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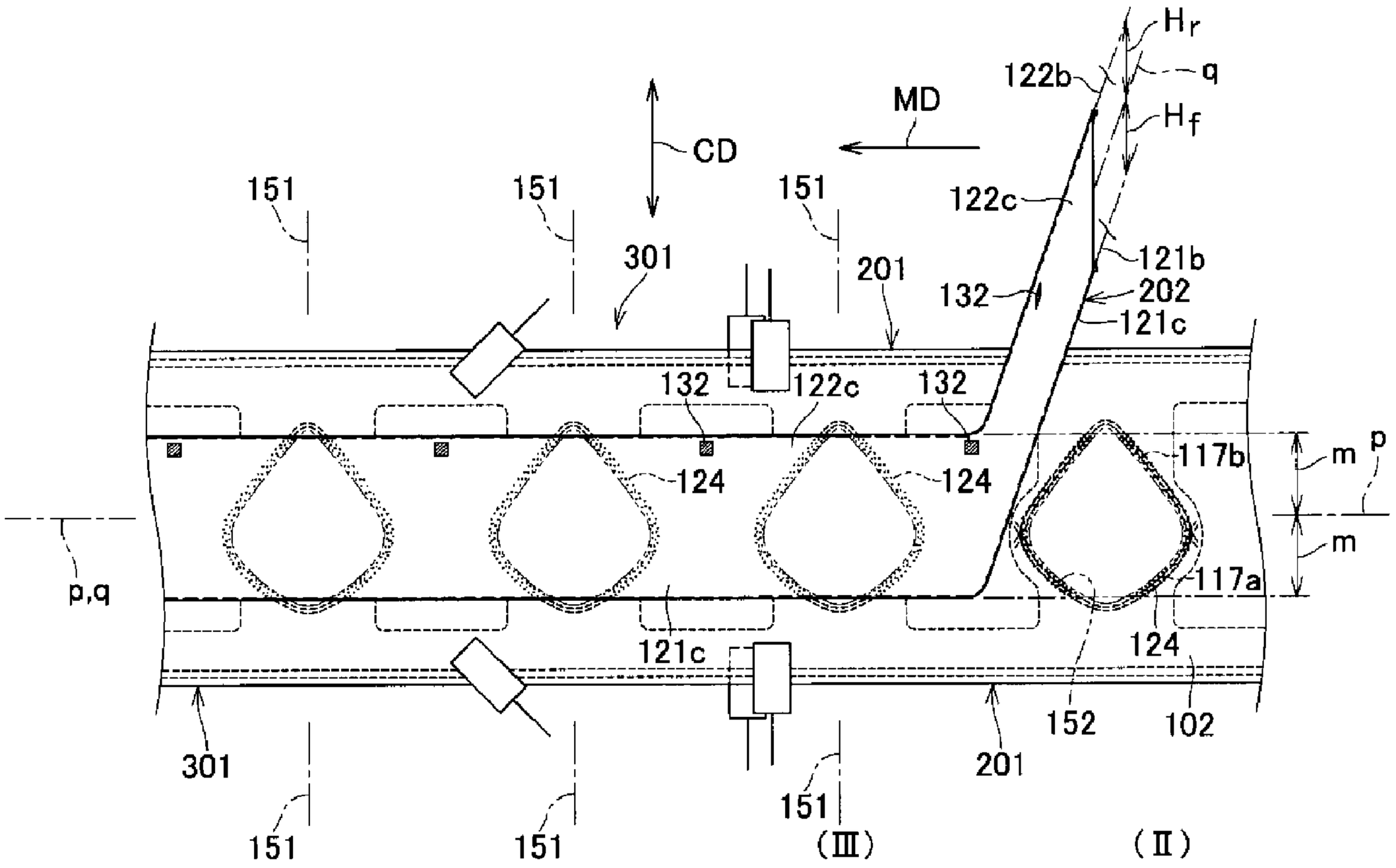
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(54) Titre : PROCEDE DE FABRICATION DE CULOTTES JETABLES DE TYPE COUCHES
(54) Title: METHOD FOR MAKING DISPOSABLE PANTS-TYPE DIAPER



(57) Abrégé/Abstract:
Disposable underpants type diapers in which a pocket for containing excrement is aligned easily with an external genitalia and an anus are produced continuously. A first web (201) where diaper basic bodies are continuous in their width direction, and a second web (202) where sheet-like members being fixed to the inner surface side of an inseam area in order to form pockets are continuous in their width direction are supplied in the machine direction MD and superimposed, and then are bonded together at the opposite side edge portions of the inseam area, thus obtaining a first compound web (301). Intermediate part in the cross

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(57) Abrégé(suite)/Abstract(continued):
direction CD isclipped substantially circularly from between the diaper basic bodies of the first compound web, thus obtaining a second compound web. The second webs (202) overlapping when the second compound web is folded are bonded locally by adhesive (132) at the central part of the diaper basic body in the machine direction MD, thus obtaining a third compound web. After an bonding area is formed along a cut line extending in the cross direction CD, the third compound web is cut at the cut line to obtain individual underpants type diapers.

A B S T R A C T

The present invention provides a method of continuously making a disposable pants-type diaper having a body waste receiving pocket adapted to be easily aligned with the wearer's external genitals and anus. A first web 201 comprising chassis continuously arranged in a transverse direction thereof is continuously fed in a machine direction MD wherein each of the chassis comprises a crotch region, a front waist region and a rear waist region. A second web 202 comprising sheet members continuously arranged in the transverse direction thereof is continuously fed onto the first web 201 wherein each of the sheet members is destined to be attached to the inner surface of the associated chassis in the crotch region thereof and thereby to form a body waste receiving pocket. The first web 201 and the second web 202 are bonded to each other along regions destined to define opposite side edges of the crotch region in the chassis to obtain first composite web 301. From the first composite web 301, a substantially circular section defined between each pair of the adjacent chassis in the middle region as viewed in a cross direction CD is clipped out to obtain a second composite web. A second composite web is folded in two and halves of the second web 202 facing each other are locally bonded together

in the middle region of each chassis as viewed in the machine direction MD by bonding agent 132 to obtain a third composite web. The third composite web is provided on both sides of a cutting line 151 extending in the cross direction CD with seal regions extending along the cutting line 151 to obtain a fourth composite web and finally the fourth composite web is cut along the cutting line 151 to obtain the individual pants-type diapers.

S P E C I F I C A T I O N

METHOD FOR MAKING DISPOSABLE PANTS-TYPE DIAPER

TECHNICAL FIELD

[0001]

The present invention relates generally to a method for making a disposable pants-type diaper and particularly to a method for making such pants-type diaper adapted to prevent feces from coming in contact with the wearer's skin.

RELATED ART

[0002]

There have conventionally been proposed various disposable diapers provided with the functions to protect the wearer's skin being soiled with feces which would otherwise come in contact therewith. For example, the pants-type diaper disclosed in PATENT DOCUMENT 1 includes the skin-contact sheet disposed on the inner sheet and is formed in the crotch region of this skin-contact sheet with the opening surrounded by the elastic member attached under tension to the inner sheet. This opening may be aligned with the wearer's anus to ensure that feces discharged by the wearer moves through the opening into the spaced defined below the skin contact sheet so that feces

would not come in contact with the skin. In the case of the method for making the disposable pants-type diaper disclosed in PATENT DOCUMENT 2, the disposable pants having the opening formed in the inner sheet of the diaper is continuously made.

PATENT DOCUMENT 1: JP 2002-11044 A

PATENT DOCUMENT 2: JP 05-42180 A

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0003]

However, the diaper disclosed in PATENT DOCUMENT 1 still has a problem that feces might move into a space defined between the wearer's skin and the skin-contact sheet and seriously soil the wearer' skin unless the opening formed in the skin-contact sheet is exactly aligned with the wearer's anus. In other words, it is essential for this diaper of prior art to being the opening of the skin-contact sheet in alignment with the wearer's anus in the course of putting the diaper on the wearer's body. However, it can not be determined from the exterior whether the opening of the diaper having been put on the wearer's body is exactly in alignment with the anus or not. Furthermore, the skin-contact sheet is formed with a notch through which urine can be directly absorbed by the absorbent core. Regrettably, urine having passed through the notch will be inevitably mixed

with feces on the surface of the absorbent core. Liquidity of feces will increase when it is mixed with urine and consequently a possibility that the wearer's skin might be soiled with feces will correspondingly increase.

[0004]

In view of the problem left behind unsolved by the conventional diaper as has been described above, it is a principal object of the present invention to provide a novel disposable pants-type diaper improved to facilitate the wearer's anus to be exactly positioned in opposition to the feces receiving pocket and thereby to protect the wearer's skin from being soiled with feces.

MEASURE TO SOLVE THE PROBLEM

[0005]

The object set forth above is achieved, according to the present invention, by an improvement in the method for making a disposable pants-type diaper comprising the continuous steps of preparing a chassis having a crotch region having a back-and-forth direction and a transverse direction which is orthogonal to the back-and-forth direction, a front waist region extending forward from the crotch region and a rear waist region extending rearward from the crotch region wherein transversely opposite side edges of the crotch region extend

in the back-and-forth direction, folding back the chassis about the crotch region in said back-and-forth direction, bonding respective inner surfaces of the front and rear waist regions put flat together to each other along transversely opposite side edges of the front and rear waist regions to make the chassis in pants-shape and providing the chassis on its inner surface with a sheet piece forming on the inner surface in the crotch region a pocket adapted to receive body waste.

[0006]

The method according to the present invention further comprises the steps of:

a) continuously feeding a first web in a machine direction wherein the first web adapted to provide successively a plurality of the chassis each having the transverse direction in coincidence with the machine direction as the first web is cut at regular pitches in the machine direction,

b) continuously feeding a second web in the machine direction wherein the second web comprising a plurality of the sheet members contiguous one to another in the transverse direction,

c) superposing the first web and the second web upon each other so that a first center line bisecting the first web in a cross direction orthogonal to the machine direction falls in

with a second center line bisecting the second web in the cross direction,

d) locally bonding the second web to the first web in regions thereof destined to form transversely opposite side edges of the crotch region in the chassis or in regions located aside toward the middle of the chassis as viewed in the machine direction so as to provide a first composite web having the second web spaced from the first web destined to define the chassis between the regions in which the first web and the second web are bonded to each other,

e) clipping out a substantially circular section defined between each pair of adjacent the chassis and in a middle region of the first composite web as viewed in the cross direction from the first composite web so as to form the side edges of the crotch region opposed to each other in the machine direction and thereby to obtain a second composite web,

f) folding back the second composite web along the first and second center lines with the second web inside,

g) bonding opposite halves of the second web in the second composite web to each other in the middle region so as to obtain a third composite web,

h) bonding opposite halves of the second composite web in the third composite web to each other in a region defined

between the middle region and the edge of the second composite web extending in the machine direction having been described with respect to the step e) so as to obtain a fourth composite web formed with a linear seal region extending the cross direction, and

i) cutting the fourth composite web along a cutting line extending in the cross direction at a middle of the seal region as viewed in the machine direction to obtain individual pants-type diapers successively.

[0007]

According to one preferred embodiment of the invention, the second web comprises an inelastic web fed in the machine direction and elastic members extending in the machine direction and attached under tension to opposed edges of the inelastic web extending in parallel in the machine direction.

