view illustrating a closed-stitch dembigh texture, and a texture obtained by displacing jacquard guides at the time of overlapping.

[0009] Embodiments will be described with reference to drawings. Also, the following embodiments are illustrative, and the scope of the invention is not limited thereto. Various omissions, substitutions, and changes can be made to the following embodiments, without departing from the spirit of the invention.

[0010] An expression of a "front-and-rear" direction is used in the following description, in which a swing-in direction is rearward and a swing-out direction is forward. Also, "left-and-right" is an expression when a knitting machine is seen from the front side.

(1) Structure of Warp Knitting Machine

[0011] A warp knitting machine used for performing a method of knitting a warp knitted fabric according to the present embodiment will be exemplified.

[0012] A warp knitting machine 1 in FIG. 1 is a single raschel machine that performs knitting using needles 22 arranged in a row in the left-and-right direction. As illustrated in FIG. 1, the warp knitting machine 1 includes a knitting machine 2 that performs knitting, a yarn supply unit 3 configured to supply yarns to the knitting machine 2, a patterning unit 4 configured to operate guides (reeds) 20 of the knitting machine 2, a driving unit 5 configured to operate the needles 22 of the knitting machine 2, a winding unit 6 configured to wind a knitted fabric knitted by the knitting machine 2, and a tension device 7 provided between the knitting machine 2 and the yarn supply unit 3 and configured to uniformly maintain a tension of yarns to the knitting machine 2.

[0013] The knitting machine 2 includes a number of needles 22 arranged in a row. These needles 22 are simultaneously moved up and down by the driving unit 5. Also, the knitting machine 2 includes a guide bar 21. For the sake of simplicity, only one guide bar 21 is illustrated in FIG. 1, but in actuality, a plurality of guide bars are provided. In one guide bar 21, a number of guides 20 are provided to be arranged in a row. The guide bar 21 is moved in the left and right directions by the patterning unit 4. The knitting machine 2 further includes a trick plate 23 provided in front of the needles 22, or a stitch comb configured to press the knitted fabric to the trick plate 23 side when the needles 22 are raised.

[0014] The yarn supply unit 3 may be any one capable of supplying yarns to the knitting machine 2, but its detailed structure is not limited. As an example of the yarn supply unit 3, one including a beam 30 on which yarns are wound, and a device configured to feed the yarns from the beam 30 may be exemplified. As such a device, a so-called weight-type passive feeding device that rotates the beam 30 in a yarn feeding direction, and adjusts the rotation speed of the beam 30 by braking in the opposite direction to the rotation direction by a weight hung at one end of the beam 30, or a computer device-type active feeding device that controls the rotation speed of the beam 30 by a computer may be exemplified.

[0015] The patterning unit 4 is preferably electronically controlled. Specifically, the patterning unit 4 includes a rod 40 connected to one end of the guide bar 21 and extending in the left-and-right direction, a moving device 41, such as a linear motor or a ball screw, configured to move the rod 40 in the left-and-right direction, and an electronic control device 42 that controls the moving device 41. When an operation instruction is input to the electronic control device 42, the moving device 41 is operated according to the operation instruction, thereby moving the rod 40 and the guide bar 21 in the left-and-right direction.

[0016] However, the structure of the patterning unit 4 is not limited thereto. For example, the patterning unit 4 may include a rotatable chain drum and a chain link that is provided to make one revolution around the outer periphery of the chain drum. In this case, the rod 40 moves in the left-and-right direction by being pushed according to a change of the chain number of the chain link (the height in the radial outward direction of the chain drum).

[0017] The driving unit 5 may be any one capable of moving up and down the needles 22, but its detailed structure is not limited. Generally, the driving unit 5 includes a rotatable shaft 50, a rotating device 51, such as a motor, configured to rotate the shaft 50, and a cam 52 fixed to the shaft 50. When the cam 52 is rotated by the rotation of the shaft 50, the needles 22 above the cam 52 are moved up and down by being pushed by the cam 52.

(2) Array of Guides and Guide Bars of Warp Knitting Machine 1

[0018] As illustrated in FIG. 2, in the knitting machine 2 of the warp knitting machine 1 according to the present embodiment, a front integrated jacquard bar PJB1 and a rear integrated jacquard bar PJB2 are provided in this order from the front side. Here, the integrated jacquard bar includes two half-gauge jacquard bars JB (each of the half-gauge jacquard bars has a half set of jacquard guides 20j), and thus has a full gauge as a whole (which

has a full set of jacquard guides 20j).

[0019] Each of these half-gauge jacquard bars JB performs movement for knitting of a basic texture. Then, all the plurality of jacquard guides 20j provided in the half-gauge jacquard bars JB perform the same movements according to the movement of the jacquard bars JB.

[0020] In addition, each of these jacquard guides 20j is configured to be independently displaced by a jacquard mechanism. Thus, the plurality of jacquard guides 20j may perform different movements according to gauge positions.

[0021] A jacquard mechanism is a mechanism configured to displace the jacquard guide 20j from a position for knitting a basic texture. An example of such a mechanism will be described with reference to FIG. 3. In the jacquard guide 20j illustrated in FIG. 3, a distal end portion 11 having a hole 10 through which yarns pass is provided at the distal end of an insulator 12. At the left and right sides of the insulator 12, piezoelectric elements 13 made of a ceramic are provided. When a voltage is applied to one of the piezoelectric elements 13, the piezoelectric element 13 is deformed and the insulator 12 is bent. As a result, the distal end portion 11 is moved in the left-and-right direction, and the position of the hole 10 is moved in the left-and-right direction. In this manner, the jacquard guide 20j is bent. It is assumed that the movement amount of the hole 10 in the left-and-right direction is a bending amount or a displacement amount of the jacquard guide 20j. In a state where a voltage is not applied to the piezoelectric element 13, the jacquard guide 20j is not bent.

[0022] When the knitting is stopped in a state where the jacquard guide 20j is not bent, the jacquard guide 20j is positioned just above the needles 22. During knitting of a basic texture, the jacquard guide 20j is bent to the right by a distance of half of 1G (a distance between adjacent needles 22). The state where a basic texture is being knitted is set as a state where the jacquard mechanism does not act. When the jacquard mechanism acts, the jacquard guide 20j is bent to the left, and is displaced to the left by a distance of 1G from the position where the basic texture is being knitted. The jacquard mechanism may be allowed to act either or both of at the time of overlapping and underlapping.

[0023] In the knitting machine, in addition to the front integrated acquard bar PJB1 and the rear integrated jacquard bar PJB2, a normal guide bar may be provided. In the normal guide bar, all the plurality of guides provided in the guide bar perform the same movement along with the movement of the guide bar, and each of the guides is not independently displaced in the left-and-right direction. For example, the normal guide bar may be provided behind the rear integrated jacquard bar PJB2, or the normal guide bar may be provided in front of the front integrated jacquard bar PJB1. The guide bars may be provided both in front of the front integrated jacquard bar PJB1 and behind the rear integrated jacquard bar PJB2.

[0024] An exemplary array in which the normal guide bar is provided behind the rear integrated jacquard bar PJB2 is set as an array example (A), and is illustrated in FIG. 4. In the array example (A), the front integrated jacquard bar PJB1, the rear integrated jacquard bar PJB2, a guide bar GB5 as a normal guide bar, and a guide bar GB6 as a normal guide bar are lined up in order from the front side. Here, the front integrated jacquard bar PJB1 includes a jacquard bar JB1 and a jacquard bar JB2, and the rear integrated jacquard bar PJB2 includes a jacquard bar JB3 and a jacquard bar JB4. Then, each of the jacquard bars JB1 to JB4 includes a half set of jacquard guides 20j. Then, the jacquard bar JB1 and the jacquard bar JB2 have a full set of jacquard guides 20j, and the jacquard bar JB3 and the jacquard bar JB4 have a full set of jacquard guides 20j.

