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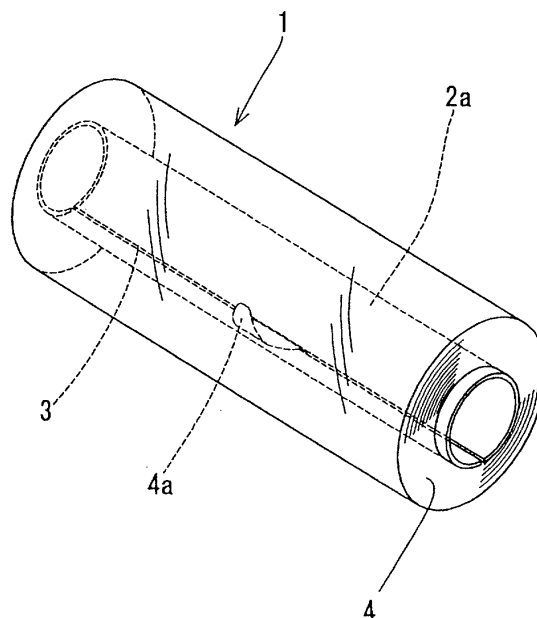
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(54) **Roll product and winding method**

(57) An improved roll product (1) is proposed in which a long strip of film or sheet (4) is wound on a core (2a) without using a conventional paper tube. The core used can be discarded without difficulty. The core (2a) is formed by bending a flat board of cardboard into a cylindrical shape. The side edges (3) of the flat board may be spaced apart, butted together or overlapped. The side edges may or may not be joined together. The end of the film (4a) gets caught between the side edges (3) of the flat board. This arrangement allows the film wound to be used up to the last inch while applying a tension thereto and without breakage of the core or winding displacement. A cap may be fitted into both ends of the core to increase the shape retainability of the core.

Fig. 1



Description**BACKGROUND OF THE INVENTION**

[0001] This invention relates to a roll product of a plastic film such as stretch film for packaging, food wrapping film, or a plastic sheet for e.g. packaging container, wound around a tubular member formed of flat cardboard instead of a paper tube, and a winding method for manufacturing roll products.

[0002] Plastic films and sheets for packaging such as stretch film used to prevent collapse of articles on pallets and food wrapping film are 300 mm to 500 mm wide and usually as long as several hundred meters. Thus, in order to roll it into a roll product, a paper tube having a high strength is usually used as a core.

[0003] In offices where such roll products are used in large amounts, used paper tubes are stocked in large amounts. Since these paper tubes have high strength so as not to collapse during winding, it is impossible to collapse them merely by stomping. Thus, they are bulky and difficult to discard. Also, recycling is not easy.

[0004] In order to solve these problems, a coreless roll product is proposed in which the winding density is increased at the wind-start portion, i.e. the radially central portion of the roll product and the plastic film is wound with the high-density central portion as a core.

[0005] With such a coreless roll product, wound film is often in close contact with adjacent layer at the high-density central portion, so that it cannot be used to the last. Thus, this portion becomes a waste. Also, as the end of use becomes near, the shape retainability of the roll itself worsens, so that the work of wrapping the film around an article while pulling the film becomes difficult.

[0006] Further, if a stretch film is wound, since the stretch film is usually formed of a polyolefin resin having a thickness of about 18 μm and a width of 500 mm and it is wound onto the core while imparting a tension of 5-8 kg/m, a large residual stress is produced in the stretch film that has been wound onto the core. Therefore, during storage after winding, the core itself may be destroyed by compression, or if it is left in a high-temperature atmosphere for a long time, winding displacement in the axial direction of the core may develop, thus lowering its commercial value.

[0007] An object of this invention is to provide a roll product which does not use a paper tube for its core, which makes it possible to discard the used core without difficulty, which makes it possible to use a wound long strip of sheet or film to the last inch without waste, and which will not develop compressive destruction of the core or winding displacement.

SUMMARY OF THE INVENTION

[0008] In a roll product of the present invention in which a long strip of sheet or film is wound on a core, the core is formed by cylindrically bending a flat board of a material which can be developed into a flat board.

[0009] By forming the core by cylindrically bending the flat board, it can be returned to a flat board state after use. Thus it is not so bulky as conventional paper tubes, so that it can be easily discarded or recycled.

[0010] Also, as the material for the flat board, by selecting one having required strength or rigidity, since the cylindrically bent flat board has shape retainability necessary for the core with the sheet or film wound therearound, it is possible to use up the wound sheet or film to the last.

[0011] The core may be formed by joining together both side edges of the bent flat board.

[0012] By joining both side edges of the flat board with adhesive or adhesive tape, the shape retainability of the core further improves.

[0013] The core may be formed with a gap provided between both side edges of the bent flat board.

[0014] By forming the core with a gap provided between the side edges of the flat board, the wound sheet or film enters the gap between the side edges of the flat board. By the interposition of the sheet or film, circumferential displacement of both sides is prevented. After winding, in the process of pulling out the sheet or film, the core retains the cylindrical shape and it is possible to prevent its inner diameter from decreasing. This makes it possible for the wound sheet or film to be shape-retained along the core even at the end of use and thus to use it with a tensile force applied to the last.

[0015] The core may be formed with both side edges of the bent flat board abutting each other.

[0016] By abutting both sides of the bent flat board, even if both sides are not joined together using an adhesive or the like, the side edges will not slip on each other. Thus, in the process of pulling out the sheet or film after winding, the core retains the cylindrical shape and it is possible to prevent its diameter from decreasing.

[0017] It is possible to wind the sheet or film with its end portion engaged in the core through between both side edges of the cylindrically bent flat board.

[0018] By biting the end of sheet or film into the core through between side edges of the cylindrically bent flat board, interposition of the sheet or film will serve as a slip stop, thereby preventing circumferential displacement of the core. In the process of pulling the sheet or film after winding, the core can retain the cylindrical shape, its inner diameter will

not decrease, and it is possible to prevent the core from moving in the axial direction.

[0019] Further, by the interposition of the sheet or film due to frictional force acting between its end, flat board and the mandrel of the winding machine, even if it is not fastened to the core using an adhesive or the like, the sheet or film can be wound without slipping.

[0020] When the flat board is cylindrically bent, whether the gap exists between both sides or both sides are superposed, it is possible to bite the end portion of the sheet or film into the core through both sides.

[0021] The flat board is preferably formed of cardboard.

[0022] Generally, for paper, the larger its thickness, the larger its rigidity. Thus, if cardboard is used as the flat board, it is possible to achieve shape retainability required for the core. Also, it can be easily developed into a flat board after use. Thus it can be easily discarded or recycled.

[0023] Two or more flat boards may be used to form a core by putting one on another around the mandrel of a winding machine.

[0024] If the wound film is a stretch film, it is preferably wound with the tension during winding restricted such that when a cut having a depth of 10 mm or over is formed in the wound stretch film roll over the entire width in the axial direction, the width of widening of the cut produced due to residual stress in the stretch film is 5 mm or less.

[0025] When the stretch film is wound, by reducing the residual tension in the stretch film by restricting the tension during winding as small as possible, so that the width of widening of the cut will be 5 mm or less, it is possible to prevent winding shrinkage and winding displacement of the stretch film and shrinkage and axial displacement of the core after winding. Thus, there is no need to use a high-strength core such as conventional paper tubes. Also, even if the roll is left at high temperature for a long time, no winding displacement will occur.

[0026] Caps each having a fitting portion and a flange portion are preferably fitted in both ends of the core.

[0027] In this arrangement, by the fitting portions of the fitted caps, the core is radially restricted at both ends, so that its shape retainability improves. Even if the width of the sheet or film increases, in the process of pulling out the sheet or film after winding, it is possible to prevent the inner diameter of the core from decreasing.

[0028] Since the core is also restricted in the axial direction at its both ends by the flange portions of the caps, in the process of pulling out the sheet or film, it is possible to reliably prevent the core from coming out of the roll of wound sheet or film.

[0029] Further, when handling the roll product, even if one end of the roll product contacts a floor surface, since it does not directly contacts the floor surface, damage to the product is prevented.

[0030] Both ends of the core preferably protrude from both ends of the wound and superposed sheet or film.

[0031] With this arrangement, the caps can be easily fitted in the core. Also, normally, since the flange portions of the caps do not contact the end faces of the wound sheet or film, in the process of using the sheet or film by pulling it out, the ends of the sheet or film will not contact the flange portions of the caps, so that there will be no trouble of pulling out.

[0032] Other features and objects of the present invention will become apparent from the following description made with reference to the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0033]

Fig. 1 is a perspective view showing a roll product of an embodiment of this invention;

Fig. 2 is a sectional view of the same;

Fig. 3 is a perspective view showing how the winding is started;

Fig. 4 is a sectional view of the state of Fig. 3;

Fig. 5 is a sectional view showing the state at an initial stage of winding;

Fig. 6 is a perspective view showing the state in which a core has been formed in the initial stage of winding;

Fig. 7 is a sectional view showing a portion of Fig. 6;

Fig. 8A is a sectional view showing another embodiment;

Fig. 8B is a sectional view showing a winding start portion of the roll of Fig. 8A;

Fig. 9A is a sectional view of a still another embodiment;

Fig. 9B is a sectional view showing a portion of the roll of Fig. 9A;

Fig. 10 is a sectional view showing the roll of a further embodiment;

Fig. 11 is a sectional view showing one example of a core of the roll of another embodiment;

Fig. 12 is a perspective view showing how the core shown in Fig. 11 is formed;

Fig. 13 is a sectional view showing another example of the core;

Fig. 14 is a perspective view showing how the core shown in Fig. 13 is formed;

Fig. 15 is an exploded perspective view showing a roll of another embodiment with caps fitted in both ends of the

core;

Fig. 16 is a longitudinal sectional side view of the roll of Fig. 15;

Fig. 17 is a sectional view taken along line A-A of Fig. 12;

Fig. 18 is a perspective view showing how a cut is formed in the roll of stretch film;

Fig. 19 is a sectional view of another embodiment; and

Fig. 20 is a sectional view taken along line A-A of Fig. 19.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0034] Hereinbelow, the embodiments of this invention will be described with reference to the accompanying drawings.