[0008]

According to another preferred embodiment of the invention, the second web is elastically stretchable and contractible in the machine direction and fed under tension in the machine direction.

[0009]

According to still another preferred embodiment of the invention, the substantially circular section defined in the

middle region of the second composite web and clipped out therefrom is asymmetric about the first center line.

[0010]

According to yet another preferred embodiment of the invention, instead of the step e), the first composite web is folded back with the second web inside along the first and second center lines in the step f) and then substantially semicircular web pieces each having a chord defined by the first center line and a circular arc being convex in the cross direction is clipped out from the first composite web to form opposite side edges of the crotch region before the step i) in which the individual pants-type diaper is obtained.

[0011]

According to further another preferred embodiment of the invention, the first web and the second web are locally bonded in the middle region of the crotch region in the chassis as viewed in the back-and-forth direction.

EFFECT OF THE INVENTION

[0012]

The method for making the disposable pants-type diaper according to the present invention is characterized in that the second web comprising the continuous sheet member adapted to form the pockets in the individual pants-type diapers is

continuously fed under tension in the machine direction onto and superposed to the first web continuously fed in the machine direction so as to be continuously bonded thereto. Namely, the second web has no need for any portion having no contribution to the desired function of the pocket such as chucked margins used to tenter the pants-type diaper in the transverse direction. Consequentially, the second web can be economically used in the course of making the pants-type diaper.

[0013]

Preferred embodiments such method for making the disposable pants-type diaper and effect provided by these preferred embodiments will be described below.

BRIEF DESCTIPTION OF THE DRAWINGS

[0014]

[FIG. 1] Fig. 1 is a partially cutaway perspective view of pants-type diaper;

[FIG. 2] Fig. 2 is a plan view of the pants-type diaper developed in a flattened state;

[FIG. 3] Fig. 3 is a sectional view taken along the line III-III in Fig. 1;

[FIG. 4] Fig. 4 is an overhead view of the pants-type diaper as viewed in a direction indicated by a pair of arrows IV-IV in Fig. 3;

[FIG. 5] Fig. 5 is a diagram illustrating a step of the process for making the pants-type diaper;

[FIG. 6] Fig. 6 is a diagram illustrating the step following up the step illustrated in Fig. 5;

[FIG. 7] Fig. 7 is a diagram illustrating the step following up the step illustrated in Fig. 6;

[FIG. 8] Fig. 8 is a diagram illustrating the step following up the step illustrated in Fig. 7;

[FIG. 9] Fig. 9 is a diagram illustrating an alternative embodiment of the step illustrated in Fig. 7; and

[FIG. 10] Fig. 10 is a diagram illustrating the step following up the step illustrated in Fig. 9.

IDENTIFICATION OF REFERENCE NUMERALS USED IN THE DRAWINGS

[0015]

1	pants-type diaper
6	crotch region
7	front waist region
7a	opposite side edge of front waist region
8	rear waist region
8a	opposite side edge of rear waist region
9	seal region
10a	chassis
12	leg-hole

13 periphery

20 sheet member (sheet piece)

20a pocket

109, 109a, 109b seal region

151 cutting line

201 first web

202 second web

301 first composite web

302 second composite web

303 third composite web

304 fourth composite web

p first center line

q second center line

MD machine direction

CD cross direction

X transverse direction

Y back-and-forth direction

DESCRIPTION OF THE BEST MODE FOR WORKING OF THE INVENTION

[0016]

Details of such method for making the disposable pants-type diaper will be more fully understood from the description given hereunder with reference to the accompanying drawings.

[0017]

Fig. 1 is a partially cutaway perspective view showing a disposable pants-type diaper 1 obtained by a method according to the present invention for making the same as put on the wearer's body. The pants-type diaper 1 has a pants-shaped skin covering assembly 10 comprising a liquid-pervious inner sheet 2, a liquid-impervious outer sheet 3 and a body fluid absorbent core 4 sandwiched between these two sheets 2, 3. The skin covering assembly 10 is configured to define a crotch region 6, a front waist region 7 extending forward from the crotch region 6 and a rear waist region 8 extending rearward from the crotch region 6. The front and rear waist regions 7, 8 are put flat together along respective laterally opposite edges 7a, 8a of thereof and sealed together along these laterally opposite edges in the belt-like seal region 9 in which a plurality of seal stripes 9a are arranged intermittently in a vertical direction as viewed in Fig. 1 so as to form a waist-hole 11 and a pair of leg-holes 12. Sandwiched between the inner and outer sheets 2, 3, a plurality of waist elastic members 14a, 14b circumferentially extend along a periphery defining the waist-hole 11a and are bonded under tension to at least one of the inner and outer sheets 2, 3. In a similar manner, a plurality of leg elastic members 17 sandwiched between the inner

and outer sheets 2, 3 circumferentially extend along each periphery 13 defining each of the leg-holes 12 and are bonded under tension to at least one of the inner and outer sheets 2, 3 so that these leg elastic members 17, inner and outer sheets 2, 3 may form loop-shaped elastic regions 41 around the respective legs.

[0018]

Fig. 2 is a partially cutaway plan view showing a developed diaper 1a corresponding to the pants-type diaper 1 of Fig. 1 having the front and rear waist regions 7, 8 peeled off from each other at the seal stripes 9a and then fully developed in a transverse direction indicated by a double-headed arrow X as well as in a back-and-forth direction indicated by a double-headed arrow Y which is orthogonal to the transverse direction. Fig. 2 shows the inner side of such developed diaper 1a. In the developed diaper 1a, the pants-shaped skin covering assembly 10 corresponds to a chassis 10a having inwardly curved concave shape. The periphery 11a of the waist-hole 11 in Fig. 1 corresponds, in Fig. 2, to a front end 7b and a rear end 8b of the basic structure 10a while the peripheries 13 of the respective leg-holes 12 correspond here to transversely opposite edges 13b of the crotch region of the chassis 10a. While these lateral edges 13b bow toward a

longitudinal center line C-C bisecting a width of the chassis 10a, the transversely opposite edges 7a, 8a of the front and rear waist regions 7, 8, respectively, extend in the back-and-forth direction Y substantially in parallel to the longitudinal center line C-C. Leg elastic members 17 extending along the transversely opposite edges 13b of the crotch region 6 respectively consist of front elastic members 17a extending from the middle of the crotch region 6 as viewed in the back-and-forth direction Y toward the front waist region 7 and rear elastic members 17b extending from the middle of the crotch region 6 toward the rear waist region 8 wherein these front and rear elastic members 17a, 17b intersect one with another in the middle of the crotch region 6. The core 4 also has inwardly curved concave shape and comprises a mixture 4a of fluff pulp and super-absorbent polymer particles wrapped with a covering sheet 4b having high absorbability as well as high spreadability for body fluids such as tissue paper. Of the chassis 10a, the inner sheet 2 defining the inner side thereof is provided in the crotch region 6 with a sheet piece 20 preferably made of a hydrophobic sheet material, more preferably made of a hydrophobic and liquid-impervious sheet material so as to form a pocket 20a (See Fig. 3).

[0019]

The sheet piece 20 has transversely opposite edges 23 fixed to the transversely opposite edges 13b of the crotch region, respectively, by hot melt adhesive 24, a front end 21 lying in the crotch region 6 in the vicinity of front waist region 7 so as to extend in the transverse direction X to the respective lateral edges 13b of the crotch region 6 and a rear end 22 lying in the crotch region 6 aside toward the rear waist region 8 so as to extend in the transverse direction X to the respective lateral edges 13b of the crotch region 6. Except for the transversely opposite edges 23, the sheet piece 20 is substantially free from the inner sheet 2 so that a tunnel- or pocket-like bodily waste receiving space 31 can be between the sheet piece 20 and the inner sheet 2. The front end 21 and the rear end 22 respectively have sleeves 21a, 22a formed by folding back the respective ends 21, 22 of the sheet piece 20. These sleeves 21a, 22a respectively contain a front elastic member 21b and a rear elastic member 22b attached thereto under tension to form a front elastic region 42 and a rear elastic region 43, respectively, extending between the transversely opposite edges 13b of the crotch region 6. These elastic regions 42, 43 intersect with elastic regions 41 formed by the leg elastic members 17, the inner sheet 2 and the outer sheet 3 in the chassis 10a. The front end 21 and the rear end 22 are substantially

at equal distances Hf, Hr from a transverse center line D-D and respectively include a front seal region 27 and a rear seal region 28 indicated by imaginary lines on the longitudinal center line C-C.

[0020]

Fig. 3 is a sectional view taken along the line III-III in Fig. 1 wherein the line III-III conforms to the longitudinal center line C-C. The pants-shaped skin covering assembly 10 includes the front waist region 7 and the rear waist region 8 joined together along the transversely opposite edges 7a, 8a, respectively. The crotch region 6 shown in Fig. 2 now bows in Fig. 3 substantially in a U-shape and the transversely opposite edges 13b of the crotch region 6 now appear as the peripheries 13 defining the respective leg-holes 12. The body waste receiving space 31 in the chassis 10a appears here as a pocket 20a defined by the front and rear ends 21, 22 of the sheet piece 20 permanently bonded together by bonding agent 32 such as hot melt adhesive or pressure-sensitive adhesive so as to form a seal region 35. The pocket 20a has a front opening 33 defined by the front end 21 of the sheet piece 20 corresponding to a front end of the pocket 20a together with the inner sheet 2 and a rear opening 34 defined by the rear end 22 of the sheet piece 20 corresponding to a rear end of the pocket 20a together with

the inner sheet 2. At the bottom 6a defined by the lowest portion of the crotch region 6, the inner sheet 2 and the sheet piece 20 are substantially or really in contact with each other.

[0021]

Fig. 4 is an overhead view of the diaper 1 as viewed in a direction indicated by the arrow line IV-IV in Fig. 3, i.e., as viewed from above the waist-hole 11. The front end 21 of the sheet piece 20 has its dimension in the transverse direction X bisected by the seal region 35 into a front end segment 21_R adapted to be held in close contact with the right leg and a front end segment 21_L adapted to be held in close contact with the left leg of the wearer (not shown). These front end segments 21_R, 21_L describe a V-shape in Fig. 4. The rear end 22 also has its dimension in the transverse direction X bisected by the seal region 35. In the same manner as the front end 21, the rear end segment 22_R is adapted to be held in close contact with the right leg of the wearer and the rear end segment 22_L is adapted to be held in close contact with the left leg of the wearer wherein these rear end segments 21_R, 21_L describe a V-shape in Fig. 4. The respective peripheries 13 of the leg-holes 12 in the skin covering assembly 10 comprise a periphery 13_R for the right leg and a periphery 13_L for the left leg wherein each of the peripheries 13_R, 13_L is divided into an upper segment 15a

not superposed on and left free from the associated lateral edge 23 of the sheet piece 20 and a lower segment 15b joined to the associated lateral edge 23 (See Fig. 3 also). In Fig. 4, a range corresponding to the upper segment 15a and a range corresponding to the lower segment 15b are represented by double-headed arrows A and B, respectively.