[0025] Also, an exemplary array in which the normal guide bars 21 are provided both in front of the front integrated jacquard bar PJB1 and behind the rear integrated jacquard bar PJB2 is set as an array example (B), and is illustrated in FIG. 5. In the array example (B), a guide bar GB1 as a normal guide bar, a front integrated jacquard bar PJB1, a rear integrated jacquard bar PJB2, and a guide bar GB6 as a normal guide bar are lined up in order from the front side. The front integrated jacquard bar PJB1 includes a jacquard bar JB2 and a jacquard bar JB3, and the rear integrated jacquard bar PJB2 includes a jacquard bar JB4 and a jacquard bar JB5. Then, each of the jacquard bars JB2 to JB5 includes a half set of jacquard guides 20j. Then, the jacquard bar JB2 and the jacquard bar JB3 have a full set of jacquard guides 20j, and the jacquard bar JB4 and the jacquard bar JB5 have a full set of jacquard guides 20j.

[0026] Also, in the embodiment described above, a fall plate is not provided in the middle of the array of the guide bars.

(3) Knitting Method

[0027] When knitting is performed using two integrated jacquard bars lined up in the front-and-rear direction, a jacquard mechanism of a jacquard guide of a selected gauge position is allowed to act so that the jacquard guide may be displaced. Here, there is overlapping or underlapping as lapping performed by the jacquard guide at each gauge position. It is possible to select any lapping of these at which the jacquard mechanism is allowed to act. The jacquard mechanism may be allowed to act at the time of both overlapping and underlapping. In this manner, the gauge position and lapping may be selected so that the jacquard mechanism is allowed to act. Then, the jacquard guide at the gauge position may be displaced at the time of the selected lapping. As a result, a change may be added to a basic texture obtained by two integrated jacquard bars.

(3-1) Example of Change in Texture by Action of Jacquard Mechanism

[0028] First, a change in a texture knitted by a jacquard guide due to the action of a jacquard mechanism will be exemplified. Also, in the following example described below, a change is made to a texture repeated at an interval of two knitting courses by the action of a jacquard mechanism, thereby obtaining a texture repeated at the same interval of two knitting courses. However, a change may be made to a texture repeated at an interval of three or more knitting courses, and a change may be made to a texture repeated at an interval of two knitting courses, thereby obtaining a texture repeated at an interval of three or more knitting courses.

[0029] FIG. 6 illustrates change examples of a texture by a jacquard guide, at an interval of two knitting courses. "H" in the drawing indicates that a jacquard mechanism is not allowed to act. In this case, a jacquard guide is located at the same position as that during knitting of a basic texture. "T" in the drawing indicates that a jacquard mechanism is allowed to act. In this case, the jacquard guide is displaced to the left from the position for knitting the basic texture. "T" and "H" are described at upper and lower ends of one needle. Meanwhile, "T" or "H" at the upper end indicates that a jacquard mechanism is allowed or not allowed to act at the time of overlapping, and "T" or "H" at the lower end indicates that a jacquard mechanism is allowed or not allowed to act at the time of underlapping. In (1) of FIG. 6, a closed-stitch dembigh texture composed of repetition units of 1-0/1-2// as a basic texture is illustrated, and by the action of the jacquard mechanism, 15 kinds of changes illustrated in (2) to (16) may be made to the basic texture. For example, the texture in (2) of FIG. 6 is a texture knitted by no action of a jacquard mechanism at the time of underlapping and overlapping at the first course, and action of the jacquard mechanism at the time of underlapping and overlapping at the second course.

[0030] FIGS. 7 to 11 illustrate other change examples of a texture by jacquard guides. The basic texture in FIG. 7 is an opened-stitch dembigh texture illustrated in (1) of FIG. 7, and is composed of repetition units of 0-1/2-1//. The basic texture in FIG. 8 is an opened-stitch chain texture illustrated in (1) of FIG. 8, and is composed of repetition units of 0-1/1-0//. The basic texture in FIG. 9 is a two-needle underlap insertion texture illustrated in (1) of FIG. 9, and is composed of repetition units of 0-0/2-2//. The basic texture in FIG. 10 is a one-needle underlap insertion texture illustrated in (1) of FIG. 10, and is composed of repetition units of 0-0/1-1//. The basic texture in FIG. 11 is a closed-stitch reversed dembigh texture (a texture in which an underlap is placed in a reverse direction to the closed-stitch dembigh texture in (1) of FIG. 6) illustrated in (1) of FIG. 11, and is composed of repetition units of 1-2/1-0//. To each of the basic textures of FIGS. 7 to 11, 15 kinds of changes may be made in the same manner as illustrated in FIG. 6. Meanwhile, in each of FIGS. 7 to 11, only four representative change examples are illustrated in (2) to (5).

(3-2) Example of Knitting by One Integrated Jacquard Bar

[0031] An integrated jacquard bar includes two half-gauge jacquard bars, but these may perform the same movements and knit the same textures. Thus, by the integrated jacquard bar, the textures exemplified in FIGS. 6 to 11 may be knitted.

[0032] Also, since the integrated jacquard bar includes two half-gauge jacquard bars, for example, any one among textures in FIGS. 6 to 11 may be knitted by one half-gauge jacquard bar, a separate texture among textures in FIGS. 6 to 11 may be knitted by the other half-gauge jacquard bar, and these may be superimposed to obtain a texture knitted by one integrated jacquard bar.

[0033] For example, the texture in FIG. 12 is an example of a texture obtained by one integrated jacquard bar. The basic texture illustrated in (1) of FIG. 12 is a counter wrapping texture obtained by superimposing a closed-stitch dembigh texture in (1) of FIG. 6 knitted by one half-gauge jacquard bar on a closed-stitch reversed dembigh texture knitted by the other half-gauge jacquard bar as illustrated in (1) of FIG. 11. On this basic texture, a jacquard mechanism may be allowed to act, thereby making changes exemplified in (2) to (5).

[0034] In (1) to (4) of FIG. 13, a wider texture is illustrated. In (1) of FIG. 13, a counter wrapping texture as a basic texture in (1) of FIG. 12 is illustrated in a wide range. The textures in (2) to (4) of FIG. 13 are examples obtained by changing the texture in (1) of FIG. 13 by the action of a jacquard mechanism, in which the basic texture indicated by broken line in a part of the drawing is displaced in the arrow direction. The texture in (2) of FIG. 13 is a raschel net texture. The texture in (3) of FIG. 13 is a texture to become a thick cloth according to two-gauge underlap, and may be combined with, for example, a dembigh texture of a thin cloth to draw a pattern in the knitted fabric. The texture in (4) of FIG. 13 has a high contraction effect. In this manner, when the jacquard mechanism is allowed to act on the basic texture in (1) of FIG. 13, various textures may be made. Also, since in the textures exemplified in (2) to (4) of FIG. 13, loops are formed at all needle positions, textures superimposed thereon do not need to form loops at all needle positions and may become various textures.

(3-3) Example of Knitting by Two Integrated Jacquard Bars

[0035] The warp knitting machine 1 according to the present embodiment is provided with two integrated jacquard bars, in which for example, any one among textures in FIGS. 6 to 13 may be knitted by one integrated jacquard bar, another one among the textures in FIGS. 6 to 13 may be knitted by the other integrated jacquard bar, and these may be superimposed. Hereinafter, a tex-

ture knitted by two integrated jacquard bars lined up in the front-and-rear direction will be exemplified.

[0036] First, as a basic texture, the closed-stitch dembigh texture knitted by each of the two front and rear integrated jacquard bars, as illustrated in (1) of FIG. 6, is exemplified. When the jacquard mechanism is allowed to act during the knitting of the basic texture, various textures may be knitted. For example, a dembigh texture is knitted by a front integrated jacquard bar, and a texture composed of a partially thick or thin cloth is knitted by the action of the jacquard mechanism by a rear integrated jacquard bar. Accordingly, a thin or thick portion is formed on the knitted fabric obtained by superimposing these textures on each other, thereby forming a pattern due to a thickness difference.