[0035] Figs. 1 and 2 show a roll product 1 embodying the present invention. As shown in Figs. 3 and 4, the roll product 1 is made by winding a long strip of plastic sheet or film 4 onto a core formed by bending a flat board 2 of cardboard with a gap 3 formed between side edges thereof, with its end portion 4a inserted into the inner side of the bent flat board 2 through the gap 3.

[0036] As shown in Figs. 3 and 4, at the start of winding into the roll product 1, the tapered end portion 4a of the rolled sheet or film 4, which is set on a spool 6 of a winding machine, is put on the outer peripheral surface of a mandrel 5 of the winding machine. Next, the flat board 2 of cardboard having such a length B that when wound around the mandrel 5, the gap 3 exists between both side edges, is supplied with its end slightly bent, inside of the sheet or film 4 so as to contact the outer peripheral surface of the mandrel 5.

[0037] In this state, when a rotary shaft 7 of the mandrel 5 is rotated in the direction of the arrow, as shown in Fig. 5, the flat board 2 is bent along the outer peripheral surface of the mandrel 5 to form a core 2a and the sheet or film 4 is simultaneously wound along the outer surface of the core 2a. As shown in Figs. 6 and 7, with the end portion 4a of the sheet or film 4 caught into the inner side of the flat board 2 through the gap 3 between both side edges of the flat board 2, the sheet or film 4 is wound on the core 2a with the speeds between the mandrel 5 and the spool 6 adjusted so that no excessive tension is applied to it.

[0038] The roll product 1 of a long strip of plastic sheet or film is thus obtained in which as shown in Figs. 1 and 2, without using a conventional paper tube, the core 2a is formed by bending the flat board 2 of cardboard. The core 2a can be developed into a flat board after use.

[0039] As the flat board 2, besides paper materials such as cardboard, a sheet of a synthetic resin such as polyethylene or polypropylene can be used.

[0040] The embodiment of this invention has the above-described structure, of which the operation will be described below.

[0041] As described above, since for the core 2a, a material that it can be returned to a flat plate, such as cardboard, is selected, it is not so bulky as conventional paper tubes and can be easily discarded or recycled. Also, since the larger the thickness of paper, the higher its rigidity, if cardboard is used as the flat board 2, the shape retainability required as the core is obtained.

[0042] Since the end of the sheet or film 4 is inserted into the inner side of the flat board 2 through the gap 3 between both side edges of the flat board 2, the sheet or film disposed in the gap 3 serves as a slip stop. Thus, both side edges will not slip on each other even if both side edges are not bonded together with an adhesive, so that it is possible to retain the cylindrical shape. Thus, while the sheet or film is being used by unwinding, the core 2a will not break or shrink. It is also possible to prevent axial displacement of the core 2a. This makes it possible to use the wound long strip of film or sheet to the last inch with a tensile force applied thereto.

[0043] As shown in Figs. 3 and 4, the end of sheet or film 4 can be caught in the cylinder of the core 2a merely by putting the end portion 4a of the film or sheet 4 on the outer periphery of the mandrel 5, feeding the flat board 2 into inside of the sheet or film in contact with the outer periphery of the mandrel 5 and turning the shaft 7 of the mandrel. The slip-stop effect by the end of film caught eliminates the need of bonding the side edges of the flat board together and fastening the end portion 4a of the film 4 to the core 2a. This simplifies the winding work for the roll.

[0044] The end portion 4a of the film 4 may not be tapered as shown in Fig. 3 but be left straight.

[0045] Figs. 8A and 8B show a roll 1a of another embodiment in which the length B of the flat board 2 is longer than in the embodiment of Fig. 3 so that its side edges will overlap each other, and the end portion 4a of the film 4 gets caught through the overlapped portion into inside of the flat board 2.

[0046] In this embodiment, too, the slip-stop effect by the end portion 4a of the film 4 caught at the overlapped portion prevents the side edges of the flat board 2 from slipping on each other and prevents the core 2a from shrinking and prevents axial displacement of the core 2a. Thus it is possible to use up the film to the last inch with a suitable tension applied thereto.

[0047] Figs. 9A and 9B show a roll product 1b of the third embodiment. A flat board 2 of cardboard is placed along the mandrel 5 of the winding machine, and bent so that a gap 3 is present between its both side edges to form a core

2a, and the end portion of sheet or film 4 is fastened to the core 2a and the film is wound around the core 2a.

[0048] With this arrangement, as shown in detail in Fig. 9B, the sheet or film 4 is received in the gap 3 between the side edges of the flat board 2. This prevents circumferential displacement of the side edges, so that in the process of unrolling the sheet or film 4, it is possible to prevent the inner diameter of the core 2a from decreasing. Also, since the end portion 4a of the sheet or film 4 is fastened to the core 2a, it can be wound without slipping, so that after winding, axial displacement of the core 2a is prevented. Thus it is possible to use the sheet or film 4 to the last centimeter with a tensile force applied thereto.

[0049] Fig. 10 shows a roll product 1c of the fourth embodiment. A flat board 2 of cardboard is cylindrically bent along the mandrel 5 of the winding machine so that both side edges of the thus bent flat board 2 will abut together to form a core 2a, and the end of the sheet or film 4 is fastened to the core and the film is wound.

[0050] In this arrangement, too, even if the abutting both side edges of the flat board 2 are not bonded with an adhesive, they will not slip on each other. After winding, in the process of unrolling the sheet or film, the core 2a will retain its cylindrical shape and will not shrink. Thus, it can be used up to the last millimeter with a tensile force applied thereto.

[0051] Fig. 11 shows an example of the core 2a of a roll product of another embodiment. As shown by chain line in Fig. 12, it is formed by cylindrically bending a rectangular flat board 2 and bonding both side edges together with an adhesive 9. Fig. 13 shows another example of the core 2a. As shown by chain line in Fig. 14, it is formed by cylindrically bending a rectangular flat board 2 and bonding both side edges together with an adhesive tape 10.

[0052] These flat boards 2 can be cylindrically bent by putting them on a cylinder or mandrel of a winding machine. As described above, by joining both sides, the core 2a is formed. By winding sheet or film 4 thereon, a roll product can be produced. The flat board 2 may be cylindrically bent beforehand, its both sides be joined together and it may be mounted on the mandrel of a winding machine. By joining both sides of the flat board 2 with an adhesive or an adhesive tape, the shape retainability of the core 2a further improves.

[0053] Figs. 15-17 show a roll product 1d of the fifth embodiment. In this roll product 1d, as with the roll product 1a shown in Figs. 8A and 8B, on a core 2a formed by cylindrically bending a flat board 2 of cardboard with an overlap 2b between both side edges of the flat board 2, a long strip of sheet or film 4 is wound with its end portion 4a getting caught into the inner side of the core 2a through between both side edges overlapped.

[0054] In this roll product 1d, as shown in Figs. 15 and 16, at both ends of the core 2a, caps 8 formed of a synthetic resin are mounted. Each cap 8 comprises a fitting portion 8a and a flange portion 8b provided at one end thereof. Their flange portions 8b are in abutment with the end faces of the core 2a. Since both ends of the core 2a protrude from both ends of the wound sheet or film 4, gaps $\underline{s}$ are present between both ends of the sheet or film 4 and the flange portions 8b of the caps 8.

[0055] Since the core 2a is restricted in a radial direction by the fitting portions 8a of the caps 8, the shape retainability of the core 2a improves, so that after winding, in the process of unwinding the sheet or film 4 for use, the core 2a is prevented from shrinking. As the width of the film or sheet increases, this is more effective.

[0056] By using the caps 8 having fitting portions 8a of different lengths according to the width of the sheet or film, i.e. the length of the core 2a, it is possible to more effectively cope with a wide sheet or film 4.

[0057] Further, since the fitting portions 8a of the caps 8 are fitted in the core 2a at both ends thereof with the flange portions 8b in abutment with the end faces of the core 2a, the latter is also restricted in the axial direction. Thus, after winding, in the process of unwinding the sheet or film 4, it is possible to reliably prevent the core 2a from displacing in the axial direction or from coming off the wound roll product 1d.

[0058] Since the gaps $\underline{s}$ are present between the flange portions 8b of the caps 8 and the end faces of the wound sheet or film 4, after winding, in the process of using the sheet or film by pulling it out, both ends are kept out of contact with the flange portions 8b. Thus, no trouble will occur if the caps 8 are fitted.

[0059] When handling the roll product, even if one end of the roll product 1 contacts the floor surface, since the end faces of the core 2a or the sheet or film will not directly contact the floor surface, damage to the roll product 1 is prevented.

[0060] Even if the length B of the flat board 2 is selected so that the gap 3 is present between its both side edges, and as shown in Fig. 1, the end of the sheet or film 4 is caught through the gap 3 to form the core 2a and the film is wound around the core, the caps 8 may be fitted into its both ends.

[0061] Similarly, as shown in Fig. 1, if the core 2a is formed so that the gap 3 exists between both side edges of the cylindrically bent flat board 2, the end portion of the sheet or film 4 is fastened to the core 2a and it is wound around the core 2a, the caps may be fitted into both ends of the core 2a. In this arrangement, the end of sheet or film 4 gets caught in the gap 3 to prevent circumferential displacement of the flat board 2, so that slip-stop effect is achieved.

[0062] Further, in the arrangement shown in Fig. 10 in which both side edges of the cylindrically bent flat board 2 are brought into abutment with each other to form the core 2a and the end portion 4a of the sheet or film 4 is fastened to the core 2a, the caps 8 may be fitted into both ends of the core 2a.

[0063] In the arrangement shown in Figs. 8A and 8B, the slip stop effect of the sheet or film 4 caught in the gap 3 of

the cylindrically bent flat board 2 improves the shape retainability of the core 2a, in addition to the fact that the caps 8 are fitted. In the arrangement shown in Fig. 10, the fact that both abutting side edges of the flat board 2 will not slip on each other, as well as the fact that the caps 8 are fitted, improves the shape retainability of the core 2a. After winding, in the process of unwinding the sheet or film for use, the core 2a will not shrink and it is possible to use the wound sheet or film to the last inch with a tensile force applied.

[0064] Figs. 19 and 20 show another embodiment which is substantially the same in other embodiments except that two flat boards 2a, 2b are used to form a core, put one on another around the mandrel of a winding machine. One of the flat boards may have a smaller width than the width of the film wound.