[0022]

A sequence in which the pants-type diaper of such configuration is put on the wearer's body and how the pants-type diaper 1 behaves in the course of being put on the wearer's body will be described. First, the front and rear waist regions 7, 8 of the skin covering assembly 10 are spaced from each other in the back-and-forth direction Y and thereby the waist-hole 11 is broadened as seen in Figs. 1 and 4. Thereupon, the front end segment 21_R for the right leg and the front end segment 21_L for the left leg constituting the front end 21 of the sheet piece 20 are deformed about the seal region 35 so as to describe the V-shape and, in a similar way, the rear end segment 22_R for the right leg and the rear end segment 22_L for the left leg constituting the rear end 22 of the sheet piece 20 are deformed so as to described the V-shape. Such deformation causes the front opening 33 and the rear opening 34 of the pocket 20a to be automatically broadened (See Fig. 3). At the same moment,

the front end segment 21_R for the right leg and the rear end segment 22_R for the right leg are widely spaced from each other while the front end segment 21_L for the left leg and the rear end segment 22_L for the left leg are widely spaced from each other. Now the right leg of the wearer (not shown) is guided through an opening 41_R for the right leg defined by the upper segment 15a of the periphery segment 13_R of the associated leg-hole 12, the front end segment 21_R for the right leg of the sheet piece 20 and the rear end segment 22_R for the right leg of the sheet piece 20. The right leg is guided further through the right leg-hole 12 defined by the upper segment 15a and the lower segment 15b of the periphery segment 13_R for the right leg. Then the left leg is guided through an opening 41_L for the left leg defined by the upper segment 15a of the periphery segment 13_L for the left leg, the front end segment 21_L for the left leg and the rear end segment 22_L for the left leg. The left leg is guided further through the left leg-hole 12 defined by the upper segment 15a and the lower segment 15b of the periphery segment 13_L for the left leg.

[0023]

In the pants-type diaper 1 put on the wearer's body in the manner as has been described above, the peripheries 13 of the respective leg-holes 12, i.e., the periphery 13_R for the

right leg and the periphery 13_L for the left leg are elastically contractible around the respective holes 12 while the front end 21 and the rear end 22 of the sheet piece 20 are elastically contractible in the transverse direction X. In the vicinity of the right groin, therefore, the upper segment 15a of the periphery 13_R for the right leg, the front end segment 21_R for the right leg and the rear end segment 22_R for the right leg are elastically held in close contact around the right leg to form a primary seal 51_R (See Fig. 4) serving to prevent leakage of body fluids from occurring around the right leg. Below the primary seal 51_R, the lower segment 15b and the upper segment 15a of the periphery 13_R cooperate integrally with each other to form a secondary seal 52_R (See Fig. 4) serving to prevent leakage of body fluids from occurring around the right leg. This secondary seal 52_R functions in a similar manner to the manner in which the leg-surrounding seal in the conventional pants-type diaper function. Just as the case of the right leg, in the vicinity of the left groin, therefore, the upper segment 15a of the periphery 13_L for the left leg, the front end segment 21_L for the left leg and the rear end segment 22_L for the left leg are elastically held in close contact around the left leg to form a primary seal 51_L. Below the primary seal 51_L, the lower segment 15b and the upper segment 15a of the periphery 13_L

cooperate integrally with each other to form a secondary seal 52_L. The pants-type diaper put on the wearer's body may be sufficiently pulled up along the waist to ensure that the front end 21 and the rear end 22 of the sheet piece 20, in the vicinity of the seal region 35, come in contact with a zone of the wearer's crotch region defined between the wearer's external genital and anus. Even after the pants-type diaper 1 has been put on the wearer's body, the front end 21 as well as the rear end 22 of the sheet piece 20 is maintained spaced from the inner sheet 2 and the front opening 33 as well as the rear opening 34 is maintained widely broadened.

[0024]

With the pants-type diaper 1 put on the wearer's body in this manner, the sheet piece 20 forming the pocket 20a distinctly divides the wearer's crotch region into a front half and a rear half so that the front opening 33 formed in the front half is reliably opposed to the wearer's external genital and the rear opening 34 is reliably opposed to the anus. Therefore, it is guaranteed that urine discharged from the external genital is guided through the front opening 33 into the pocket 20a while feces discharged from the anus is guided through the rear opening 34 into the pocket 20a. In this way, the pocket 20a or sheet piece 20 effectively prevents urine and/or feces from

coming in contact with the wearer's skin. A possibility that urine and feces might be mixed with each other within the bodily waste receiving space 31 is effectively alleviated because the sheet piece 20 is substantially or really maintained in contact with the inner sheet 2 at the bottom 6a of the crotch region 6. Consequentially, an anxiety that a liquidity of feces might be enhanced by admixture of urine and feces is effectively alleviated by the pants-type diaper 1. Even in the unlikely event that urine and/or feces is not guided into the bodily waste receiving space 31 but moves along the wearer's legs, the primary seals 51_R, 51_L and the secondary seals 52_R, 52_L provided around the wearer's legs cooperate together to prevent urine and/or feces from readily moving out beyond the leg-holes 12 of the pants-type diaper 1. Alternatively, the inner sheet 2 and the sheet piece 20 may be bonded to each other locally, for example, merely along the bottom 6a of the crotch region 6 over the full width in order to eliminate the problem that urine and feces might be mixed with each other within the pants-type diaper 1.

[0025]

In the pants-type diaper 1 provided by the present invention, stock materials for the inner sheet 2 may be selected from the group including a liquid-pervious nonwoven fabric and

a perforated plastic film. Stock materials for the outer sheet 3 may be selected from the group including a liquid-impervious plastic film and a laminated sheet consisting of such plastic film and nonwoven fabric. As liquid-absorbent material for the core 4, a mixture of fluff pulp and super-absorbent polymer particles, or fluff pulp fibers alone, or a mixture of fluff pulp fibers and super-absorbent polymer fibers may be used. For the wrapping sheet 4b, tissue paper often used may be replaced by an appropriate nonwoven fabric. As sheet materials 62 for the sheet piece 20, a hydrophobic, or hydrophobic and liquid-impervious nonwoven fabric or a plastic film may be preferably used. More preferably, the sheet materials can be elastic or inelastic so long as it is elastically or inelastically extensible in response to elastic extension of the elastic members 21b, 22b. When the sheet piece 20 is elastically extensible and contractible, the front elastic member or the rear elastic member can be omitted. If the inner and outer sheets 2, 3 and the other sheet materials such as the sheet piece 20 contain any heat-fusible plastics, the sheet materials may be heat-sealed by the known sonic sealing technique.

[0026]

The sheet piece 20 of the chassis 10a shown in Fig. 2 is

attached to the chassis 10a so that the distance Hf from the transverse center line D-D to the front joint region 27 is equal to the distance Hr from the transverse center line D-D to the rear joint region 28. In the case of the sheet piece 20 used in the pants-type diaper 1 for baby, each distance Hf, Hr is preferably in a range of 20 to 150 mm, more preferably in a range of 40 to 80 mm. In addition, a dimension of the front and rear joint regions 27, 28 in the transverse direction X is preferably in a range of 3 to 50 mm, more preferably in a range of 10 to 30 mm. A dimension of the sheet piece 20 in the back-and-forth direction Y is at least 3 mm. Alternatively, it is possible to dimension the sheet piece 20 in the transverse direction X to be less than that in the illustrated embodiment so that the transversely opposite edges 23 thereof may be placed aside from the transversely opposite edges 13 of the chassis 10a toward the center line C-C in the back-and-forth direction.

[0027]

The chassis 10a of Fig. 2 further includes a pair of side flaps 25 defined by portions of the inner and outer sheets 2, 3 extending outward in the transverse direction X beyond the transversely opposite edges of the core 4. The side flaps 25 have a flexural stiffness in the transverse direction X lower than that of the core 4 and are correspondingly easier to be

deformed. These side flaps 25 include the leg elastic regions 41. When the pants-type diaper 1 obtained from the chassis 10a is in a state of Fig. 1 wherein the crotch region 6 bows in U-shape in the front-and-rear direction Y, the side flaps 25 tend to raise themselves up along the lateral opposite edges 4c of the core 4 under contraction of the elastic regions 41 in the vicinity of the transverse center line D-D, i.e., at the bottom 6a of the crotch region 6. On the other hand, the sheet piece 20 is bonded along the transversely opposite edges 23 thereof to the inner surface of the elastic regions 41 by adhesive 24. In response to deformation of the front and rear ends 21, 22 of the sheet piece 20 in a V-shape as shown in Fig. 4 from the state thereof shown in Fig. 2 wherein these front and rear ends 21, 22 rectilinearly extend, these front and rear ends 21, 22 function to pull the side flaps 25 toward the longitudinal center line C-C and thereby enhance the behavior of the side flaps 25 to raise themselves up. The side flaps 25 behaving in this manner are reliably held in close contact around the legs of the wearer from below and thereby effectively prevent leak of body fluids from possibly occurring around the legs. However, if such leakage preventing effect is not required for the pants-type diaper 1, the leg elastic members 17a, 17b may be saved.

[0028]

Fig. 5 through Fig. 8 are diagrams exemplarily illustrating step of the process for continuously making the pants-type diaper 1 of Fig. 1. In these diagrams, a machine direction is indicated by an arrow MD and a cross direction orthogonal to the machine direction MD is indicated by a double-headed arrow CD.

[0029]

In a first step I illustrated in Fig. 5, a first web 201 is continuously fed in the machine direction MD, preferably under tension in the machine direction MD as well as in the CD direction. This first web 201 is laminate consisting of continuous inner sheet 102 corresponding to the liquid-pervious inner sheet 2 of the chassis 10a (See Fig. 2) which is continuous in its transverse direction X and continuous outer sheet 103 corresponding to the liquid-impervious outer sheet 3 which has the same width as that of the continuous inner sheet 102 and continuous in its transverse direction X. Between these two continuous inner and outer sheets 102, 103, a plurality of body fluid absorbent cores 104 are sandwiched at regular center intervals each corresponding to the width of the chassis 10a in the machine direction MD and bonded to at least one of these continuous inner and outer sheets 102, 103 by hot meld adhesive

(not shown). The continuous inner and outer sheets 102, 103 also are bonded to each other by hot melt adhesive (not shown). An imaginary line 151 extending in the cross direction CD in the middle between each pair of the adjacent cores 104 indicates a position at which the assembly including the first web 201 will be cut in a subsequent step (See Fig. 8) and a dimension between each pair of the adjacent imaginary lines 151, 151 is equal to the width of the chassis 10a. A loop-shaped imaginary line 152 illustrated to be bilaterally symmetric about the imaginary line 151 but to be asymmetric as viewed in a vertical direction, i.e., in the cross direction CD indicates a boundary surrounding a region which will be cut away in a subsequent step (See Fig. 7). Immediately outside the imaginary line 152, leg elastic members 117a, 117b extend along the imaginary line 152 so as to be sandwiched between the continuous inner and outer sheets 102, 103 and bonded to at least one of these continuous inner and outer sheets 102, 103 by hot melt adhesive (not shown). These elastic members 117a, 117b respectively trace substantially semicircular courses and intersect one another so as to describe together a loop wherein these elastic members 117a, 117b are under tension at least partially along this loop. The first web 201 is further provided along edges 107b, 108b thereof extending in parallel to each other in the machine

direction MD with elastic members 114a, 114b respectively extending under tension in the machine direction MD. These elastic members 114a, 114b are bonded to the inner surface of at least one of the continuous inner and outer sheets 102, 103 by hot melt adhesive (not shown). The opposite edges 107b, 108b of the first web 201 are nipped in thickness direction thereof by associated sets of feed rolls 153, respectively, which are paired in the cross direction and adapted to feed the first web 201 under tension in the machine direction MD. The sets of feed rolls 153 paired in this manner are intermittently disposed at appropriate intervals in the machine direction MD. While axes 154 of these feed rolls 153 are illustrated to extend orthogonally to the machine direction MD, an angle of these axes 154 with respect to the machine direction MD may be appropriately varied, if desired. In addition to these feed rolls 153, tentering rolls 156 paired in the cross direction are disposed in appropriate regions along the opposite edges 107b, 108b so that these tentering rolls 156 may be held in contact with the continuous inner sheet 102 and thereby tenter the first web 201 in the cross direction CD. While axes 157 of the respective tentering rolls 156 are illustrated to intersect with the machine direction MD obliquely at a particular angle, this angle is not limited to the particular

angle as illustrated. An imaginary line p-p in Fig. 5 indicates a first center line bisecting the first web 201 in the cross direction CD. It will be appreciated that the first web 201 may be fed in the machine direction MD by any means replacing the rolls 153, 156 used in the illustrated embodiment. In the illustrated embodiment, the first web 201 may be successively cut at a pitch corresponding to a distance between each pair of the adjacent imaginary lines 151, 151 to obtain the chassis 10a in a continuous fashion.