[0037] Then, as basic textures, the closed-stitch dembigh texture knitted by the front integrated jacquard bar as illustrated in (1) of FIG. 6, and the closed-stitch reversed dembigh texture knitted by the rear integrated jacquard bar as illustrated in (1) of FIG. 11 are exemplified. In these textures, since a sinker loop formed by the front integrated jacquard bar and a sinker loop formed by the rear integrated jacquard bar intersect each other, a contraction effect occurs in the knitted fabric. When the jacquard mechanism is allowed to act during the knitting of the basic texture, various textures may be knitted as described above. The knitted fabric of the texture has a contraction effect.

[0038] Then, as a basic texture, the counter wrapping texture knitted by each of the front and rear integrated jacquard bars as illustrated in (1) of FIG. 12 and (1) of FIG. 13, is exemplified. When the jacquard mechanism is allowed to act during the knitting of the counter wrapping texture, various textures may be knitted. For example, a portion ("A portion") of a texture knitted by the integrated jacquard bar becomes a raschel net texture as illustrated in (2) of FIG. 13. Then, textures each partially including a raschel net texture are knitted by the two integrated jacquard bars, respectively, and the raschel net textures are superimposed while their hole positions are aligned. In this manner, a knitted fabric in which a superimposed area of raschel net textures is formed in a net shape may be obtained. Also, in this case, in a texture knitted by one integrated acquard bar, a texture of a portion ("B portion") other than the A portion is not limited. For example, between the two superimposed B portions, one B portion may become a net texture, and the other B portion may become a texture other than the net texture. Also, both B portions may become a texture other than the net texture. Accordingly, an area of the knitted fabric other than a net-like partial area may be formed as various textures, thereby achieving various appearances.

[0039] Then, as basic textures, the closed-stitch dembigh texture knitted by the front integrated jacquard bar as illustrated in (1) of FIG. 6, and the counter wrapping texture knitted by the rear integrated jacquard bar as illustrated in (1) of FIG. 12 and (1) of FIG. 13 are exemplified. When in the rear integrated jacquard bar, a jacquard mechanism is allowed to act on the basic texture, for example, the raschel net texture illustrated in (2) of FIG. 13 may be knitted. Also, when in the front integrated jacquard bar, a jacquard mechanism is allowed to act, a texture having a pattern composed of, for example, a thick cloth portion and a thin cloth portion may be knitted. Then, these textures may be integrated, thereby obtaining a knitted fabric with a clear texture pattern by the front integrated jacquard bar.

[0040] Then, as basic textures, the counter wrapping texture knitted by the front integrated jacquard bar as illustrated in (1) of FIG. 12 and (1) of FIG. 13, and the closed-stitch reversed dembigh texture knitted by the rear integrated jacquard bar as illustrated in (1) of FIG. 11 are exemplified. When in the front integrated jacquard bar, a jacquard mechanism is allowed to act on the basic texture, for example, the raschel net texture illustrated in (2) of FIG. 13 may be knitted. Also, when in the rear integrated jacquard bar, a jacquard mechanism is allowed to act, a texture having a pattern composed of, for example, a thick cloth portion and a thin cloth portion may be knitted. Then, these textures may be integrated, thereby obtaining a knitted fabric with a visible texture pattern by the rear integrated jacquard bar. This pattern looks relatively thin.

[0041] The knitted fabric may have many variations not only by the knitting method as described above, but also by using different kinds of yarns passing through the two integrated jacquard bars (i.e., four jacquard guides). The different kinds of yarns specifically indicate that yarns are different in a raw material, a shape, a thickness, a number of twists, or a finishing. The different kinds of yarns are different in an elasticity, a stretchability, a flexibility, a presence or absence of glossiness, a feel, or a stained state.

[0042] For example, yarns having different stained states at a predetermined temperature, for example, at least polyamide and polyester are allowed to pass through four jacquard guides, respectively, to perform knitting. Then, by staining at a predetermined temperature, due to a difference of yarns in the stained state, a shape composed of shades of colors may be drawn on the knitted fabric.

[0043] Also, when knitting is performed by passing a highly elastic yarn through one or two or more of the four jacquard guides, a knitted fabric that is contracted in accordance with the knitting method after knitting may be obtained. For example, when knitting is performed by passing elastic yarns through the jacquard guides that perform a chain stitch, a knitted fabric that is contracted in a course direction may be obtained.

[0044] Also, by setting the yarns passing through the two integrated jacquard bar to have at least two or more colors, a shape caused by a color difference may be drawn on the knitted fabric. For example, a yellow yarn is allowed to pass through the rear integrated jacquard bar to knit a dembigh texture, a red yarn is allowed to

pass through the front integrated jacquard bar to knit a net texture having open holes, and these may be superimposed to obtain a knitted fabric in which a yellow color is visible below a red color. Also, for example, a yellow yarn is allowed to pass through the rear integrated jacquard bar to knit a closed-stitch dembigh texture, a red yarn is allowed to pass through the front integrated jacquard bar to knit a closed-stitch dembigh texture, and these may be superimposed so that a knitted fabric with separate colors may be knitted at a sinker loop portion in which the front side has a red color and the rear side has a yellow color. Here, each of the rear integrated jacquard bar and the front integrated jacquard bar has a full set of acquard guides . Thus, the color separation is clearer as compared to that in a case where a red yarn and a yellow yarn are allowed to pass through two half-gauge jacquard bars in one integrated jacquard bar, respectively, to perform knitting. Meanwhile, when different colors of yarns are allowed to pass through the four jacquard bars, respectively, to perform knitting, a knitted fabric composed of four colors may be obtained.

[0045] When a normal guide bar is provided in addition to the front integrated jacquard bar and the rear integrated jacquard bar, a variation of a knitted fabric is also increased.

[0046] In the array example (A), for example, an inserting yarn may be inserted by the guide bar GB5 or GB6, and a shape may be drawn or a border may be formed on the knitted fabric by the inserting yarn. The example of forming the border by the inserting yarn is described as follows. It is assumed that two pieces of clothing are knitted to be lined up by the integrated jacquard bars PJB1 and PJB2. In this case, at any guide bar, a disintegrated yarn by a chain stitch is provided between adjacent pieces of clothing. Then, by the guide bar GB5 or GB6, a rubber yarn is inserted to be imposed on the disintegrated yarn and one piece of clothing, and a rubber yarn is inserted to be imposed on the disintegrated yarn and the other piece of clothing. That is, two adjacent pieces of clothing are connected to each other by one disintegrated yarn and two rubber yarns at both sides of the disintegrated yarn. Here, as the rubber yarn, a highly stretchable yarn which may be made of, for example, polyurethane is used. Then, after the two pieces of clothing are knitted to be lined up, and finished, the disintegrated yarn is released. Then, the two rubber yarns are released from the disintegrated yarn and contracted to be integrated with end portions of pieces of clothing, respectively, at the hanging sides. In this manner, pieces of clothing are separated from each other in a state where the edges become clean.

[0047] Also, in the array example (B), for example, an inserting yarn may be inserted by the front integrated jacquard bar PJB1. Since the guide bar GB1 is placed in front of the front integrated jacquard bar PJB1, when the guide bar GB1 performs a chain stitch and forms a loop, it is possible to press the inserting yarn.

[0048] Thereafter, on the knitted fabric knitted as described above, heat-setting, washing, drying, or other processings as necessary may be performed to finish a product such as clothing.

(4) Effect

[0049] According to the method of knitting the warp knitted fabric according to the present embodiment, a knitted fabric with many variations may be knitted by using a full-gauge integrated jacquard bar including a pair of half-gauge jacquard bars, performing knitting using two integrated jacquard bars, and selecting action/non-action of the jacquard mechanism at the time of overlapping or underlapping.

[0050] For example, in one integrated acquard bar, half-gauge j acquard bars are paired, and action/non-action of the jacquard mechanism may be selected at the time of overlapping and underlapping. Thus, various changes may be made on a part of a texture knitted by one integrated jacquard bar. Then, since knitting is performed using two integrated jacquard bars as described above, two textures each of which is partially changed by a jacquard mechanism may be superimposed.