[0065] Table 1 shows the results of tests in which the influence of the tension applied to stretch film during winding on winding shrinkage and winding displacement was examined for roll products of stretch film.

[0066] In the winding test, a polyolefin resin stretch film having a thickness of 15 μm and a width of 500 mm was wound by a winding machine to a length of 300 meters while adjusting the speed between the mandrel 5 and the spool 6. Setting the tension per unit width applied to the stretch film was set to three different values, 8 kg/m, 5 kg/m and 0.5 kg/m, various rolls of stretch film were made by winding it onto paper tubes having different thicknesses and an inner diameter of 3 inches. After leaving them for four hours in a 40 °C atmosphere, they were checked on whether the paper tubes were destroyed due to winding shrinkage or whether winding displacement occurred.

[0067] The results are as shown in Table 1. For rolls that were wound with as slight tension as 0.5 kg/m applied, a 10 mm-deep cut was formed in the surface of the wound roll of stretch film over the entire width in the axial direction as shown in Fig. 18 and the width of the widening of the cut was measured. The width was 2 mm. This satisfies the condition of this invention that the cut widening width should be 5 mm or less. Thus, even if a thin paper tube having a thickness of 4.5 mm or less, no compressive destruction or no winding displacement occurred.

[0068] In contrast, when the tension at the winding portion was as large as 5 kg/m or 8 kg/m, the cut widening width was 8 mm and 12 mm, respectively. Because of high winding shrinkage due to residual stress of the stretch film, if the thickness of the paper tube was 5 mm or less, compressive destruction occurred in the paper tube. Also, when the rolls were left in a 40 °C atmosphere for 4 hours, winding displacement occurred.

[0069] Thus, by measuring the widening width of a cut formed in the surface of wound stretch film roll over the entire width in the axial direction, it is possible to determine the degree of residual stress in the stretch film, i.e. the degree of winding shrinkage. According to the present invention, since the stretch film is wound with as light tension applied to the stretch film as possible, the residual stress in the stretch film and winding shrinkage decrease. Thus, there is no need to use a high-strength paper tube as the core. Even if one formed by cylindrically bending a flat board of cardboard is used as the core, no compressive destruction of the core due to winding shrinkage will occur. Also, even if left in a high-temperature atmosphere, no winding displacement will occur.

[0070] As explained above, according to this invention, since the core is formed by cylindrically bending a flat board made of cardboard or synthetic resin sheet, it can be returned to a flat board after use. Thus, it is not so bulky as conventional paper tubes and can be easily discarded or recycled.

[0071] Also, both side edges of the flat board are prevented from slipping on each other by providing the gap between both side edges of the cylindrically bent flat board with the end of the film received in the gap, abutting both side edges, or biting the end portion of the sheet or film into the cylinder. Thus the core has the shape retainability required. Thus, after winding, in the process of using the sheet or film by pulling it out, it is possible to prevent the core from shrinking and axial displacement of the core. Thus it is possible to use the wound long strip of sheet or film to the last with a tensile force applied.

[0072] Further, when the end portion of the sheet or film is engaged into the core through between both side edges of the flat board, the work of fastening the end portion to the outer peripheral surface of the core is unnecessary, so that the work of winding the film is simplified.

[0073] Also, since the caps each having the fitting portion and the flange portion are fitted in both ends of the core, the core is restricted in the radial direction, so that the shape retainability improves. Thus, even if the width of the sheet or film is large, in the process of using the sheet or film by pulling it out, it is possible to prevent the inner diameter of the core from decreasing. Also, since the core is restricted in the axial direction, too, at its both ends by the flange portions of the caps, it is possible to reliably prevent the core from moving in the axial direction or from coming out. Thus it is possible to use the sheet or film with a tensile force applied to the last.

[0074] Besides, by measuring the width of widening of a cut formed in the surface of the wound stretch film roll, it is possible to grasp the degree of residual stress in the stretch film, i.e. the degree of winding shrinkage. Thus, by winding the stretch film with as a light tension applied as possible so that the cut widening width will be at a predetermined value, no compressive destruction of the core will occur. Also, even if left in a high-temperature atmosphere for a long time, no winding displacement will occur.

TABLE 1

Thickness of paper pipe (mm)	Winding tension (kg/m)	Cut widening width	Deformation of paper pipe	Winding displacement
15	8	12	No	Observed
15	5	8	No	Observed
15	0.5	2	No	No
12	8	12	No	Observed
12	5	8	No	Observed
12	0.5	2	No	No
10	8	12	No	Observed
10	5	8	No	Observed
10	0.5	2	No	No
7	8	12	No	Observed
7	5	8	No	Observed
7	0.5	2	No	No
5	8	12	No	Observed
5	5	8	No	Observed
5	0.5	2	No	No
4.5	8	12	broken [※]	Observed
4.5	5	8	broken [※]	Observed
4.5	0.5	2	No	No
4	8	12	broken [※]	Observed
4	5	8	broken [※]	Observed
4	0.5	2	No	No
3	8	12	broken [※]	Observed
3	5	8	broken [※]	Observed
3	0.5	2	No	No
2	8	12	broken [※]	Observed
2	5	8	broken [※]	Observed
2	0.5	2	No	No
1	8	12	broken [※]	Observed
1	5	8	broken [※]	Observed
1	0.5	2	No	No
0.5	8	12	broken [※]	Observed
0.5	5	8	broken [※]	Observed
0.5	0.5	2	No	No

※ Compressive breakage observed

Claims

1. A roll product formed by winding a long strip of sheet or film on a core, **characterized in that** said core is formed by bending a flat board into a cylindrical shape, said core being made of a material which can be developed into a flat board after use.
2. A roll product as claimed in claim 1 wherein said flat board has its side edges joined together after bending.
3. A roll product as claimed in claim 1 wherein said core is formed with a gap provided between side edges of said

flat board after bending.

4. A roll product as claimed in claim 1 wherein said core is formed with side edges of said flat board overlapping each other after bending.
5. A roll product as claimed in claim 1 wherein said core is formed with side edges of said flat board abutting each other after bending.
6. A roll product as claimed in claim 1, 3 or 4 wherein the end portion of said film or sheet is caught into said core through between side edges of said bent flat board.
7. A roll product as claimed in any of claims 1-6 wherein said flat board is formed of cardboard.
8. A roll product as claimed in any of claims 1-7 wherein the film is a stretch film and wherein the film is wound with the tension to the film during winding restricted such that when a cut having a depth of 10 mm is formed in the surface of the wound film roll over the entire width, the width of widening of said cut caused due to residual stress in the stretch film will be 5 mm or less.
9. A roll product as claimed in any of claims 1-8 wherein caps each having a fitting portion and a flange portion are fitted in both ends of said core.
10. A roll product as claimed in claim 9 wherein both ends of said core protrude from both ends of said wound sheet or film.
11. A roll product as claimed in any of claims 1-10 wherein a plurality of said flat boards are used to form said core.
12. A method of winding a long strip of sheet or film into a roll product, comprising the steps of placing a flat board along a mandrel of a winding machine, bending said flat board with a gap present between side edges of said flat board to form a core, and winding said sheet or film on said core with its end portion fastened to said core.
13. A method of winding a long strip of sheet or film into a roll product, comprising the steps of placing a flat board along the outer periphery of a mandrel of a winding machine, bending said flat board with its side edges abutting each other to form a core, and winding said sheet or film on said core with its end portion fastened to said core.
14. A method of winding a long strip of sheet or film into a roll product, comprising the steps of placing an end portion of said sheet or film on the outer periphery of a mandrel of a winding machine, feeding a flat board to the inner side of said sheet or film so as to contact the outer peripheral surface of said mandrel to simultaneously wind said flat board and said sheet or film, bending said flat board into a cylindrical shape to form a core, and getting one end of the sheet or film caught into said core through between side edges of the bent flat board.