[0030]

In a second step II illustrated in Fig. 6, immediately outside and along the loop-shaped imaginary line 152, the continuous inner sheet 102 of the first web 201 is coated with hot melt adhesive 124 so as to describe substantially in a loop-shape. A range in which the continuous inner sheet 102 is coated with the adhesive 124 is defined by a distance m from the first center line p-p as measured on both sides thereof in the cross direction CD, preferably falling in with the elastic members 117a, 117b.

[0031]

In a third step III illustrated by Fig. 6, a second web 202 comprising the sheet pieces 20 destined to be attached to the associated chassis 10a and continuously arranged in the

transverse direction X is continuously fed in the machine direction MD preferably under tension in the machine direction MD as well as in the cross direction CD onto the first web 201 so that a second center line q-q bisecting the second web 202 in the cross direction CD falls in with the first center line p-p of the first web 201. It should be understood that the first center line p-p and the second center line q-q may be misaligned with each other so far as such alignment does not disturb making and use of the pants-type diaper. The first web 201 and the second web 202 are bonded to each other by adhesive 124 coated on the first web 201 to obtain first composite web 301. In this first composite web 301, the first web 201 and the second web 202 are free from each other except the region in which the first web 201 and the second web 202 are bonded to each other by the adhesive 124. Alternatively, the second web 202 may be bonded to the first web 201 at a region put aside toward the middle between each pair of the adjacent imaginary lines 151, 151. The second web 202 has a pair of edges 121c, 122c extending in parallel to each other in the machine direction MD respectively at distances Hf, Hr from the second center line q-q wherein the distance Hf is equal to the distance Hr. Each of these distances Hf, Hr may be equal to the dimension m defining the range in which the first web 201 is coated with the adhesive 124 or

slightly larger than the dimension m. On the surface of the second web 202 facing away from the first web 201, the edge 122c is coated at regular pitches each corresponding to the width of the chassis 10a with bonding agent 132 such as pressure-sensitive adhesive so that the region coated with the bonding agent 132 lies in the middle between each pair of the imaginary lines 151, 151. The edges 121c, 122c are further provided with elastic members 121b, 122b extending in the machine direction MD attached under tension the respective edges 121c, 122c by hot melt adhesive (not shown). Though not illustrated, the feed rolls and the tentering rolls similar to those used for the first web 201 may be disposed at appropriate locations in association with the second web 202 also so as to feed the second web 202 in the machine direction MD and to tenter the second web 202 in the cross direction CD.

[0032]

In a fourth step IV illustrated in Fig. 7, a first composite web 301 being fed in the machine direction MD is subjected to a clipping step wherein the section surrounded by the loop-shaped imaginary line 152 as indicated in the middle region thereof as viewed in the cross direction CD is clipped out from the first composite web 301 to obtain a second composite web 302 having substantially circular through-hole 112 in the

middle region thereof. In the step IV, the clipping step generates scrap in the form of substantially circular sheet pieces 203. According to the illustrated embodiment, the through-hole 112 is symmetric about the imaginary line 151 but asymmetric about the first and second center lines p-p, q-q falling in with each other. It will be appreciated that the through-hole 112 may be formed so as to be symmetric about these first and second center lines p-p, q-q.

[0033]

In a fifth step V illustrated by Fig. 8, the second composite web 302 is folded back along the first and second center lines p-p, q-q with the second web 202 inside and opposite halves of the second web 202 folded in this manner are locally bonded to each other by the bonding agent 132 to obtain third composite web 303. In the course of bonding the halves of the second web 202, the second composite web folded back in this manner may be compressed in a thickness direction thereof.

[0034]

In a sixth step VI illustrated by Fig. 8, the inner surface of the first web 201 folded in two is bonded to itself on both sides of the imaginary line 151 along two seal regions each comprising a plurality of seal stripes 109a, 109b to obtain a fourth composite web 304. To achieve the desired bonding effect,

appropriate bonding means such as the known sonic sealing technique or hot melt adhesive may be used. A plurality of seal stripes 109a and a plurality of seal stripes 109b form seal regions 109, respectively, which are belt-like regions extending in the cross direction CD.

[0035]

In a seventh step VII illustrated by Fig. 8, a fourth web 304 is cut along the imaginary line 151 to obtain the individual pants-type diaper 1.

[0036]

The chassis 10a and the sheet piece 20 in the pants-type diaper 1 shown in Figs. 1 and 2 are obtained from the first web 201 and the second web 202, respectively. The inner sheet 2, the outer sheet 3 and the liquid-absorbent core 4 are obtained from the continuous inner sheet 102, the continuous outer sheet 103 and the liquid-absorbent core 104, respectively. The periphery of the through-hole 112 is destined to form the peripheries 13 of the leg-holes 12 in the diaper 1 and the elastic members 117a, 117b are respectively divided in right and left halves to form the front elastic members 17a and the rear elastic members 17b of the respective leg elastic members 17 shown by Fig. 2. The elastic members 114a, 114b in the first web 201 correspond to the waist elastic members 14a, 14b in Fig. 1,

respectively. The bonding agent 132 by means of which the halves of the second web 202 are bonded to each other correspond to the bonding agent 32 in Fig. 3.

[0037]

Figs. 9 and 10 illustrate steps in one preferred embodiment of the method according to the present invention. The step IV illustrated in Fig. 9 corresponds to the step downstream of the third step III in Fig. 6 except that the loop-shaped imaginary line 152 in the fourth step IV illustrated in Fig. 9 approximates a circle which is symmetric about the first and second center lines p-p, q-q falling in with each other. The continuous inner sheet 102 constituting the first web 201 is coated immediately outside and along the imaginary line 152 with the bonding agent 124 by means of which the second web 202 is bonded to the first web 201. The elastic members 117a, 117b are sandwiched between the continuous inner sheet 102 and the continuous outer sheet 103.

[0038]

In the fifth step V illustrated in Fig. 10, the first composite web 301 is folded beck along the first line p-p and the second center line q-q falling upon each other with the second web 202 inside and respective halves of the second web 202 are bonded to each other by the bonding agent 132 to obtain

the second composite web 302 formed with the seal region 135. In the sixth step VI illustrated in Fig. 10, the section surrounded by the substantially circular imaginary line 152 is clipped out from the second composite web 302 to obtain the third composite web 303 having substantially semicircular notch 112. This clipping step generates scrap in the form of substantially semicircular web pieces 203 each having a chord defined by the first and second center lines p-p, q-q falling upon each other and a circular arc which is convex toward the edges 107b, 108b of the first web 201 symmetrically about the imaginary line 151. In the seventh step illustrated in Fig. 10, the inner surface of the first web 201 folded in two is bonded to itself on both sides of the imaginary line 151 along two seal regions each comprising a plurality of seal stripes 109a, 109b to obtain a fourth composite web 304. In the seventh step VII illustrated in Fig. 10, the fourth web 304 is cut along the imaginary line 151 to obtain the individual pants-type diaper 1.

[0039]

The method for making the pants-type diaper exemplarily illustrated allows the first web 201 and the second web 202 to be maintained under tension in the machine direction MD as well as in the cross direction CD by the feed rolls and the tentering rolls disposed at appropriate locations along the edges of these

webs 201, 202, respectively. There is no need for chucks or the like used only for the purpose of keeping these first and second webs 201, 202 under tension and therefore both the first web 201 and the second web 202 are not wasted in the course of making the pants-type diaper 1. In addition, the pants-type diaper 1 made by the method of the invention advantageously facilitates the external genitals and the anus of the wearer to be exactly opposed to the front opening 33 and the rear opening 34, respectively, of the pocket 20a in the diaper 1 (See Figs. 1, 3 and 4).

[0040]

The steps of the method exemplarily illustrated may be variously modified without departing from the object of the present invention. For example, the pants-type diaper 1 may be made without use of the elastic members 117a, 117b.

C L A I M S

[1] A method for making a disposable pants-type diaper comprising continuous the steps of preparing a chassis having a crotch region having a back-and-forth direction and a transverse direction which is orthogonal to said back-and-forth direction, a front waist region extending forward from said crotch region and a rear waist region extending rearward from said crotch region wherein transversely opposite side edges of said crotch region extend in said back-and-forth direction, folding back said chassis about said crotch region in said back-and-forth direction, bonding respective inner surfaces of said front and rear waist regions put flat together to each other along transversely opposite side edges of said front and rear waist regions to make said chassis in a pants-shape and providing said chassis on its inner surface with a sheet piece forming on said inner surface in said crotch region a pocket adapted to receive body waste, said continuous steps for making said disposable pants-type diaper further comprising the steps of:

a) continuously feeding a first web in a machine direction wherein said first web is adapted to provide successively a plurality of said chassis each having said transverse direction

in coincidence with said machine direction as said first web is cut at regular pitches in said machine direction,

b) continuously feeding a second web in said machine direction wherein said second web comprising a plurality of said sheet members contiguous one to another in said transverse direction,

c) superposing said first web and said second web upon each other so that a first center line bisecting said first web in a cross direction orthogonal to said machine direction falls in with a second center line bisecting said second web in said cross direction,

d) locally bonding said second web to said first web in regions thereof destined to form transversely opposite side edges of said crotch region in said chassis or in regions located aside toward middle of said chassis as viewed in said machine direction so as to provide a first composite web having said second web spaced from said first web destined to define said chassis between said regions in which said first web and said second web are bonded to each other,

e) clipping out a substantially circular section defined between each pair of adjacent said chassis and in a middle region of said first composite web as viewed in said cross direction from said first composite web so as to form side edges of said

crotch region opposed to each other in said machine direction and thereby to obtain a second composite web,

f) folding back said second composite web along said first and second center lines with said second web inside,

g) bonding opposite halves of said second web in said second composite web to each other in said middle region so as to obtain a third composite web,

h) bonding opposite halves of said second composite web in said third composite web to each other in a region defined between said middle region and edge of said second composite web extending in said machine direction having been described with respect to said step e) so as to obtain a fourth composite web formed with a linear seal region extending said cross direction, and

i) cutting said fourth composite web along a cutting line extending in said cross direction at middle of said seal region as viewed in said machine direction to obtain individual said pants-type diapers successively.