[0051] Also, when a guide bar provided behind the rear integrated jacquard bar or in front of the front integrated jacquard bar is used for knitting, a knitted fabric with more variations may be knitted as exemplified above.

[0052] Also, when the yarns passing through the two integrated jacquard bars are set to have at least two or more types, or the yarns passing through the two integrated jacquard bars are set to have at least two or more colors, a knitted fabric with more variations may be knitted as exemplified above.

[Description of Reference Numerals and Signs]

[0053]

1	warp knitting machine
2	knitting machine
3	yarn supply unit
4	patterning unit
5	driving unit
6	winding unit
7	tension device
10	hole
11	distal end portion
12	insulator
13	piezoelectric element
20	guide
20j	jacquard guide
21	guide bar
22	needle
23	trick plate
30	beam
40	rod
41	moving device
42	electronic control device

50	shaft
51	rotating device
52	cam
PJB1	front integrated jacquard bar
PJB2	rear integrated jacquard bar
GB	guide bar
JB	jacquard bar

Claims

1. A method of knitting a warp knitted fabric comprising:

performing single knitting using two front and rear integrated acquard bars which are lined up and each of which has a full gauge in which two half-gauge jacquard bars are paired, and displacing a jacquard guide included in each of the jacquard bars by allowing a jacquard mechanism of a selected gauge position to act at a time of selected lapping during the single knitting.

2. The method according to claim 1, wherein the knitting is performed using a guide bar provided behind the rear integrated jacquard bar.

3. The method according to claim 1 or 2, wherein the knitting is performed using a guide bar provided in front of the front integrated jacquard bar.

4. The method according to any one of claims 1 to 3, wherein yarns to pass through the two integrated jacquard bars are set to have two or more types.

5. The method according to any one of claims 1 to 3, wherein yarns to pass through the two integrated jacquard bars are set to have two or more colors.