Fig. 1

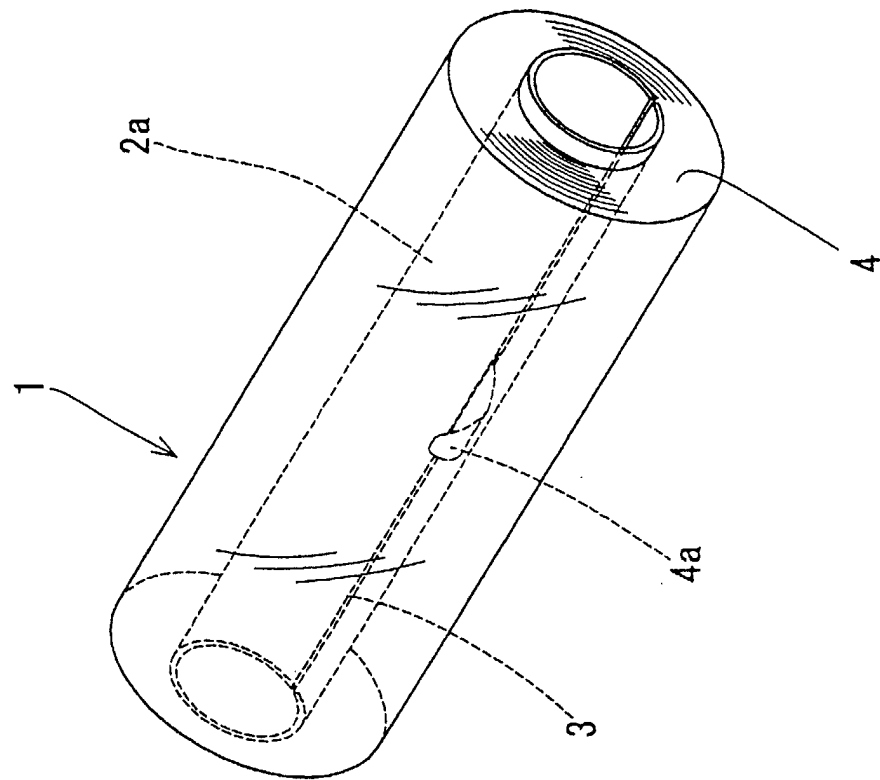


Fig. 2

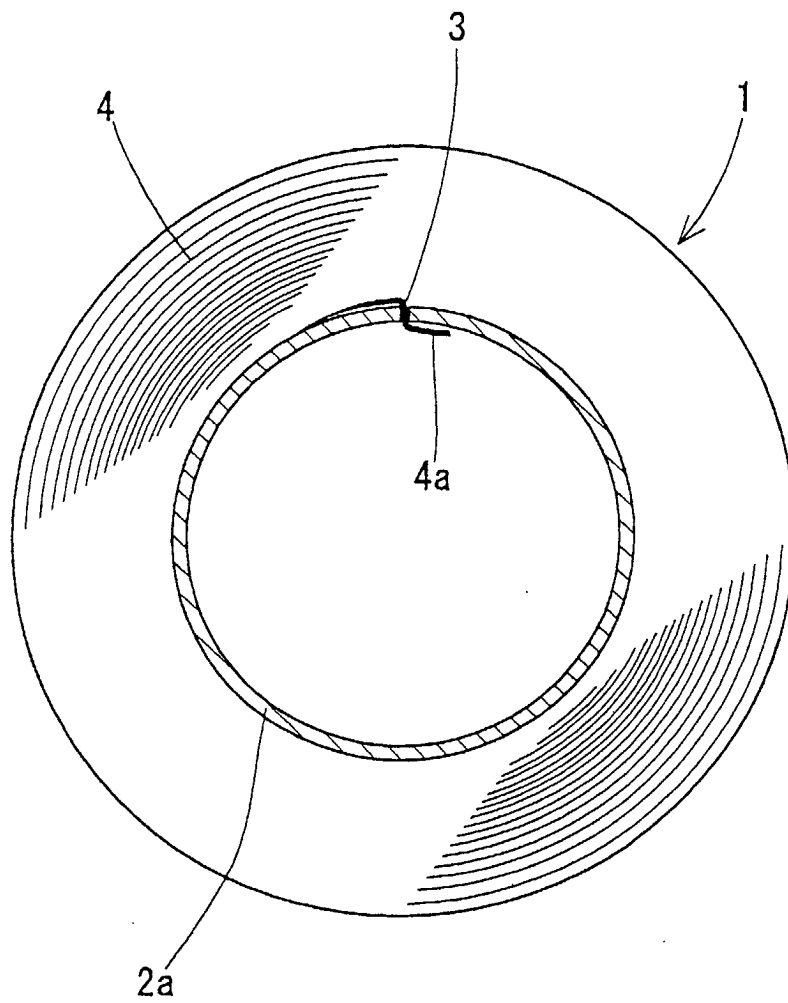


Fig. 3

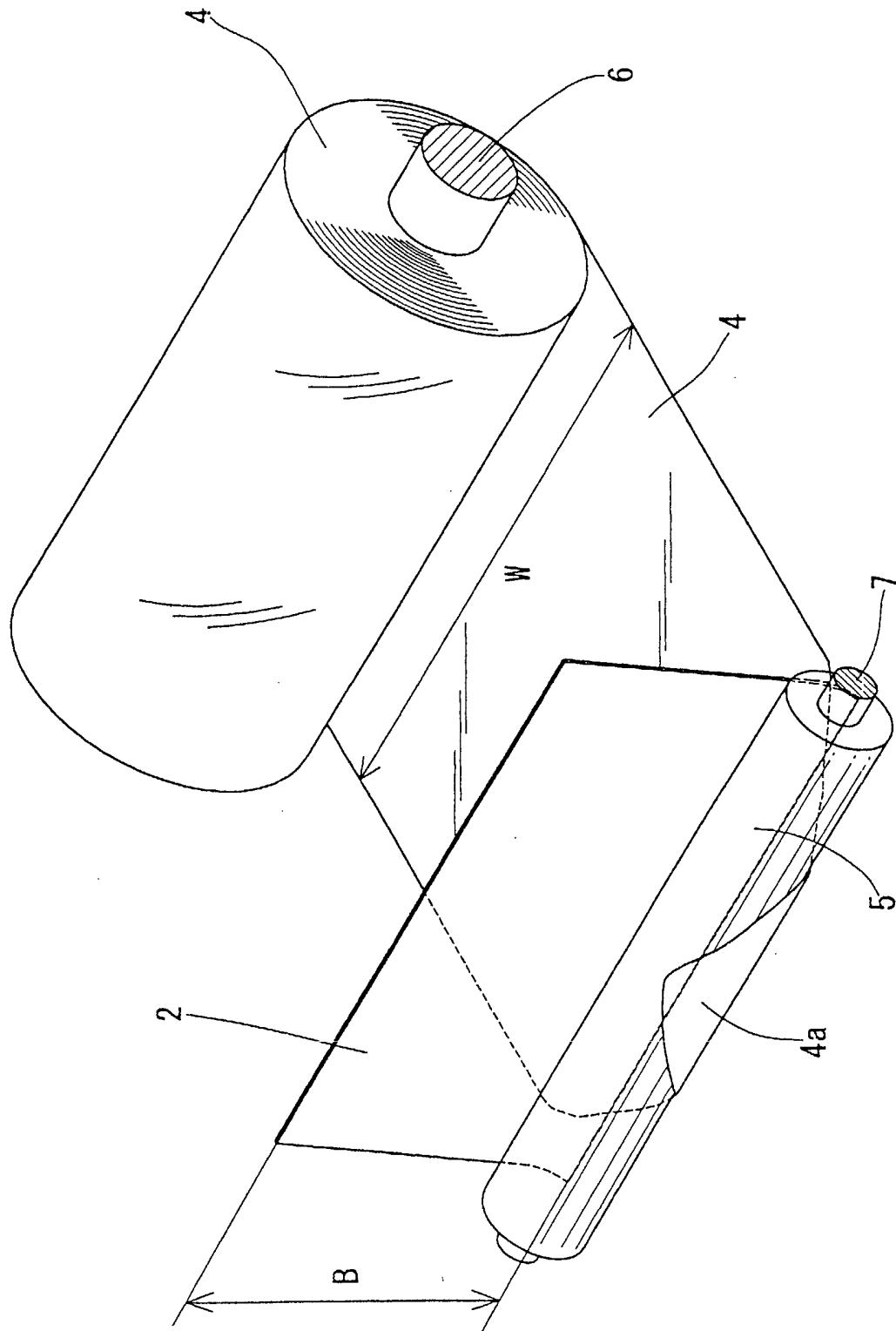


Fig. 4

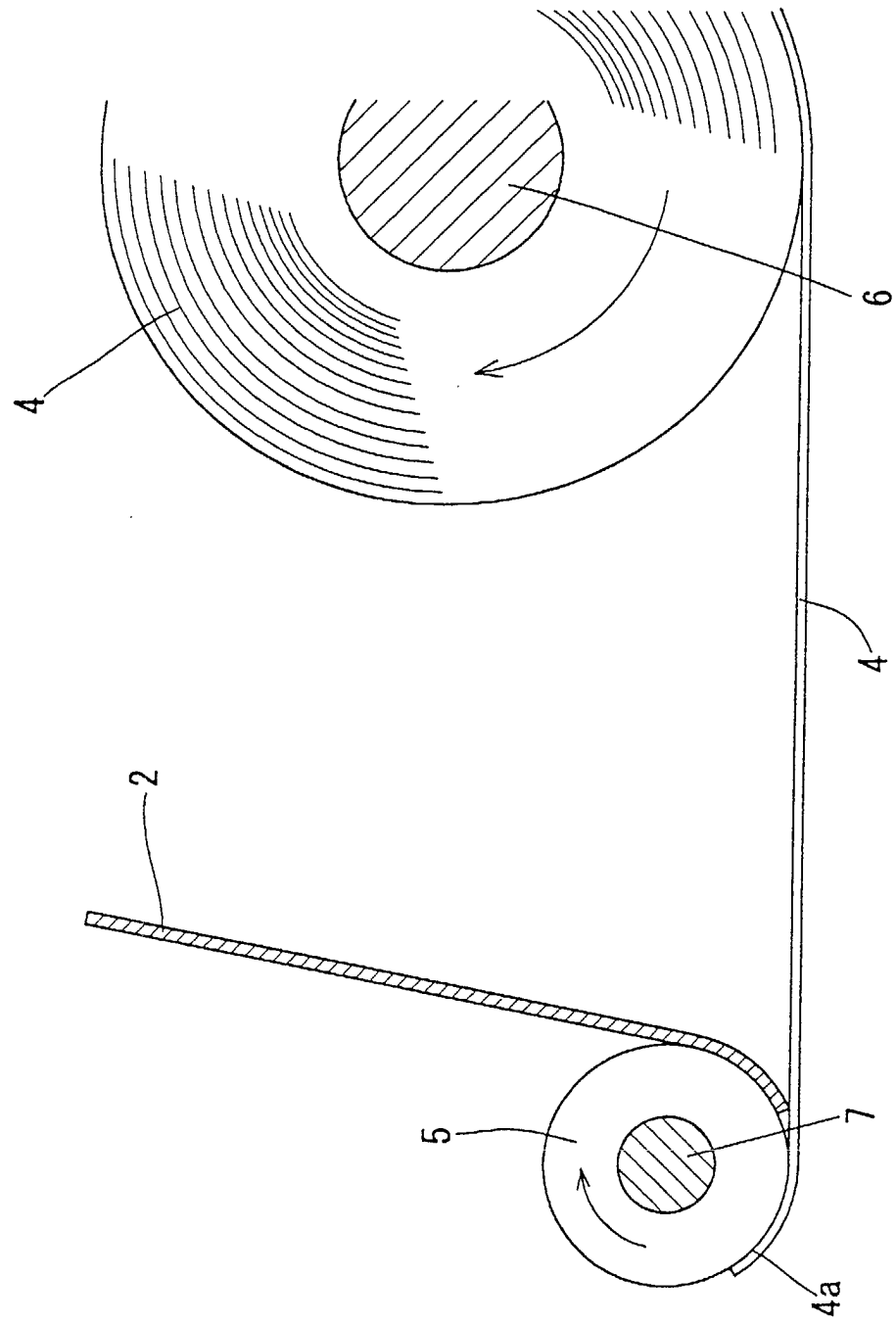


Fig. 5

