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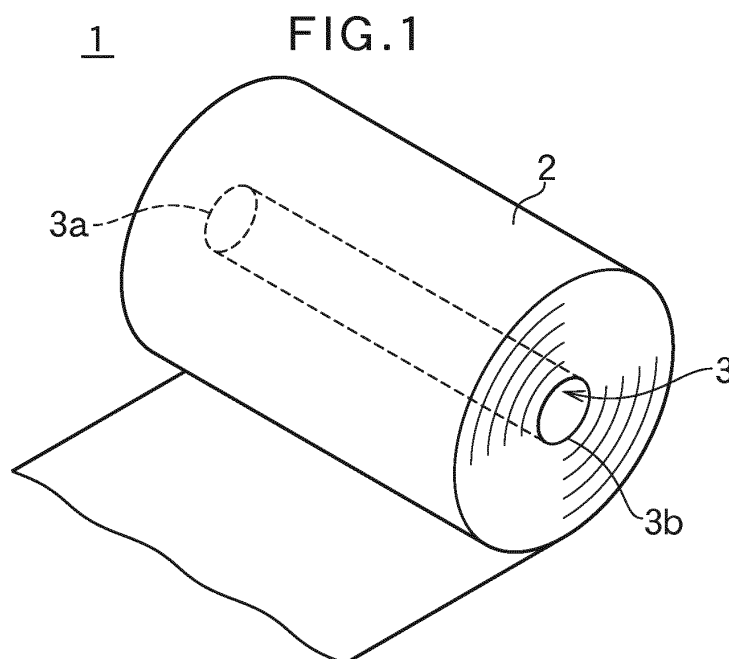
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(54) **CORELESS ROLLED PAPER MANUFACTURING METHOD**

(57) Provided is a coreless paper roll manufacturing method for manufacturing roll-shaped wound paper that can be used up to its last edge. The method includes: a first step for winding up paper (2) to form paper roll (1) having a roll shape; a second step for inserting an insertion section, which ejects an adhesive, into a center hole (3) of the paper roll (1); a third step for causing the adhesive to adhere to a predetermined position of the center hole (3); and a fourth step for performing a heating and drying process on an area to which the adhesive is ad-

hered so as to harden opposite ends (3a, 3b) of the center hole (3). The third step includes causing the adhesive to adhere to near opposite extending ends of the center hole (3). The adhesive has adhesive strength to an extent that the paper (2) wound up into the roll shape is peelable when the paper roll (1) is to be used. The fourth step includes drying the adhesive adhered to the center hole (3) before the adhesive spreads from the predetermined position of the center hole (3).



Description

Technical Field

- 5 **[0001]** The present invention relates to a method for manufacturing coreless paper roll wound up without being provided with a core, such as paperboard.

Background Art

- 10 **[0002]** For example, when a thin paper material (paper) is to be wound up into a roll, as in a toilet paper roll, the manufacturing process involves preparing a substantially tubular core formed of, for example, paperboard, and winding the paper around this core. When the toilet paper roll is completely used up, the remaining core becomes waste. For this reason, there are coreless toilet paper rolls that are formed without using cores.

- 15 **[0003]** For example, the manufacturing process for a coreless toilet paper roll involves spraying, for example, an adhesive with low adhesive strength onto the leading edge of the paper, wrapping the leading edge of the paper around a winding shaft, and sequentially winding up the paper into a roll (e.g. see Patent Literature 1). In detail, when a coreless toilet paper roll is to be manufactured, the leading edge of the paper is wrapped around the winding shaft and, while the paper is being wound up by five to six turns from the leading edge, the adhesive or the like is sprayed onto this section so that this section is adhered to form a tubular shape. Furthermore, for example, when the paper is being wound up as described above, the winding shaft is heated so that the sprayed adhesive or the like is dried.

- 20 **[0004]** There is also a coreless-toilet-paper-roll manufacturing apparatus in which a shaft of a riding roller that comes into contact with the outer periphery of wound paper when the paper is wound around a winding shaft is provided with holes from which an adhesive exudes (e.g. see Patent Literature 2).

- 25 **[0005]** This apparatus performs a manufacturing process including a paper winding step that involves suctioning the adhesive into the shaft of the riding roller, applying the adhesive to paper nipped between the riding roller and the winding shaft by causing the adhesive to exude to the surface of the shaft, and winding up this paper around the winding shaft into a roll shape. In detail, with regard to the riding roller, a roller section formed of a thick-walled cylindrical sponge is fitted around the shaft provided with the holes, as described above. Small capillary tubes are formed between the inner wall and the outer wall of the roller section, and the adhesive exuding from the surface of the shaft reaches the surface of the roller section via the capillary tubes. The adhesive exuding to the surface of the roller section is applied to the paper nipped between the winding shaft and the riding roller, so that the center of the toilet paper roll is hardened.