Fig. 1

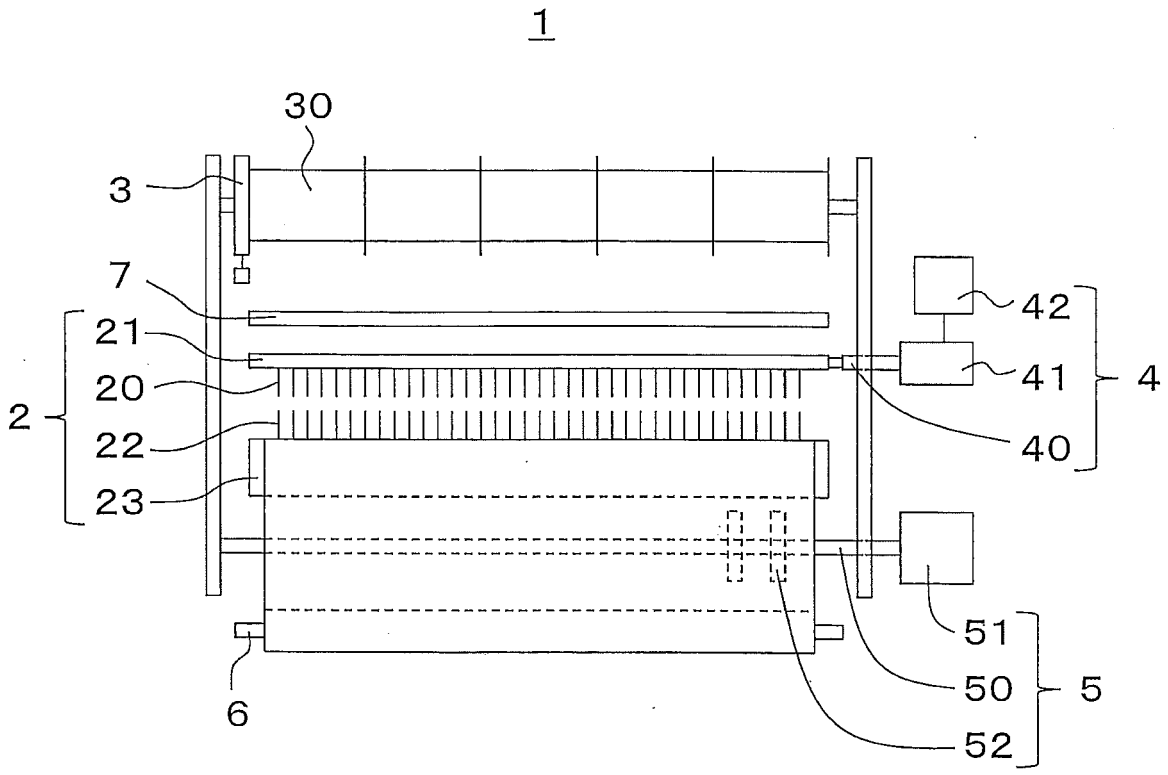

Fig. 2

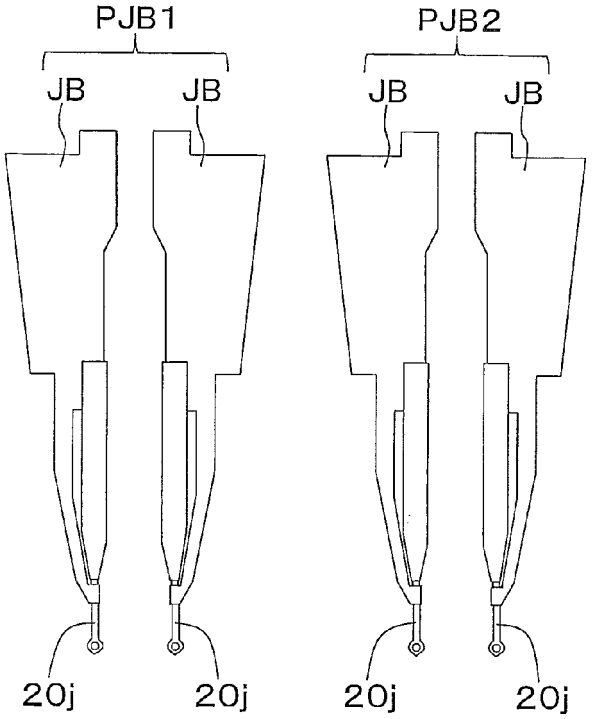

Fig. 3

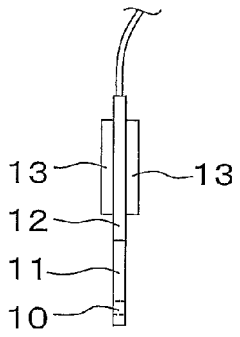

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Fig. 4

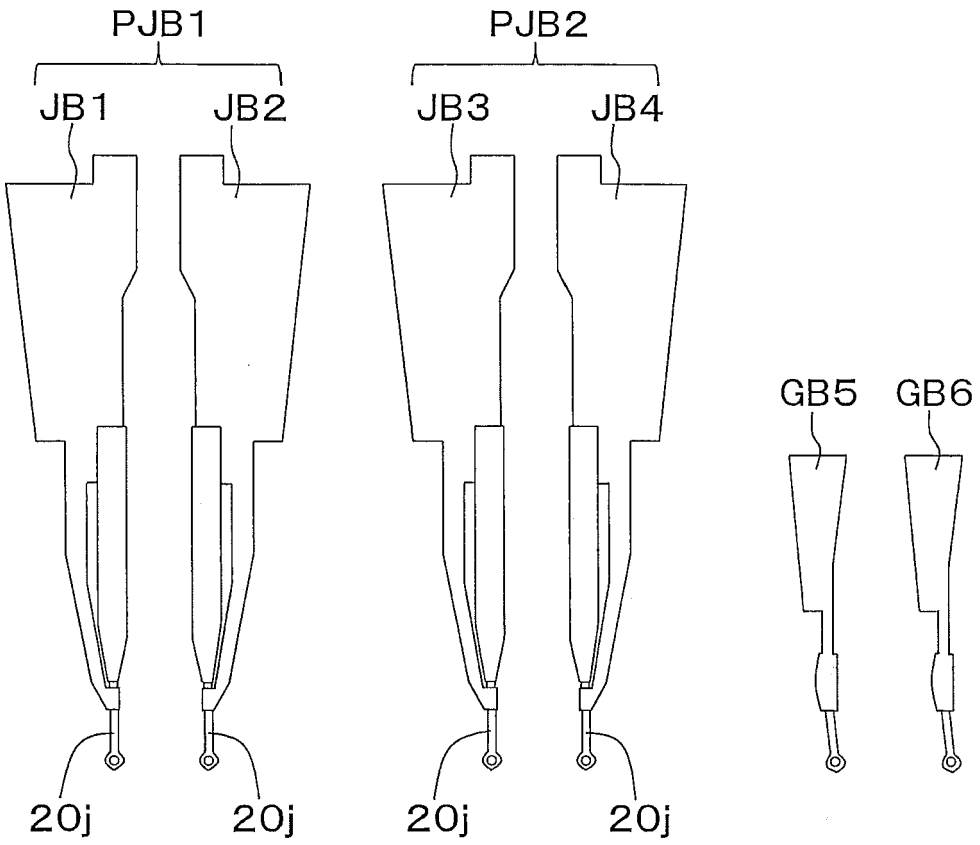
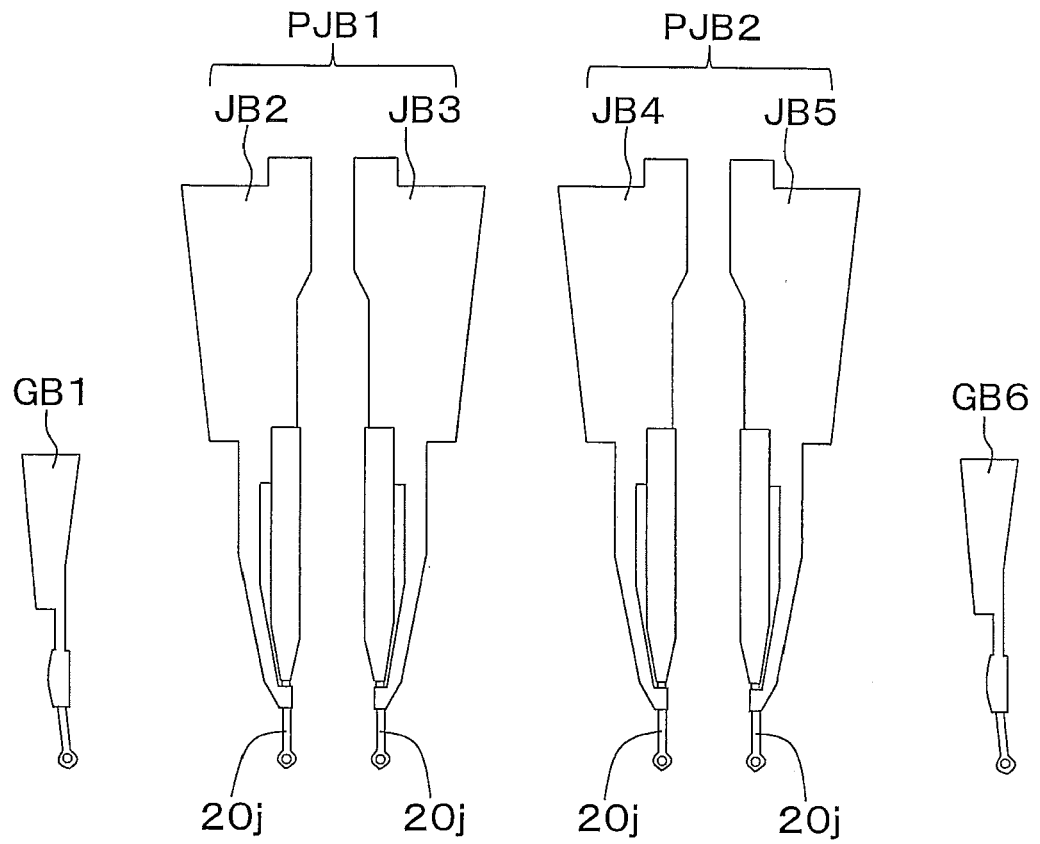


Fig. 5



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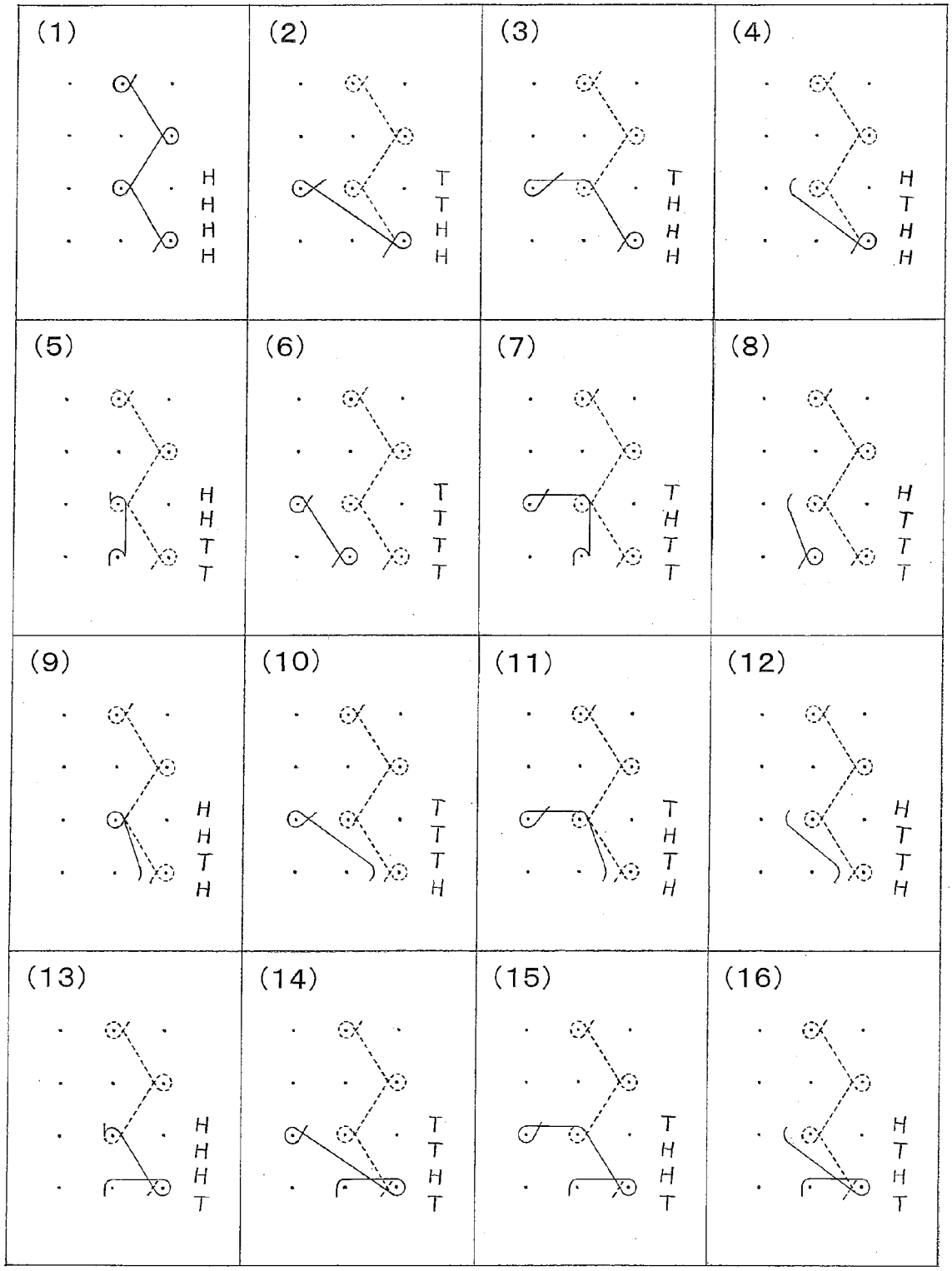
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Fig. 7