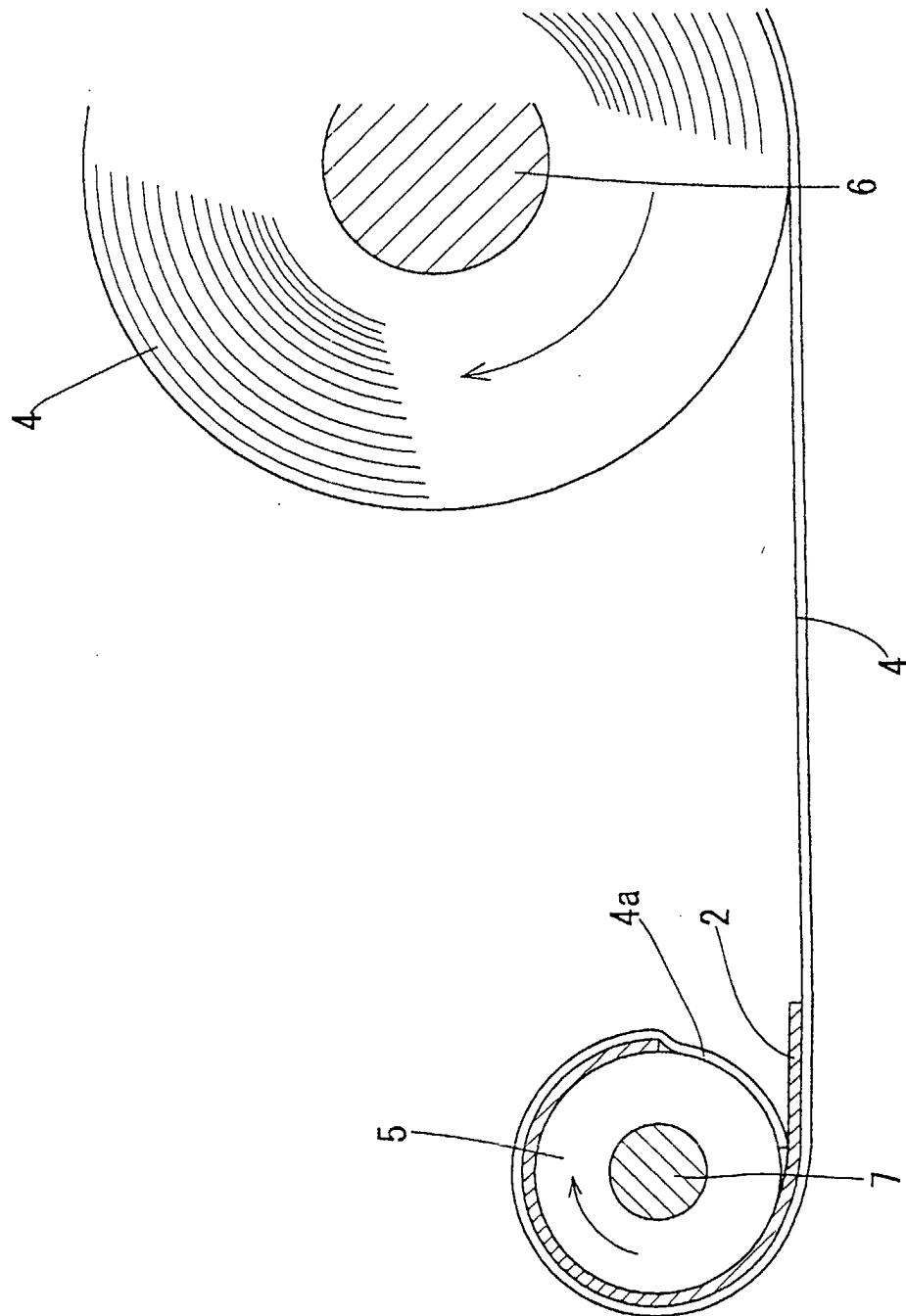


Fig. 6

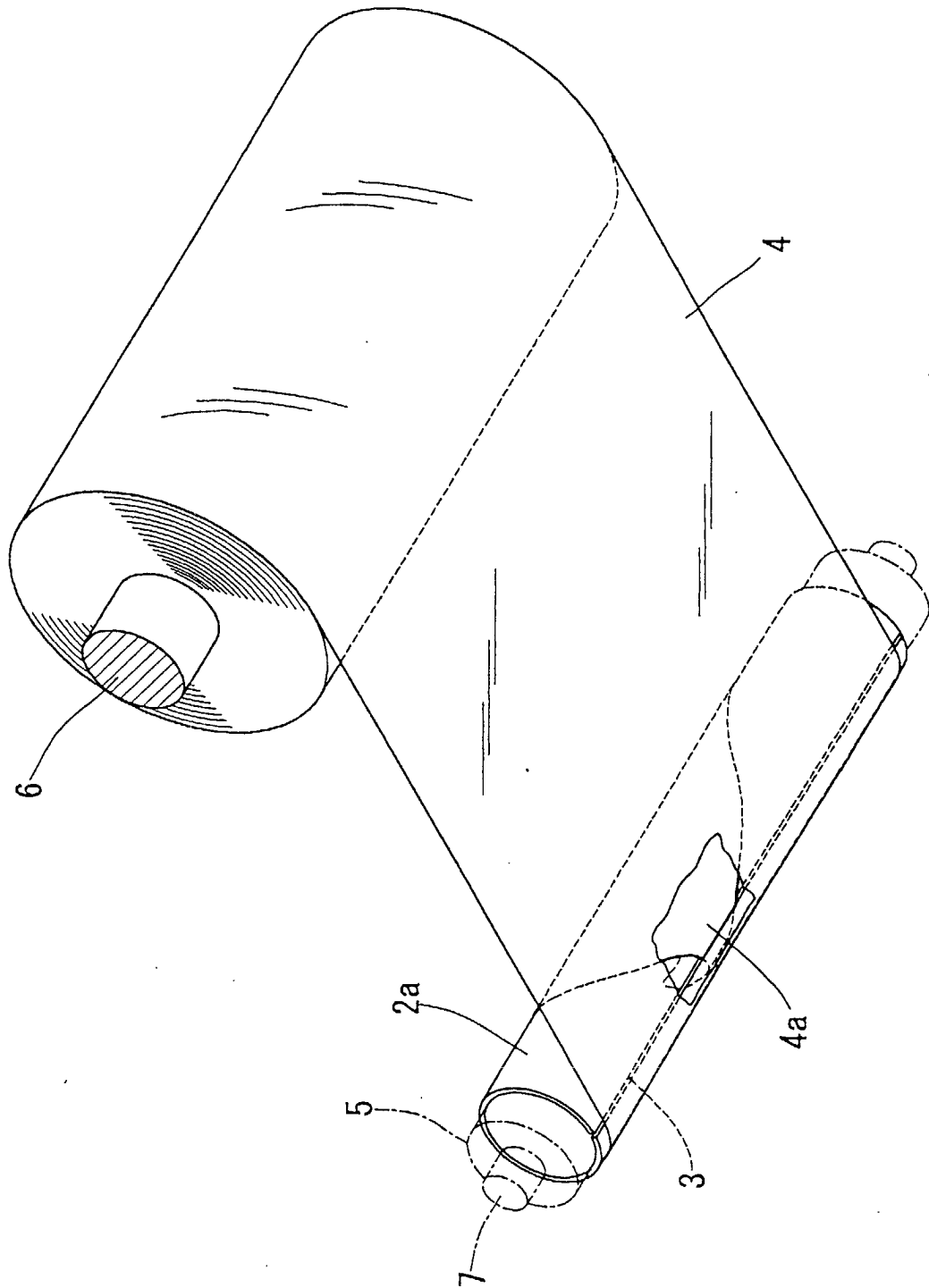


Fig. 7

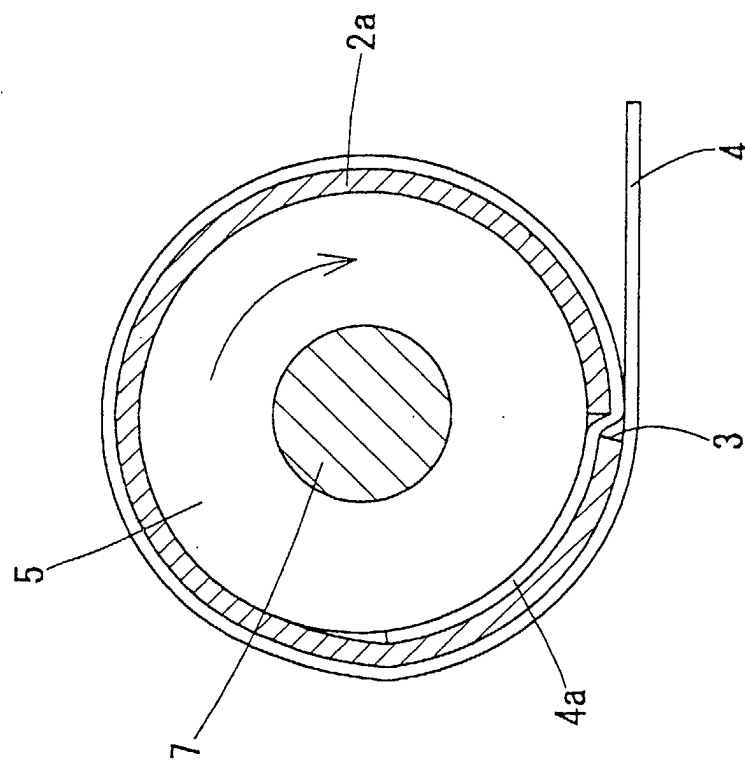


Fig. 8A

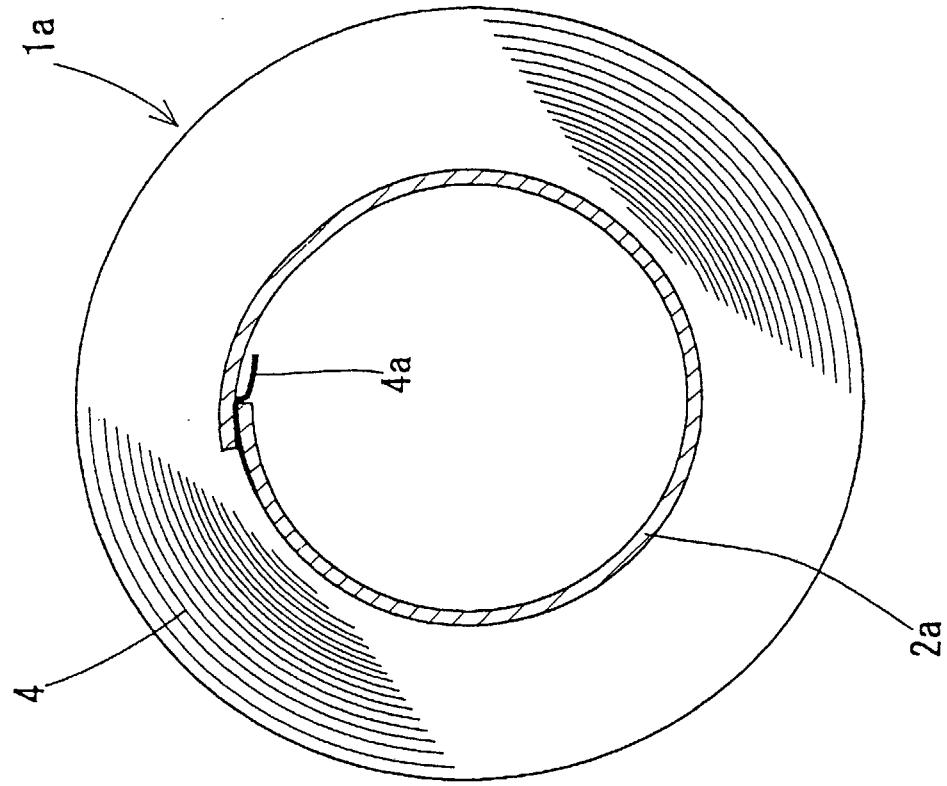


Fig. 8B