[2] The method as recited by Claim 1, wherein said second web comprises an inelastic web fed in said machine direction and elastic members extending in said machine direction and attached under tension to opposed edges of said inelastic web

extending in parallel in said machine direction.

[3] The method as recited by Claim 1, wherein said second web is elastically stretchable and contractible in said machine direction and fed under tension in said machine direction.

[4] The method as recited by any one of Claims 1 through 3, wherein said substantially circular section defined in middle region of said second composite web and clipped out therefrom is asymmetric about said first center line.

[5] The method as recited by any one of Claims 1 through 3, wherein instead of said step e), said first composite web is folded back with said second web inside along said first and second center lines in said step f), and then substantially semicircular web pieces each having a chord defined by said first center line and a circular arc being convex in said cross direction is clipped out from said first composite web to form opposite side edges of said crotch region before said step i) in which individual pants-type diaper is obtained.

[6] The method as recited by any one of Claims 1 through 5, wherein said first web and said second web are locally bonded

in middle region of said crotch region in said chassis as viewed in said back-and-forth direction.

FIG.1

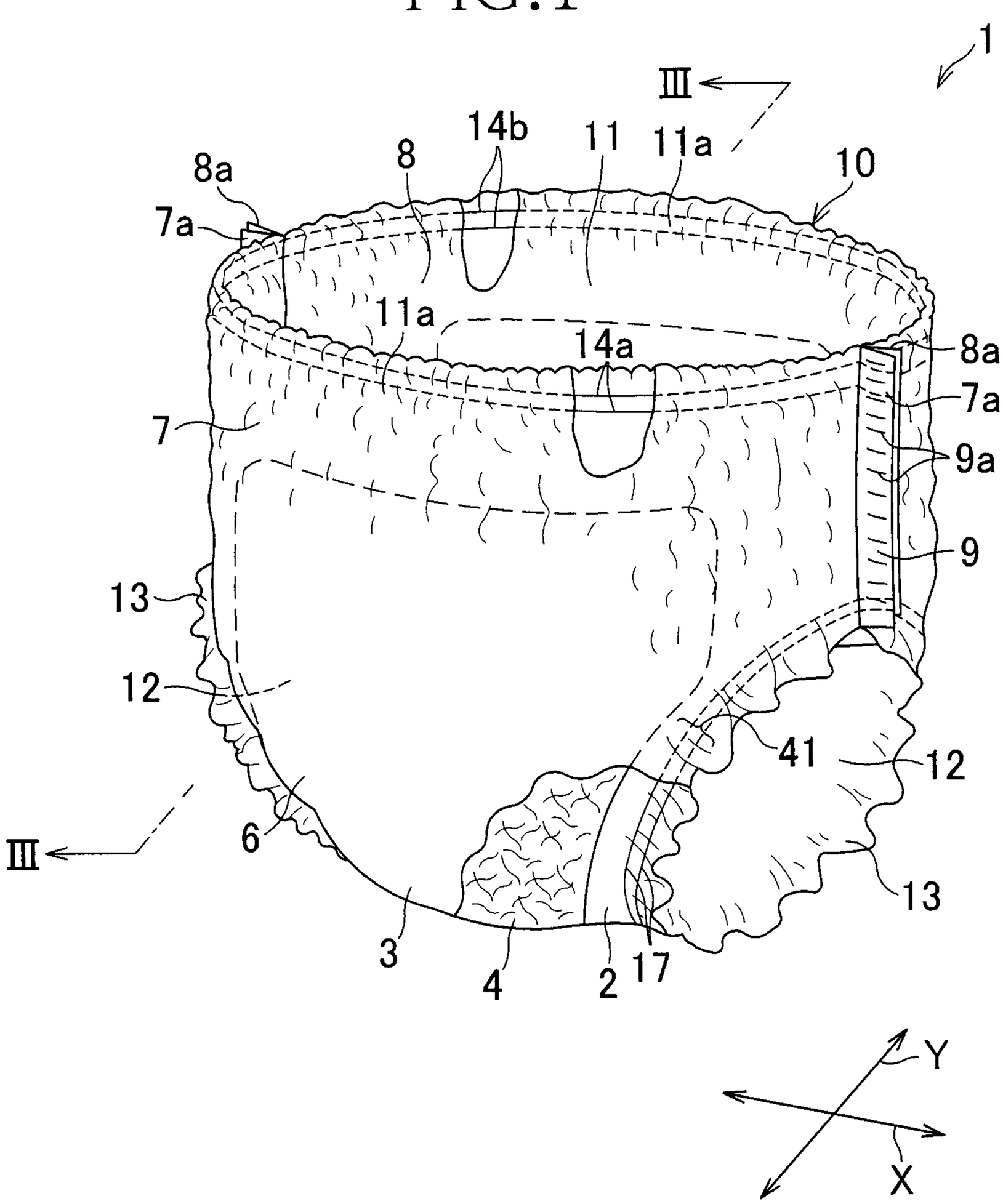

1
III
14b
11
11a
10
8
8a
7a
11a
14a
8a
7a
9a
7
9
13
12
41
12
III
6
13
3
4
2
17
Y
X

FIG.2

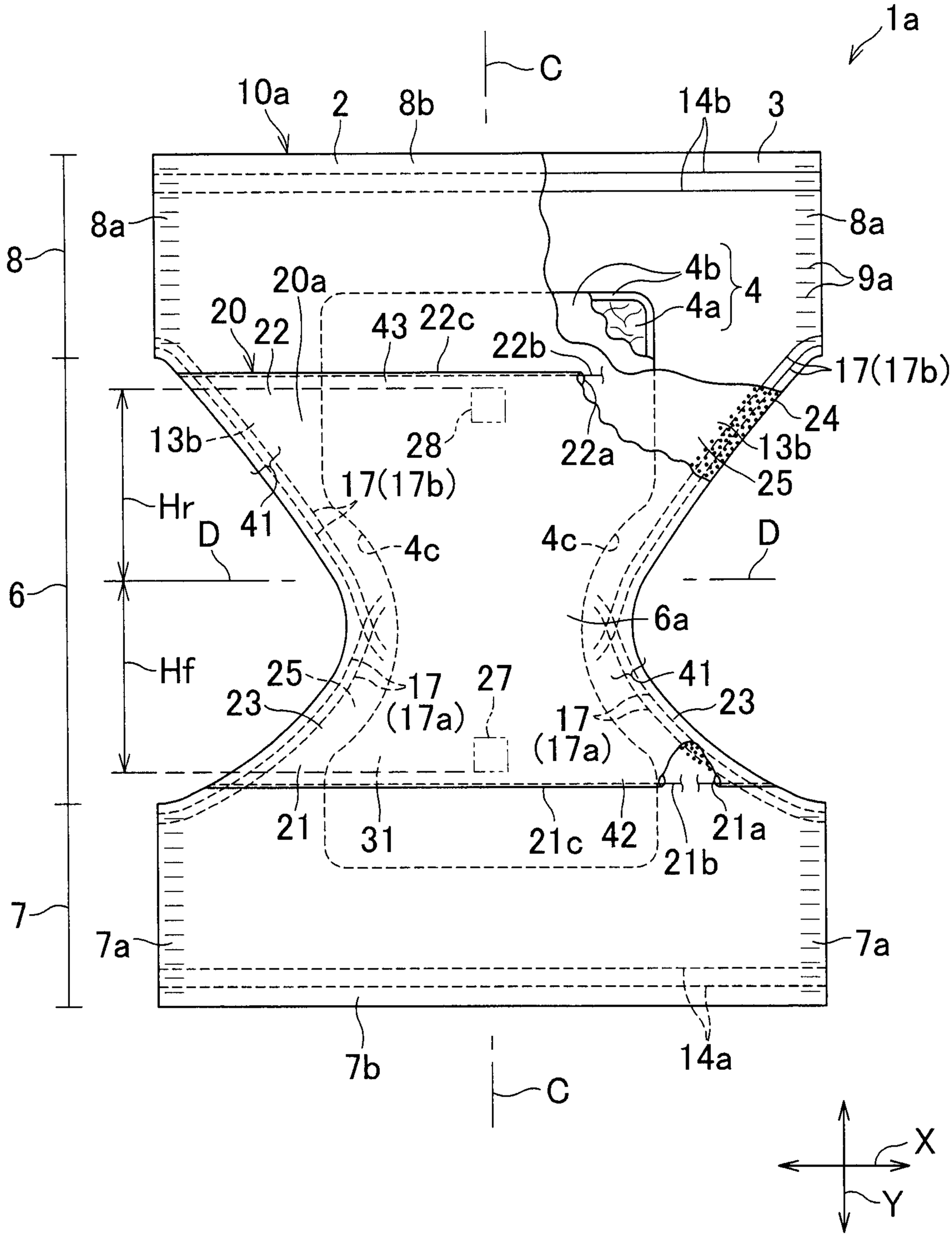

1a
C
10a
2
8b
14b
3
8a
8a
8
4b
4
4a
9a
20a
20
22
43
22c
22b
17(17b)
24
13b
28
22a
13b
25
17(17b)
41
Hr
D
4c
4c
D
6
6a
Hf
25
17
(17a)
27
41
23
23
17
(17a)
21
31
21c
42
21b
21a
7
7a
7a
7b
C
14a
X
Y