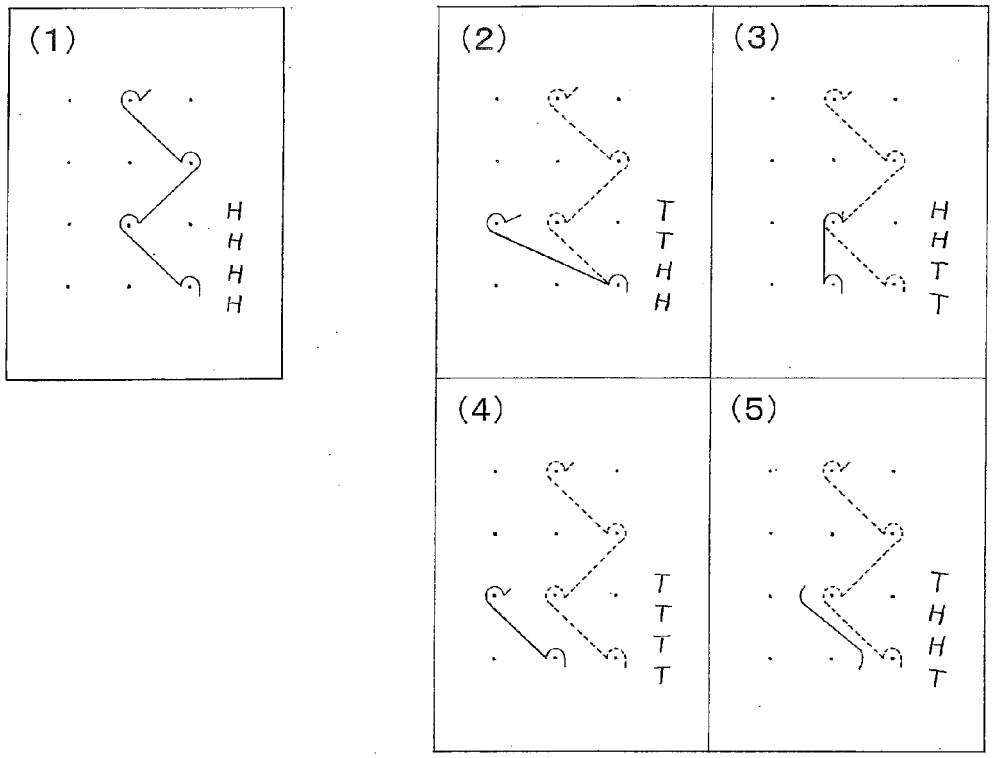
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Fig. 8

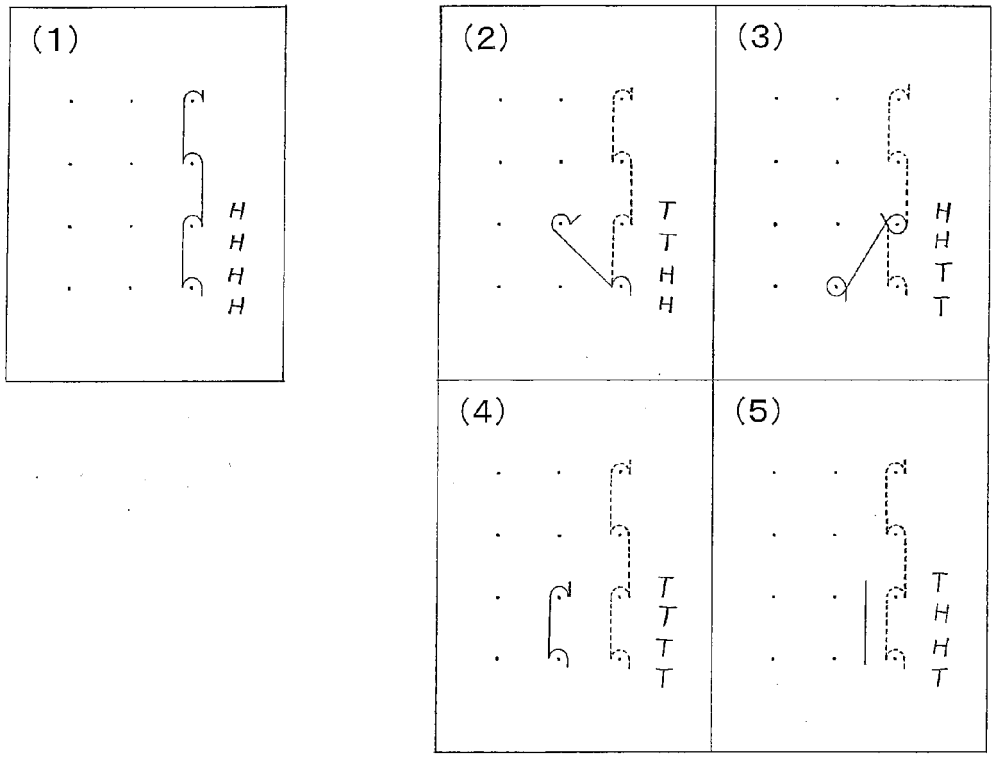
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Fig. 9

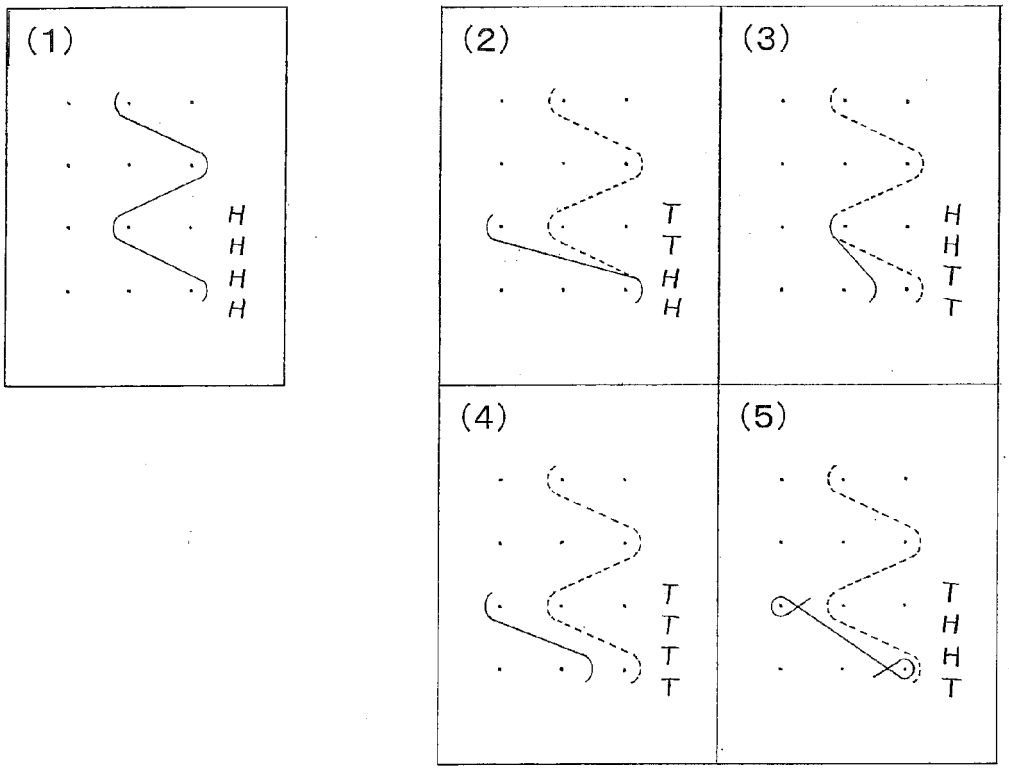
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Fig. 10