Citation List

- 35 Patent Literature

[0006]

- 40 PTL 1: Japanese Unexamined Patent Application Publication No. 6-199452
PTL 2: Japanese Unexamined Patent Application Publication No. 9-216755

Summary of Invention

Technical Problem

- 45 **[0007]** Because the coreless paper roll in the related art is manufactured in the above-described manner, the leading wound section of the paper is hardened to become a tubular shape. Thus, when the time approaches for using up the paper roll, for example, it becomes difficult to remove the paper roll from the holder holding the paper roll, thus making it difficult to completely use up the paper roll even if it is of a coreless type. This is problematic in that the hardened section at the center of the roll may be left unused.

- 50 **[0008]** The present invention has been made to solve the aforementioned problem, and an object thereof is to provide a coreless paper roll manufacturing method for manufacturing roll-shaped wound paper that can be used up to its last edge. Solution to Problem

- 55 **[0009]** A coreless paper roll manufacturing method according to this invention includes a first step for winding up paper to form paper roll having a roll shape; a second step for inserting an insertion section, which ejects an adhesive, into a center hole of the paper roll; a third step for causing the adhesive to adhere to a predetermined position of the center hole; and a fourth step for performing a heating and drying process on an area to which the adhesive is adhered so as to harden opposite ends of the center hole. The third step includes causing the adhesive to adhere to near opposite

extending ends of the center hole. The adhesive has adhesive strength to an extent that the paper wound up into the roll shape is peelable when the paper roll is to be used. The fourth step includes drying the adhesive adhered to the center hole before the adhesive spreads from the predetermined position of the center hole.

[0010] Furthermore, the second step includes inserting the insertion section toward a middle of the center hole from the opposite extending ends of the center hole and increasing a hole diameter at the opposite ends of the center hole to a predetermined size, and the third step includes causing the adhesive to adhere to areas of the center hole with the increased hole diameter.

[0011] Moreover, the third step includes decreasing an adhered amount of the adhesive toward a middle of the center hole from the opposite extending ends of the center hole, and the fourth step includes performing heating and drying such that the opposite ends of the center hole are maximally hardened. Advantageous Effects of Invention

[0012] According to the present invention, paper roll can be prevented from easily losing its shape in its packaged state when being shipped and transported or the like, and can be completely used up without leaving behind a core or the like when being used.

Brief Description of Drawings

[0013]

Fig. 1 is a perspective view illustrating coreless toilet paper manufactured by using a coreless paper roll manufacturing method according to a first embodiment of the present invention.

Fig. 2 is an explanatory view illustrating a step for manufacturing the coreless paper roll illustrated in Fig. 1.

Fig. 3 is an explanatory view illustrates a step for manufacturing the coreless paper roll illustrated in Fig. 1.

Fig. 4 is an explanatory view illustrating a step for manufacturing coreless paper roll by using a coreless paper roll manufacturing method according to a second embodiment of the present invention.

Fig. 5 is an explanatory view illustrating a step for manufacturing the coreless paper roll by using the coreless paper roll manufacturing method according to the second embodiment.

Description of Embodiments

[0014] Embodiments of the present invention will be described below.

(First Embodiment)

[0015] Fig. 1 is a perspective view illustrating coreless toilet paper manufactured by using a coreless paper roll manufacturing method according to a first embodiment of the present invention. Paper roll 1 illustrated is coreless toilet paper not provided with a core, such as paperboard, and manufactured by winding up paper 2 having a center hole 3 as a through hole connecting opposite sides of the roll. The center hole 3 has an inner diameter similar to that of a common paperboard core.

[0016] Hole ends 3a and 3b (openings) serving as opposite ends of the center hole 3 are sprayed with an adhesive or the like, which will be described later, so as to be adequately hardened. The hole ends 3a and 3b are hardened to an extent such that, when the paper 2 is pulled from the paper roll 1, the paper 2 that is layered by being wound up is peeled without ripping.

[0017] Figs. 2 and 3 illustrate steps for manufacturing the coreless paper roll illustrated in Fig. 1.

[0018] A toilet paper roll (i.e. paper roll 1) is manufactured by winding up paper, obtained from a parent roll or the like, in a coreless state by using a predetermined manufacturing apparatus (not illustrated). In this case, the paper 2 is wound up into a roll by using water or an adhesive or the like with extremely low adhesive strength, where necessary, or preferably, without using water or an adhesive or the like. The paper roll 1 formed here has no sections with sufficient rigidity since it is simply formed by winding up the paper 2. Thus, the paper roll 1 or the center hole 3 may deform easily, and may thus easily lose its shape.