FIG.3

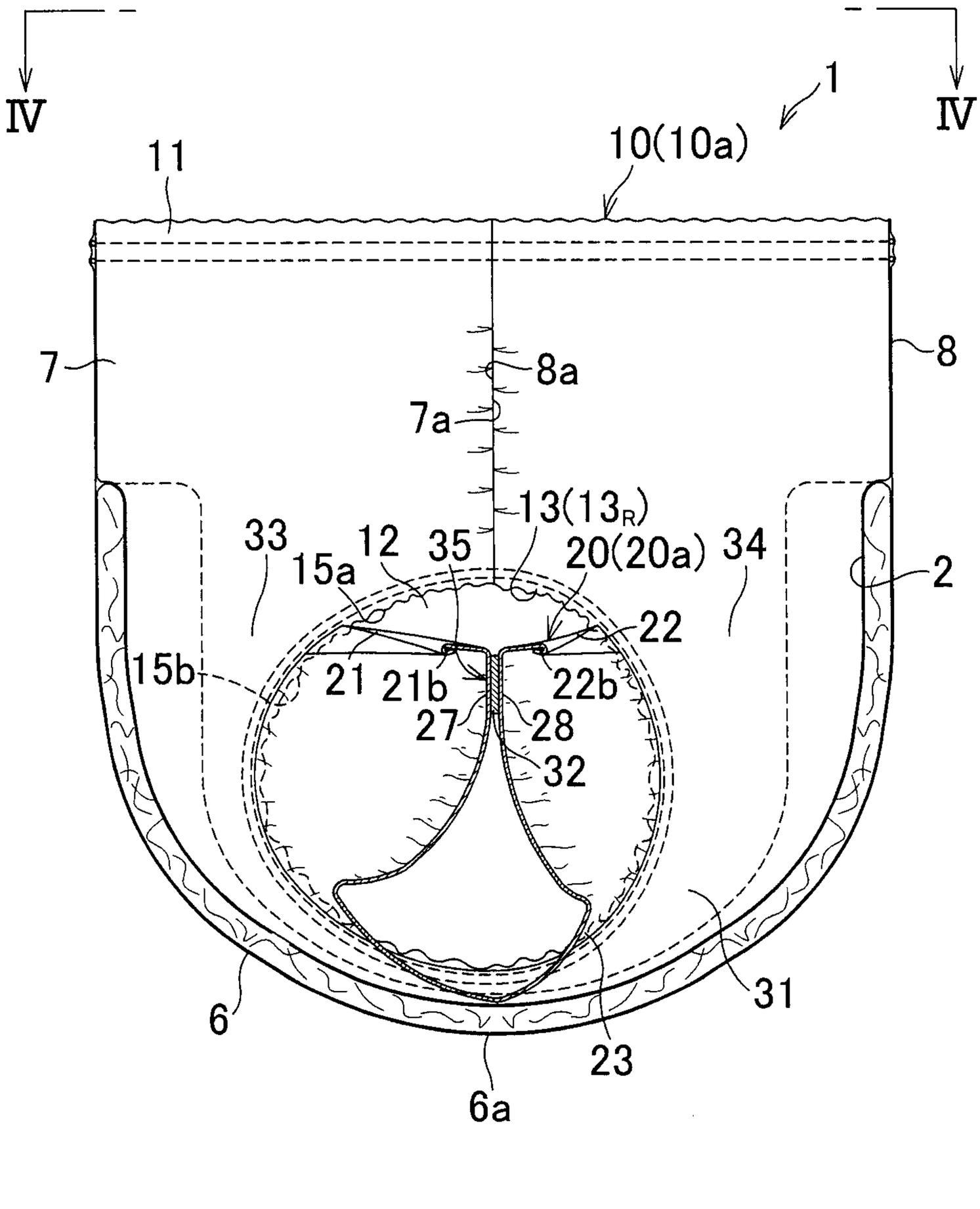

IV
IV
1
11
10(10a)
7
8a
8
7a
13(13R)
33
12
35
20(20a)
34
2
15a
22
15b
21
21b
22b
27
28
32
6
31
23
6a

FIG.4

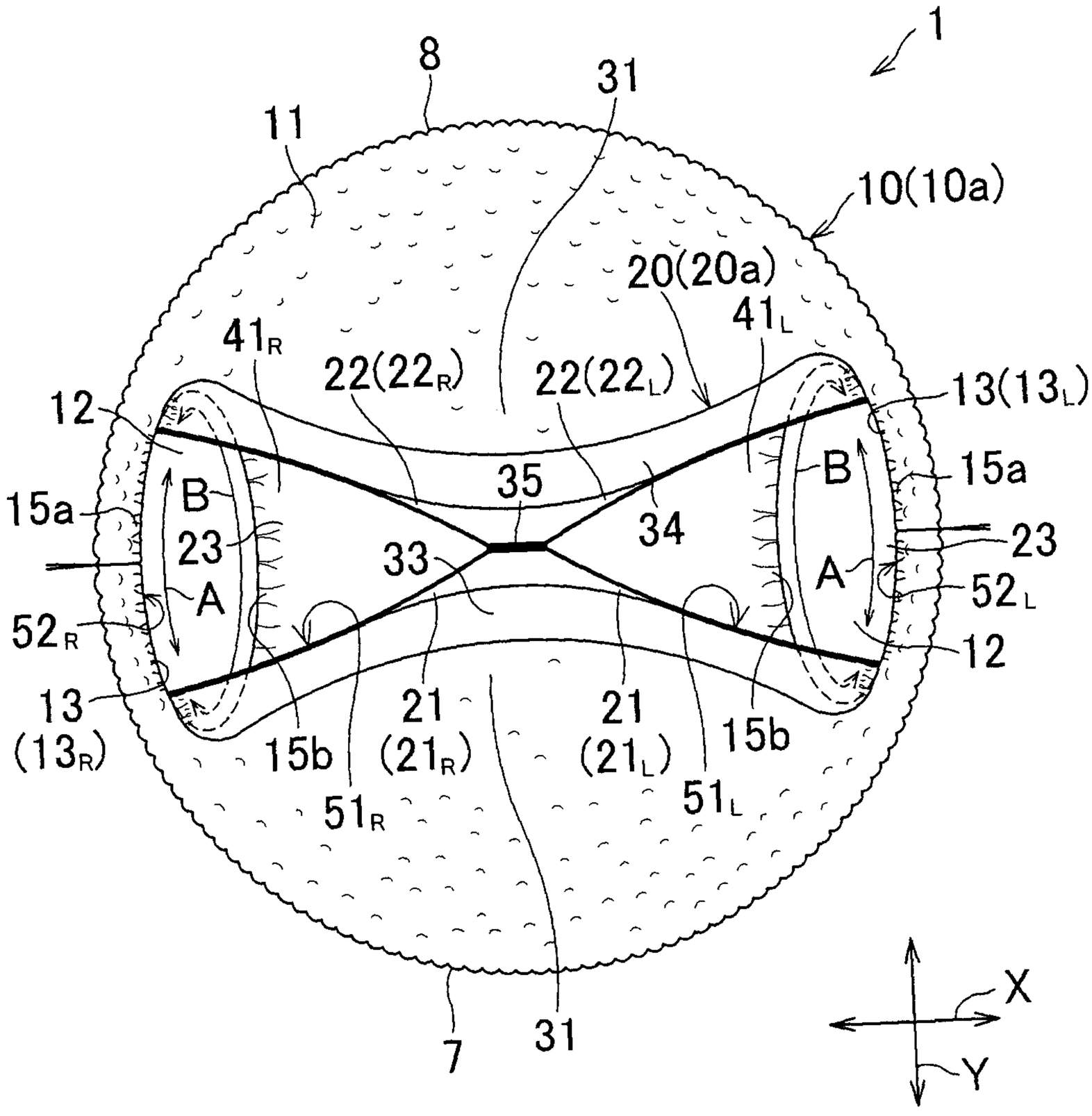

1
8
31
11
10(10a)
20(20a)
41L
41R
22(22R)
22(22L)
13(13L)
12
15a
B
35
34
23
33
A
52L
52R
12
13
(13R)
21
(21R)
21
(21L)
15b
15b
51R
51L
7
31
X
Y

FIG.5

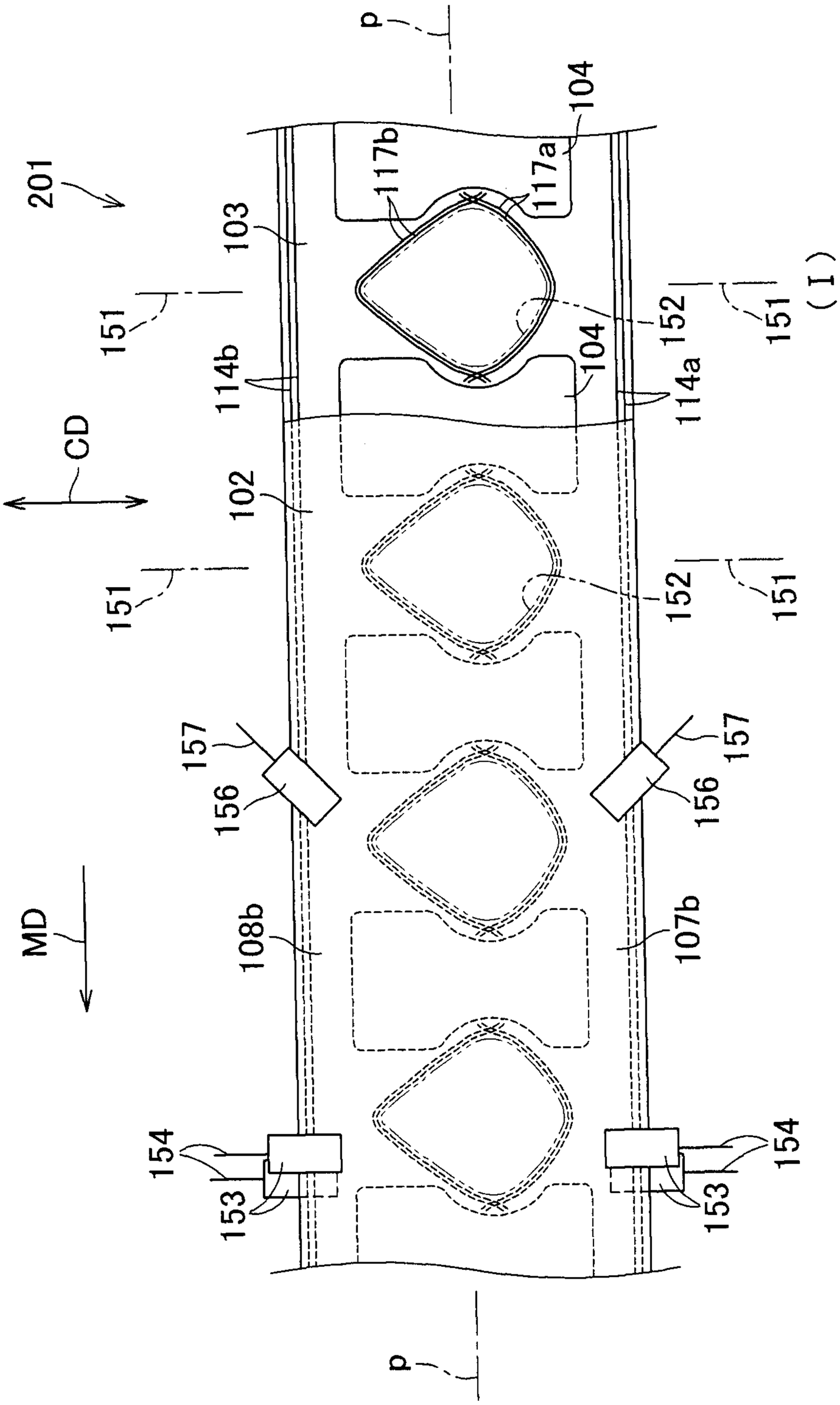

P
104
201
117b
117a
103
151
152
(I)
114b
104
114a
CD
102
MD
157
156
108b
107b
154
153