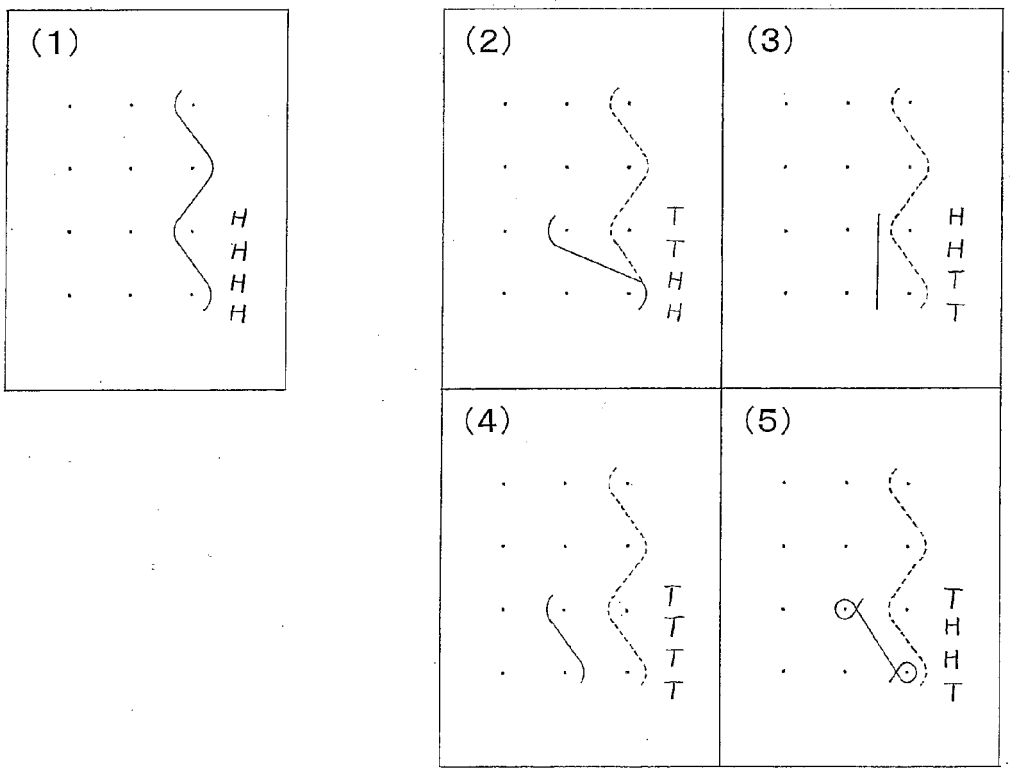
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Fig. 11

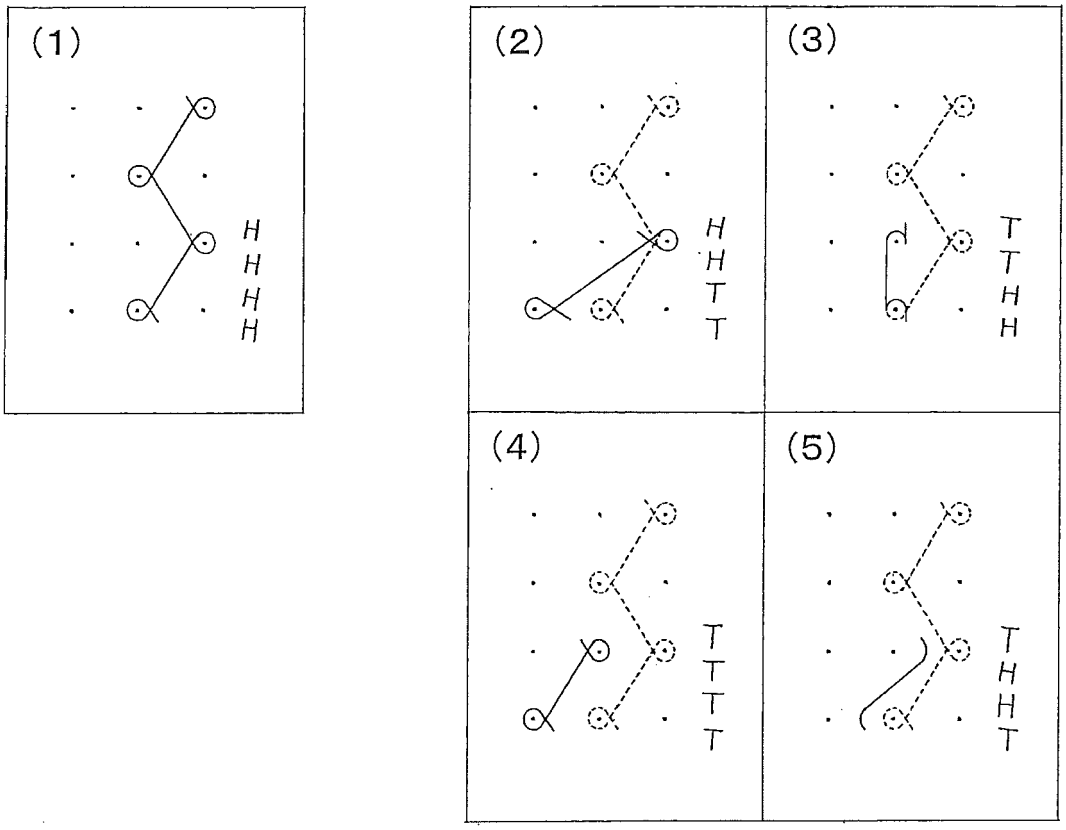
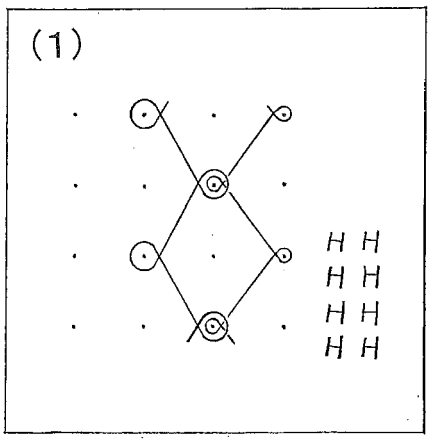