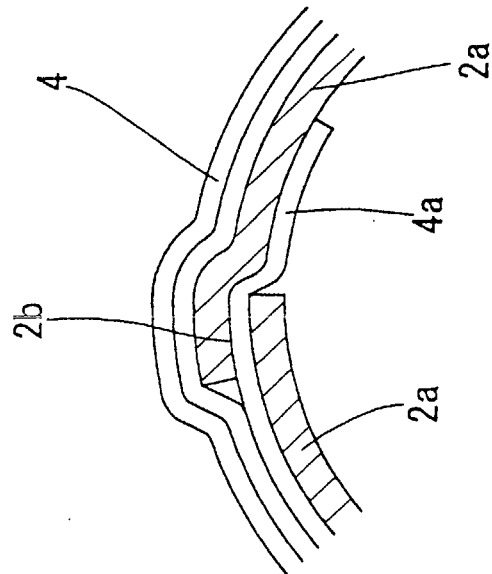


Fig. 9A

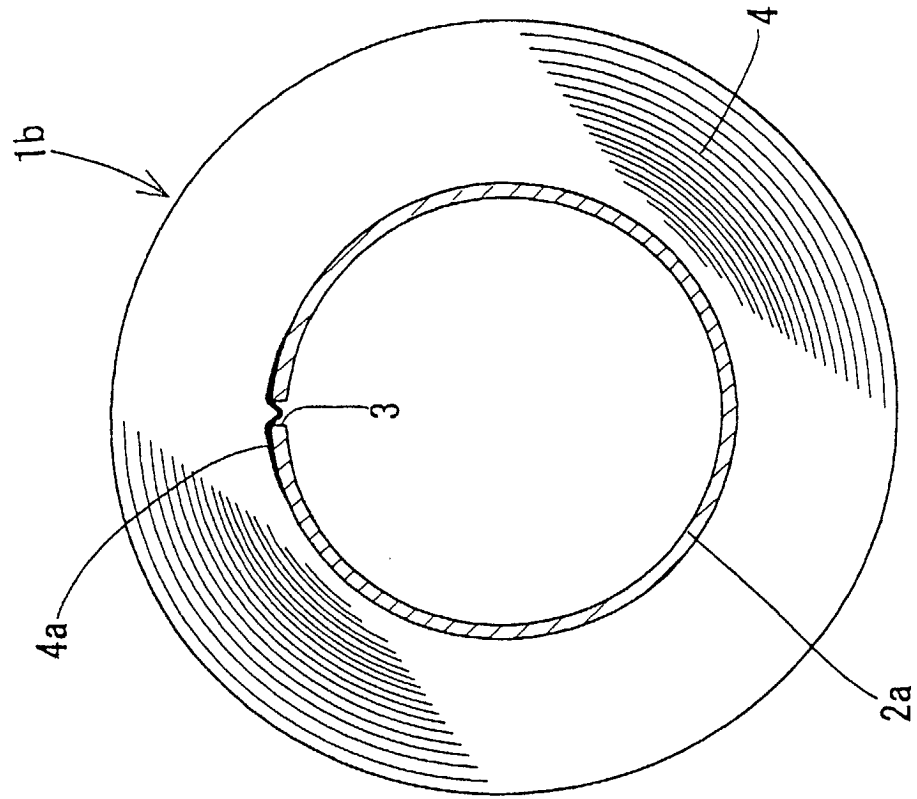


Fig. 9B

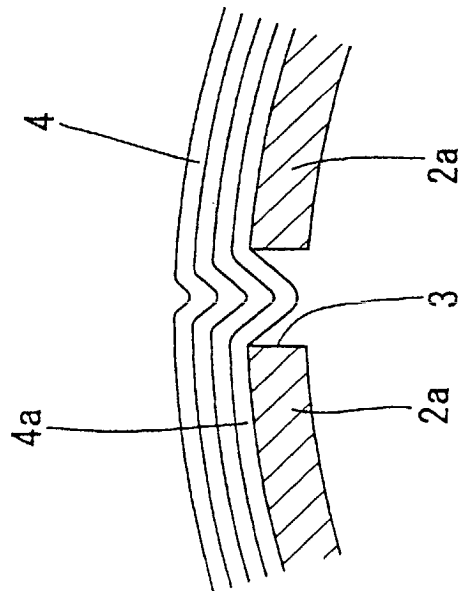


Fig. 10

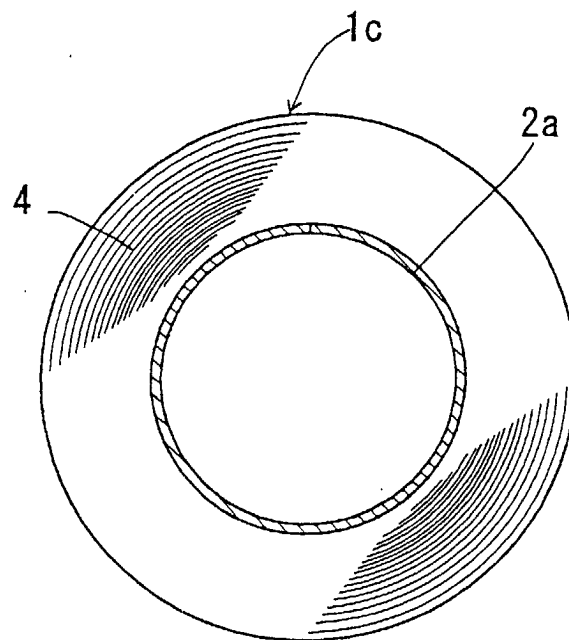


Fig. 11

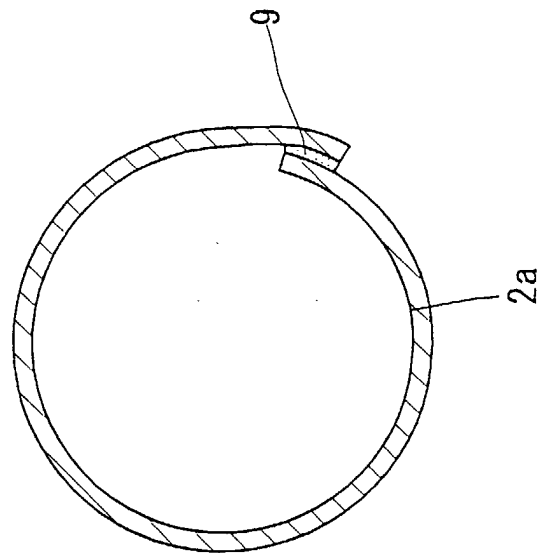