FIG.6

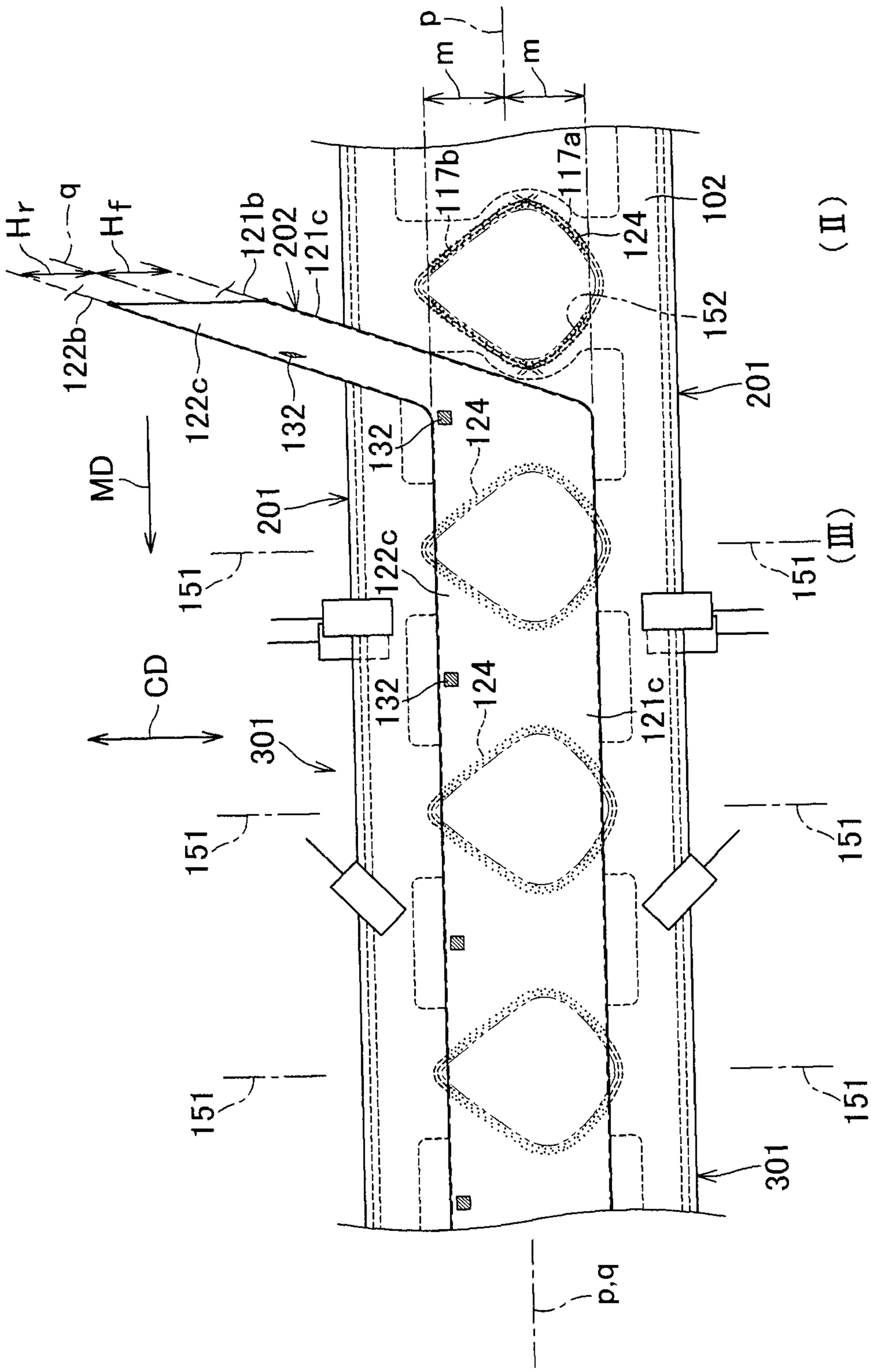

p
m
m
117b
117a
102
124
121b
202
121c
Hr
q
Hf
122b
122c
132
152
201
MD
(II)
(III)
151
CD
301
p,q

FIG.7

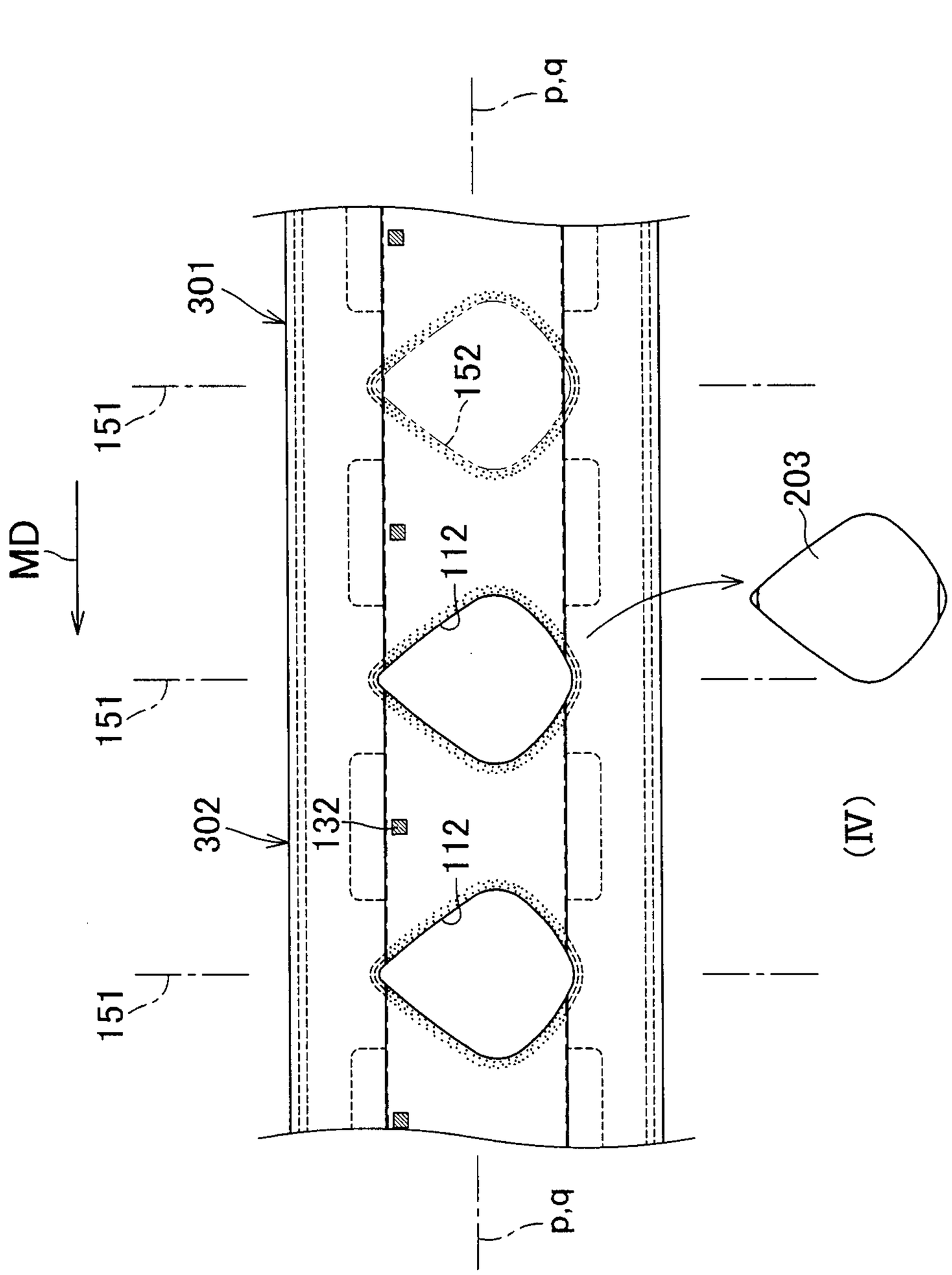


FIG.8

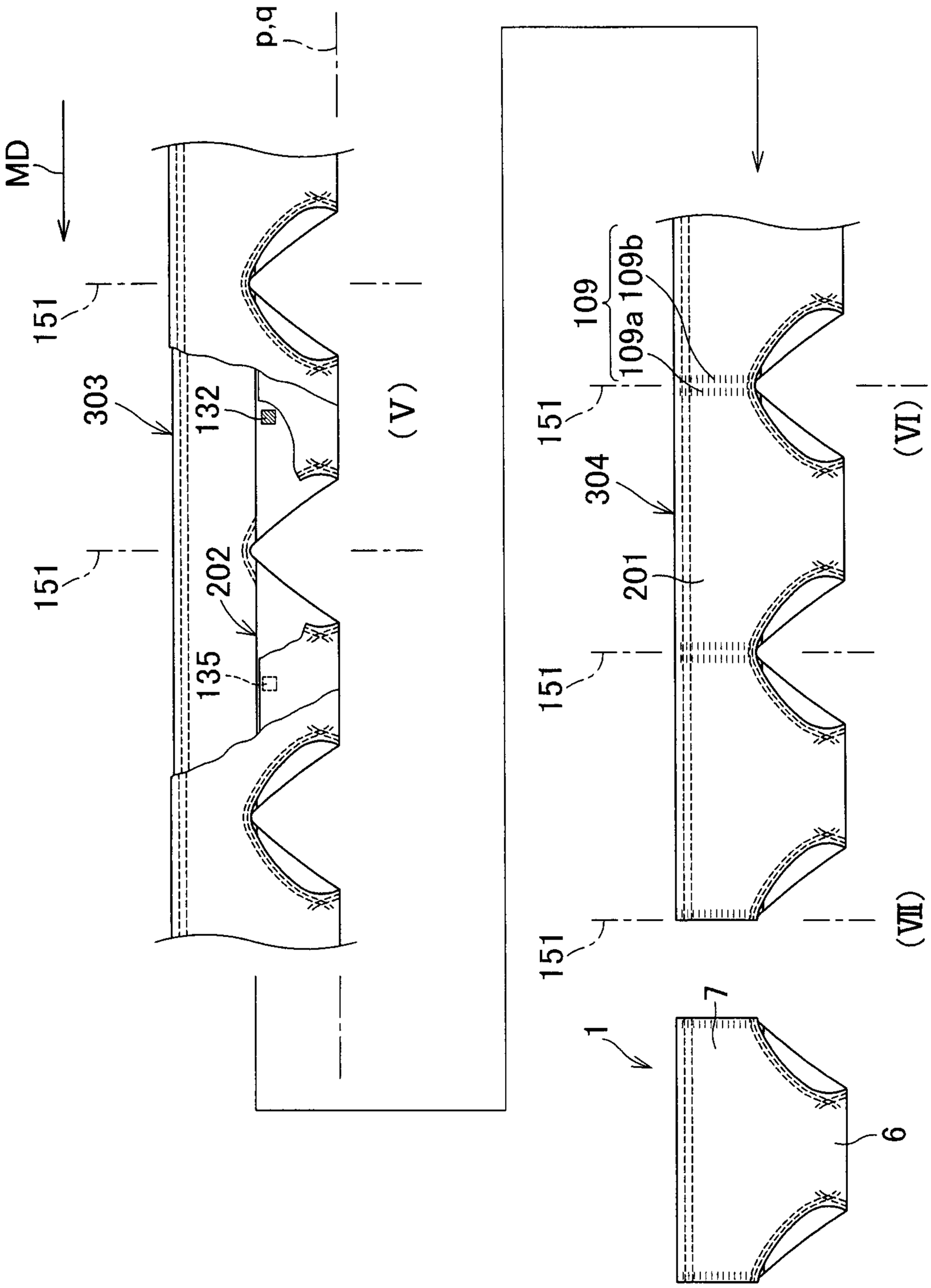

MD
151
303
132
202
135
151
(V)
b,d
109
109a
109b
151
304
201
151
(VI)
(VII)
1
7
6