Fig. 12



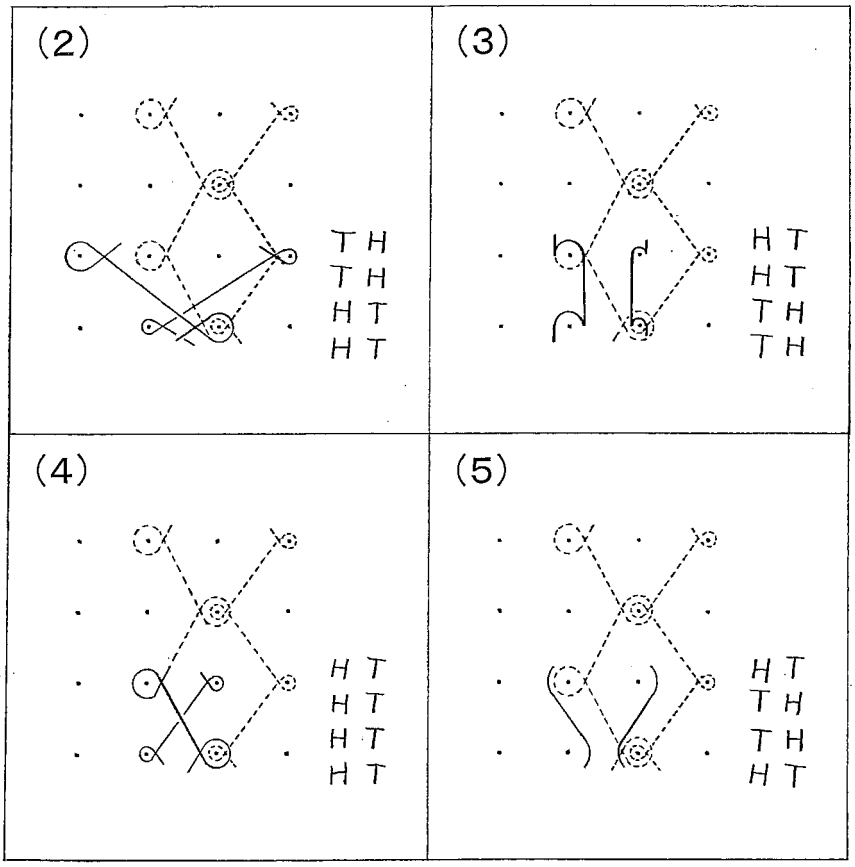


Fig. 13

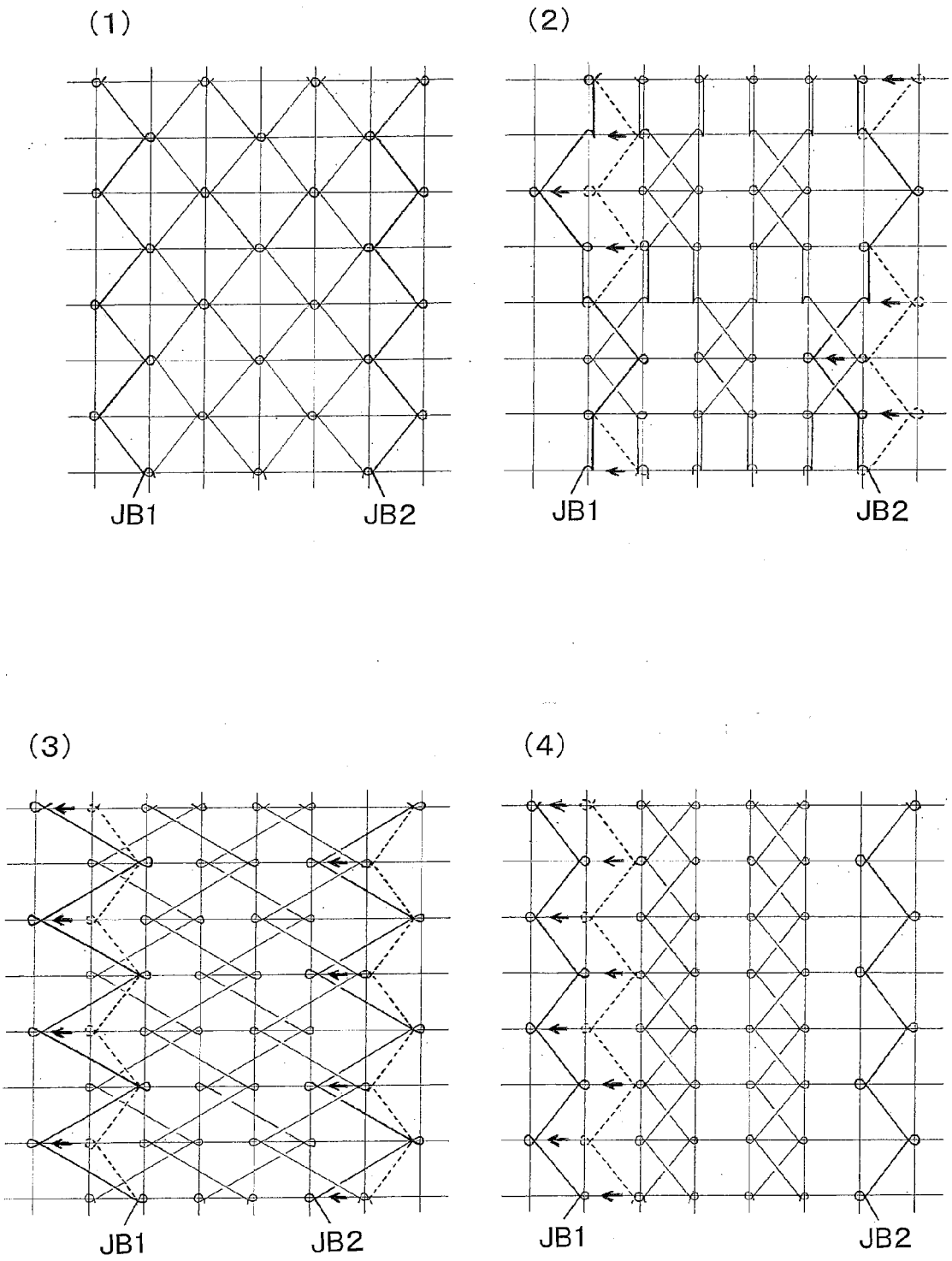


Fig. 14

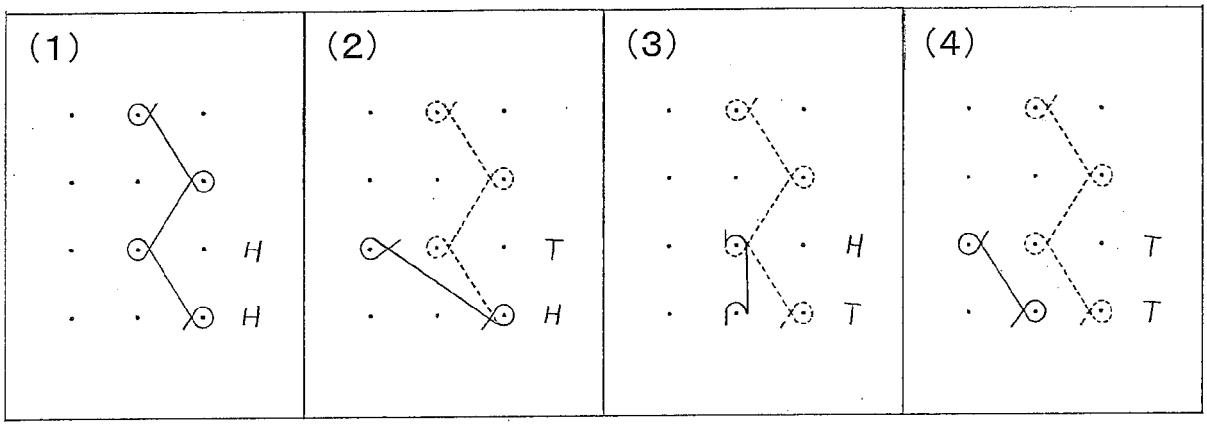
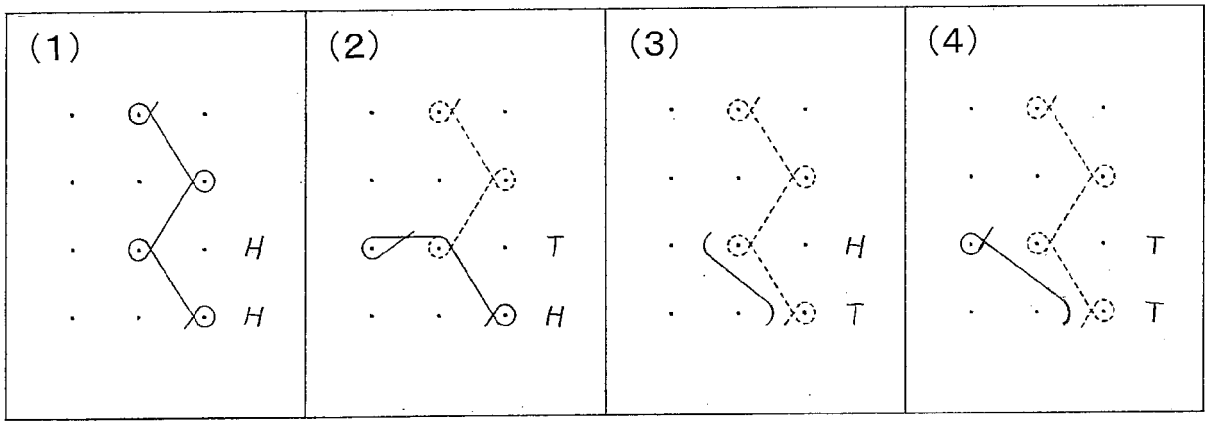


Fig. 15



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EUROPEAN SEARCH REPORT

Application Number
EP 16 18 0889

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 43 12 443 C1 (MAYER TEXTILMASCHF [DE]) 15 September 1994 (1994-09-15) * column 3, line 14 - column 4, line 31; figures 1-3 *	1-5	INV. D04B21/06 D04B21/10 D04B27/32
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D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 January 2017	Braun, Stefanie

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