Fig. 12

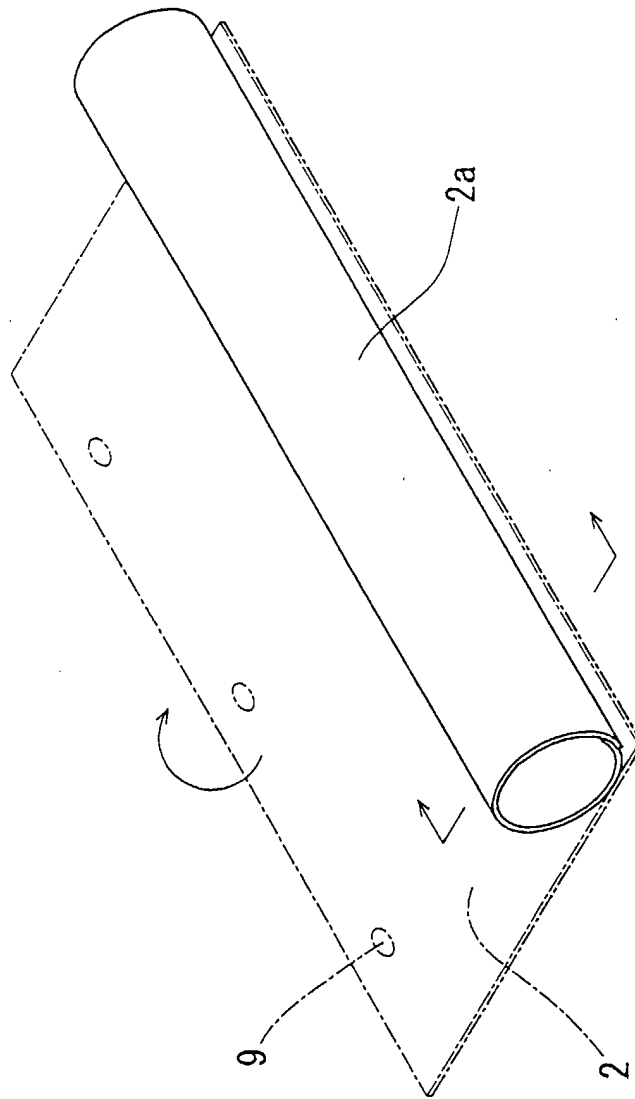


Fig. 13

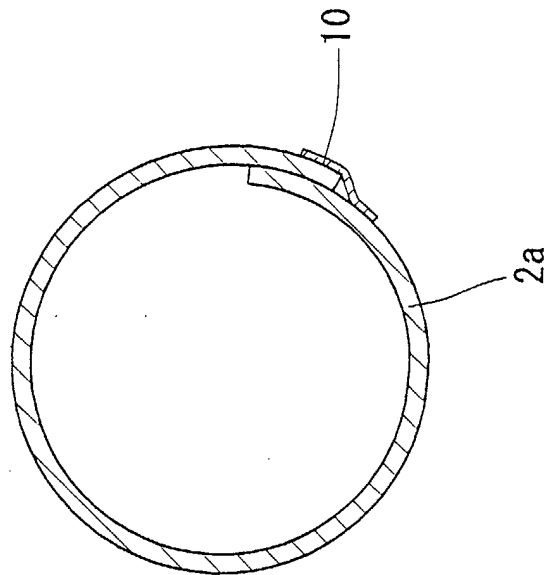


Fig. 14

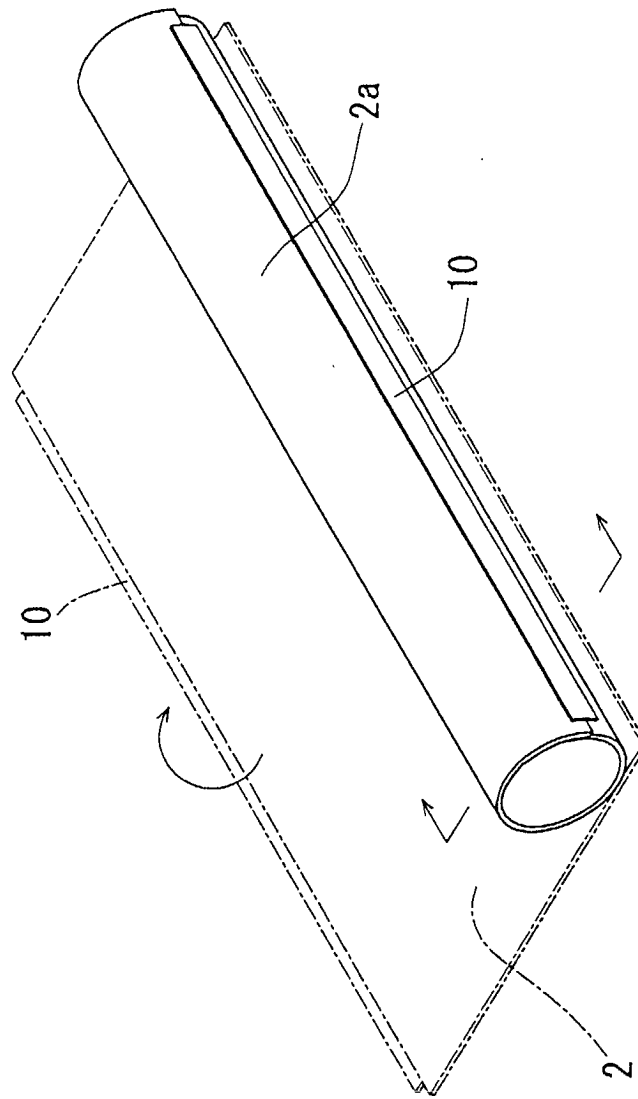


Fig. 15

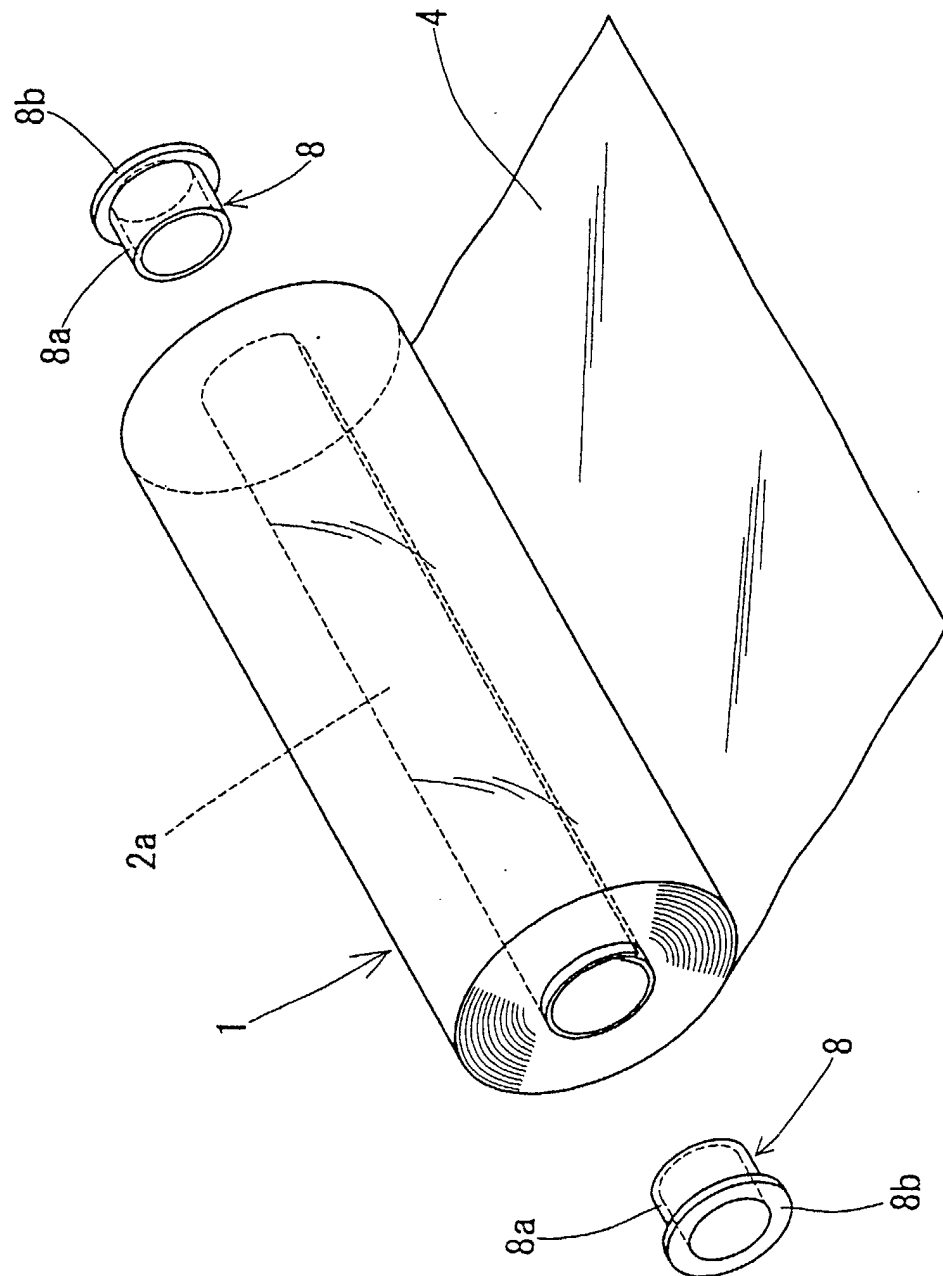