FIG.9

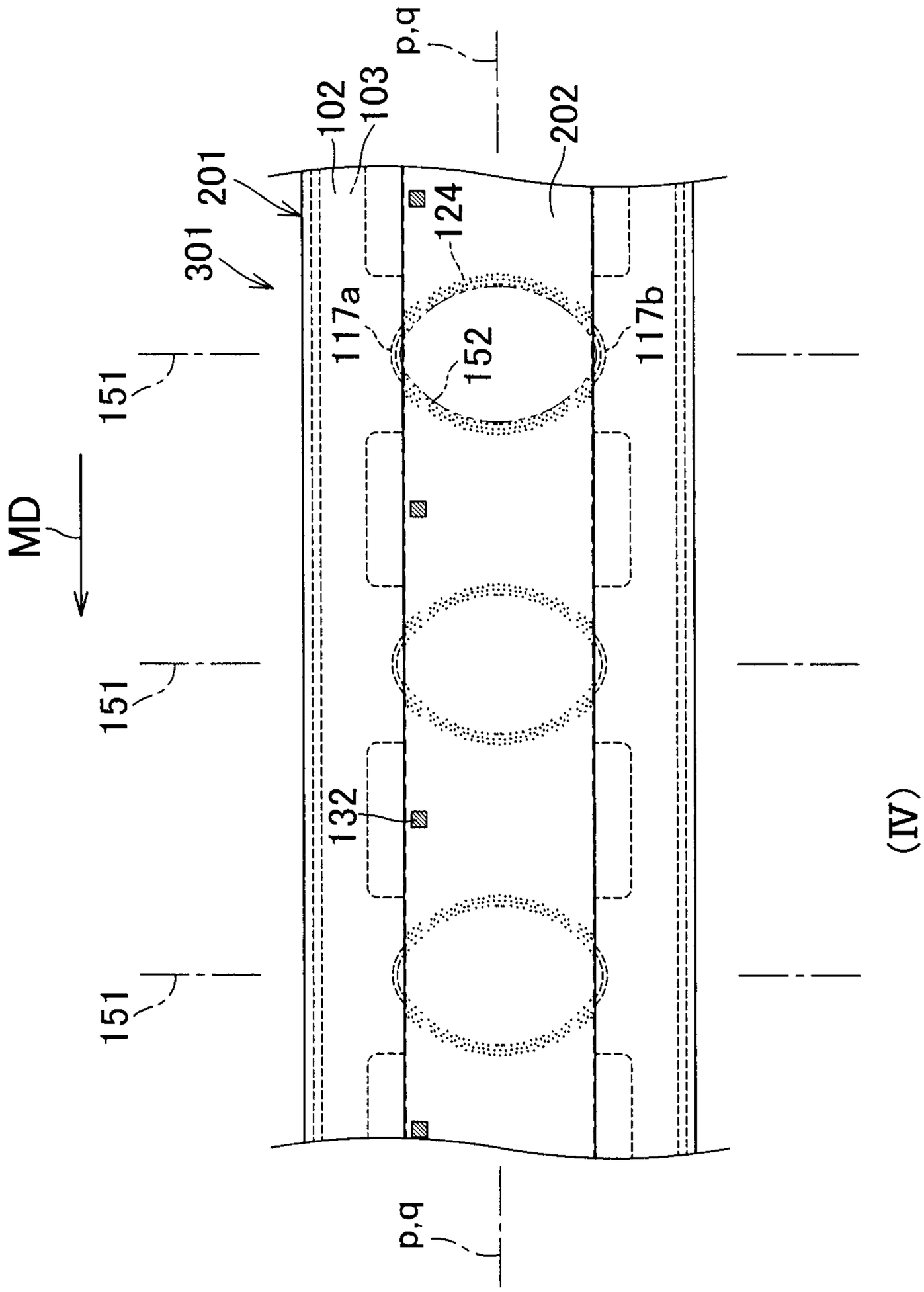
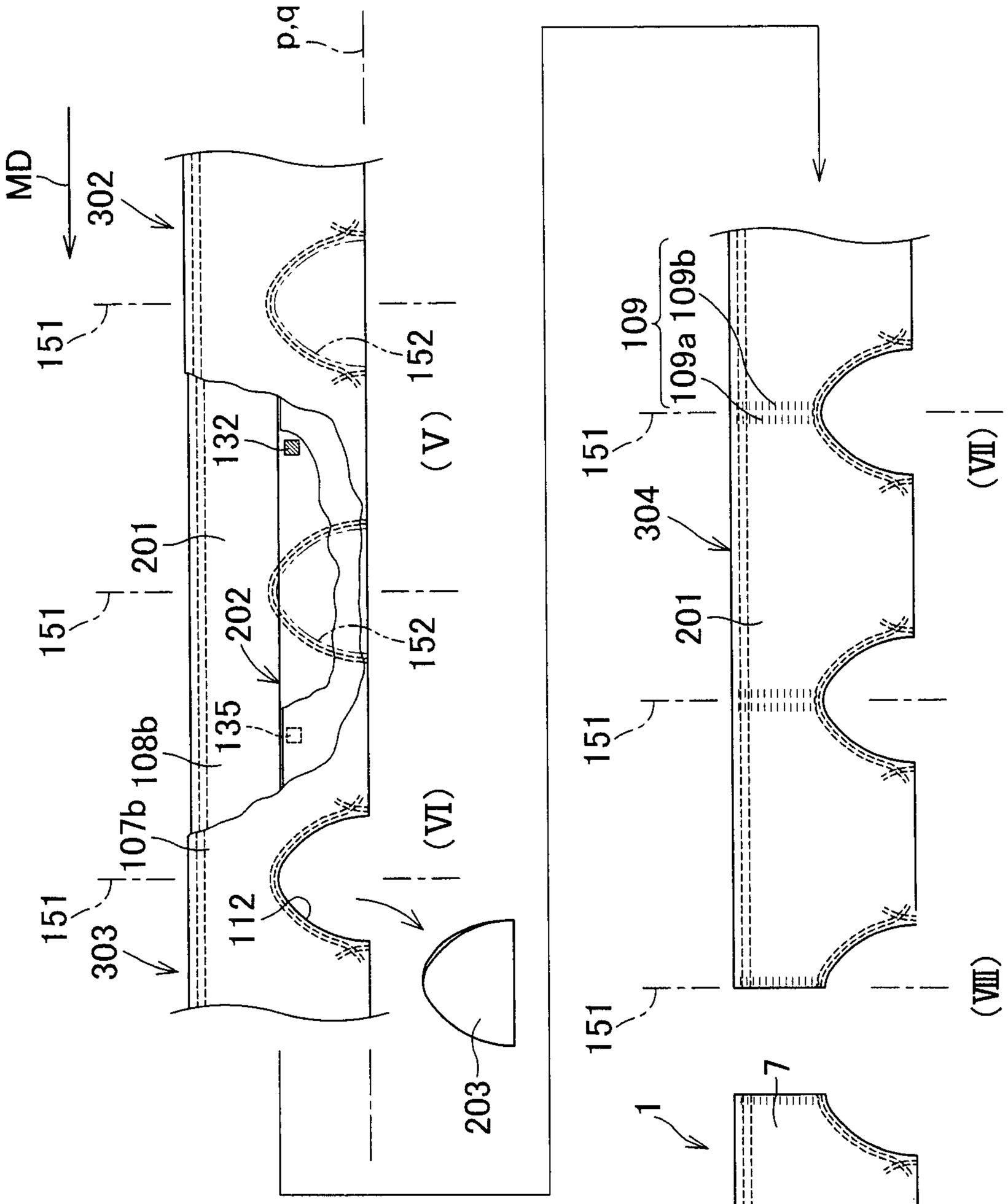
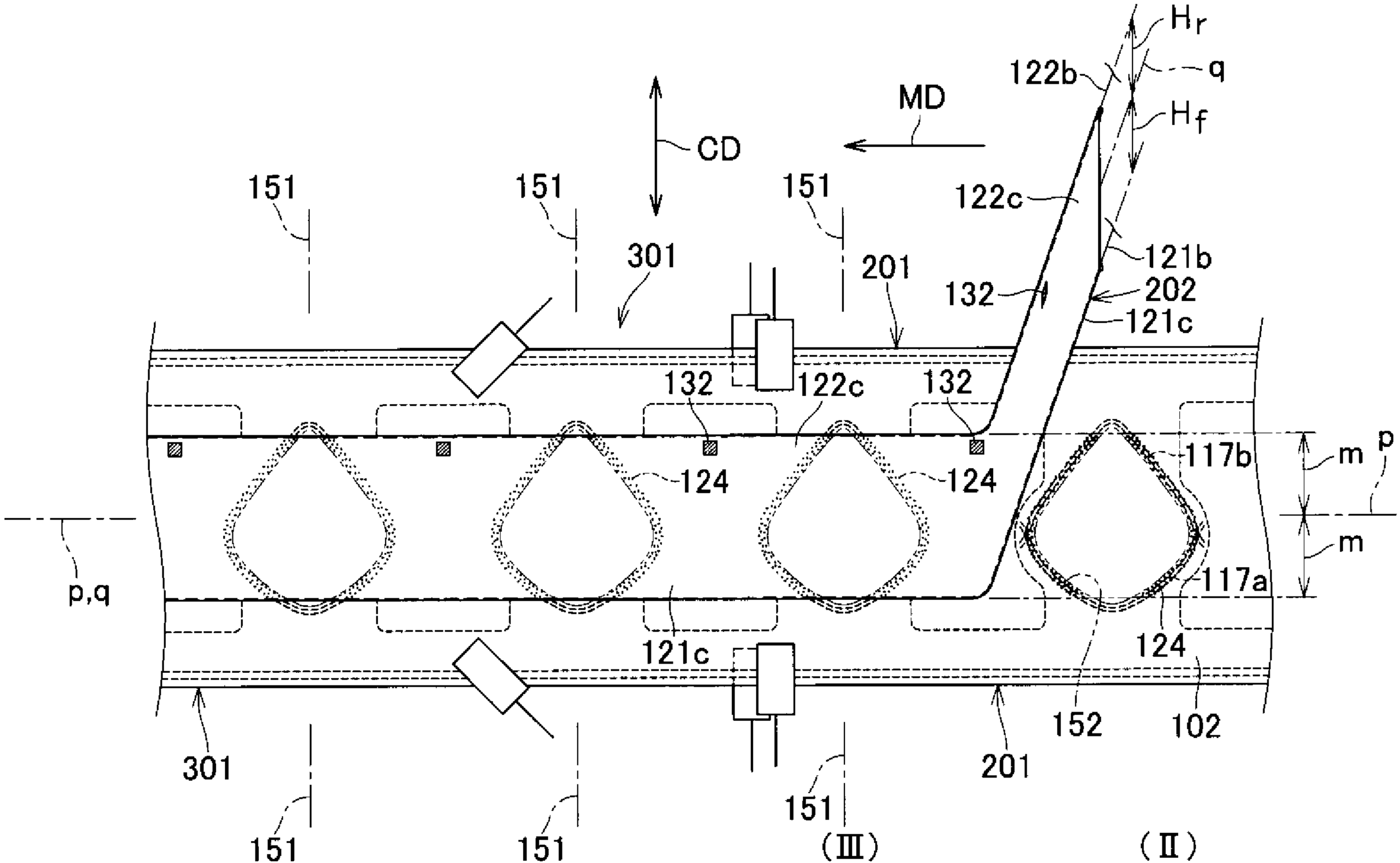


FIG.10


MD
302
151
152
(V)
132
201
202
135
108b
107b
(VI)
303
112
203
p,q
109
109a
109b
(VII)
304
(VIII)
1
7
6


Hr
q
122b
Hf
MD
CD
151
151
151
301
201
122c
121b
132
202
121c
132
122c
132
117b
m
p
124
124
m
p,q
117a
121c
124
152
102
301
201
151
151
151
(Ⅲ)
(Ⅱ)