Fig. 16

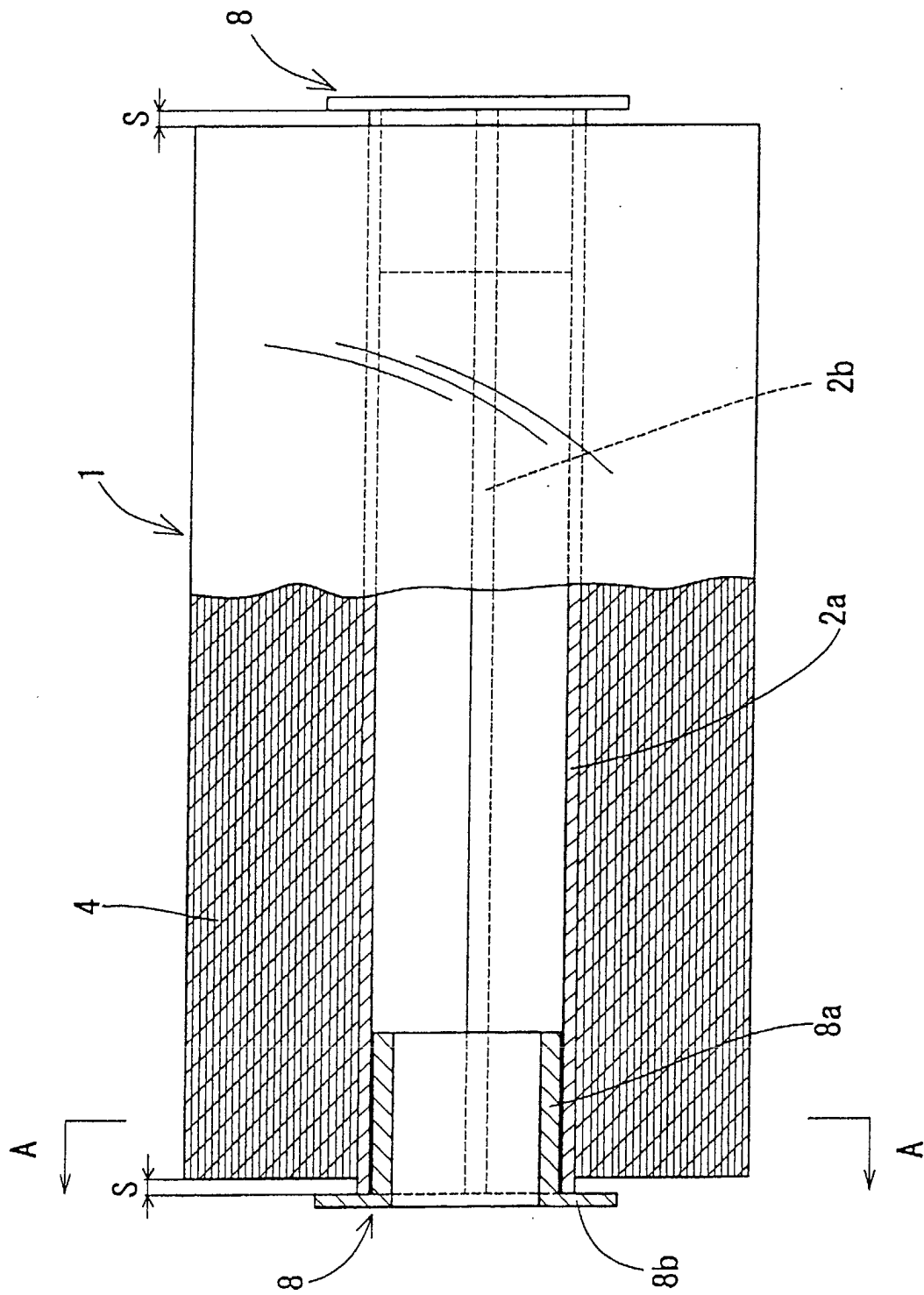


Fig. 17

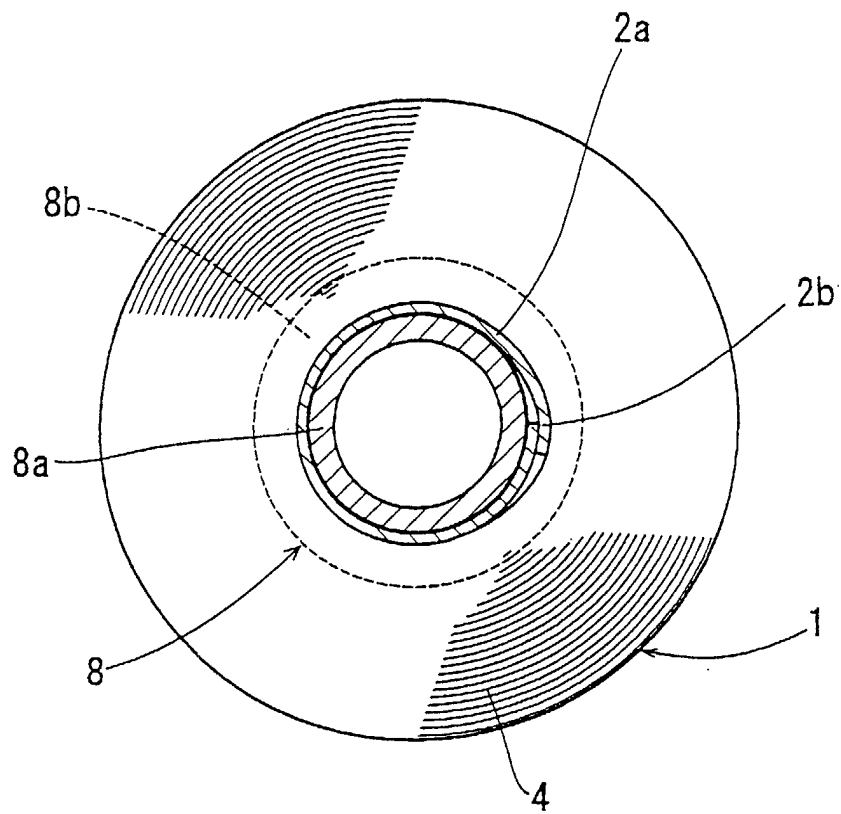


Fig. 18

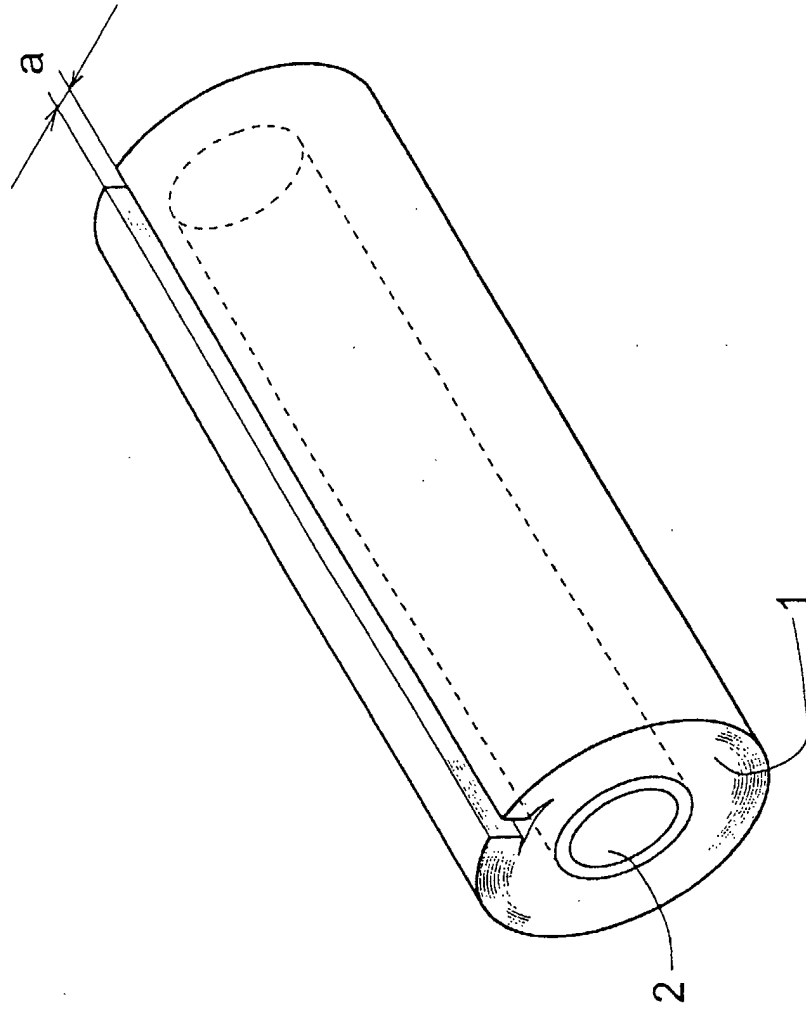


Fig. 19

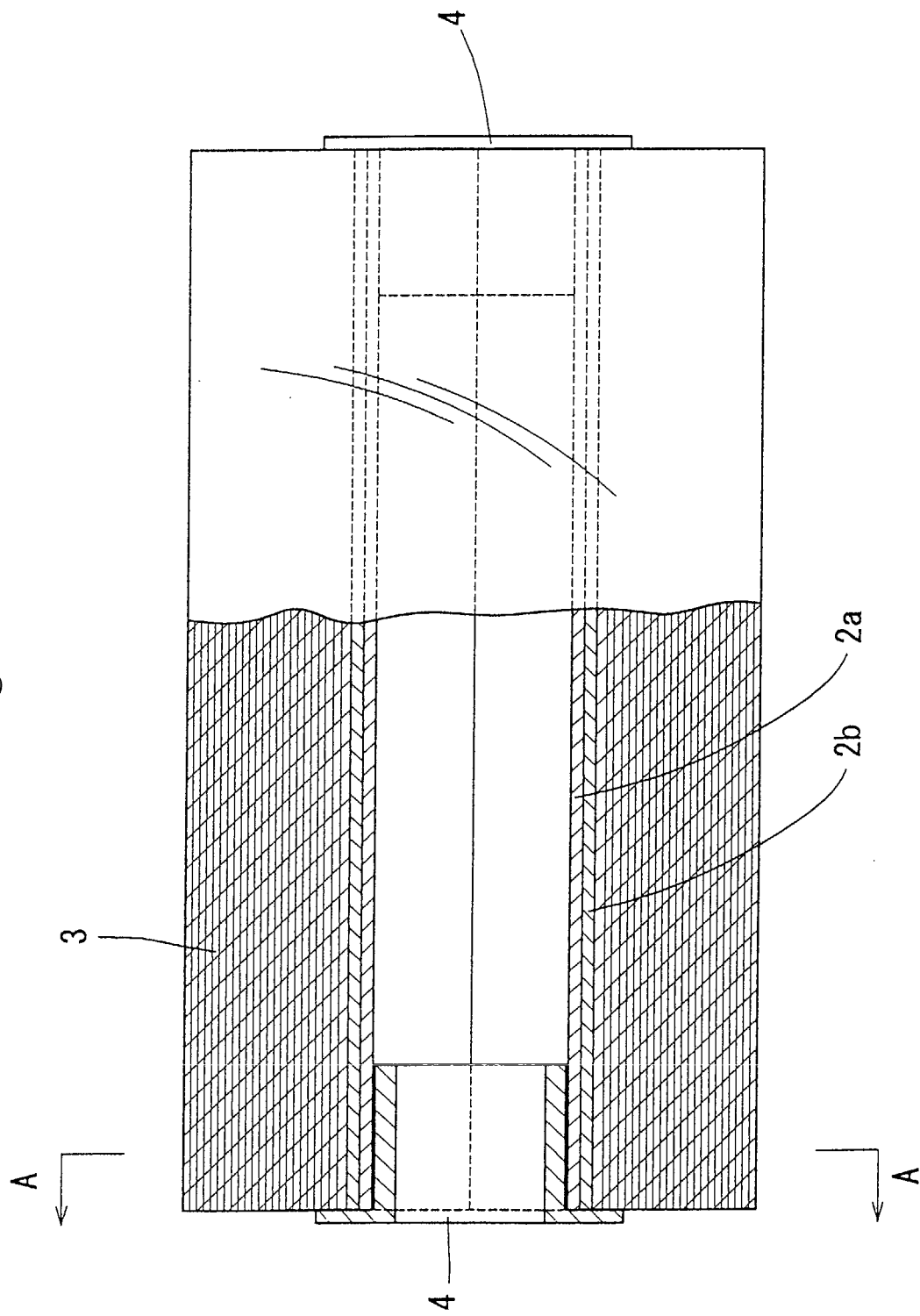


Fig. 20