[0019] The paper roll 1 in this state is set in, for example, the predetermined manufacturing apparatus (not illustrated), and a tubular adhesive spraying unit 10 provided in the manufacturing apparatus and having sealed tips is inserted into the center hole 3 of the paper roll 1, as illustrated in Fig. 2.

[0020] The adhesive spraying unit 10 is configured such that an insertion end 10a and an insertion end 10b are respectively inserted from opposite ends at the peripheral walls of the paper roll 1, namely, opposite ends of the center hole 3, and includes a mechanism (not illustrated) for moving these insertion ends 10a and 10b.

[0021] The insertion ends 10a and 10b are disposed facing each other. The insertion ends 10a and 10b each have a tubular shape with a sealed tip and each have a plurality of ejection holes extending to the surface thereof from its inner tube hole. Specifically, the adhesive spraying unit 10 is configured to eject, an adhesive or the like, which is sent into

the inner tube holes of the tubular adhesive spraying unit 10 by sending means, such as a pump, provided in the manufacturing apparatus (not illustrated), to the surface of the insertion end 10a or the like (from the ejection holes).

[0022] The insertion ends 10a and 10b have a length similar to that of, for example, tiltable support members used for supporting and fixing the paper roll 1 and provided in a common one-touch holder.

[0023] In other words, the insertion ends 10a and 10b have a length such that, when the paper roll 1 is fitted to the one-touch holder or the like, an adhesive or the like can be ejected to the areas with which the support members of the one-touch holder inserted into the center hole 3 come into contact, and are configured to not allow the adhesive or the like to adhere to the middle area of the center hole 3 in the extending direction thereof, such as the area near the center along the roll axis (i.e. in the width direction of the paper 2) of the paper roll 1.

[0024] With regard to the paper roll 1 set at a predetermined position of the aforementioned manufacturing apparatus, the insertion end 10a of the adhesive spraying unit 10 is inserted from the hole end 3a side of the center hole 3, and the insertion end 10b of the adhesive spraying unit 10 is inserted from the hole end 3b side of the center hole 3.

[0025] For example, the insertion ends 10a and 10b inserted into the center hole 3 are inserted to positions similar to those of the support members of the one-touch holder (i.e. deep in the center hole 3), as described above, and eject the adhesive or the like. When the adhesive or the like is to be ejected to the inner wall of the center hole 3, the adhered amount of the adhesive may be large at the hole ends 3a and 3b and may gradually decrease toward the deep area (i.e. the middle) of the center hole 3, so that the adhesive strength is at the maximum at the opening ends of the hole ends 3a and 3b and decreases toward the middle of the center hole 3 to eventually become null.

[0026] The adhered amount of the adhesive or the like may be adjusted in this manner so that the wound paper 2 becomes the hardest near the hole ends 3a and 3b, the middle section of the paper roll 1 or the paper 2 in the width direction is prevented from being hardened by the adhesive or the like, and a hardened section that facilitates peeling of the paper 2 is also formed in the wound section near the center hole 3.

[0027] After the adhesive or the like is sprayed onto the predetermined positions of the center hole 3, the insertion ends 10a and 10b are removed from the center hole 3, and a heating unit 11 provided in the manufacturing apparatus (not illustrated) is inserted into the hole ends 3a and 3b, as illustrated in Fig. 3.

[0028] The heating unit 11 includes, for example, a heating element therein and has heating ends 11a and 11b with tapered tips. The heating ends 11a and 11b are disposed facing each other and are similar to the insertion end 10a and the insertion end 10b described above in that they include a mechanism (not illustrated) for enabling insertion to and removal from the center hole 3. The heating ends 11a and 11b have a length substantially similar to that of the insertion ends 10a and 10b described above, and have, for example, a shape and size such as not to directly come into contact with the areas to which the adhesive or the like is adhered by the insertion ends 10a and 10b.

[0029] After the adhesive or the like is adhered to the predetermined positions of the center hole 3 by the adhesive spraying unit 10, for example, the heating unit 11 is immediately inserted into the center hole 3 and the adhesive or the like adhered to the predetermined positions of the center hole 3 penetrates into the paper fibers. Accordingly, the aforementioned areas are quickly dried and predetermined areas are hardened so that the adhesive or the like does not spread more than necessary along the wound peripheral surface and does not spread to a large number of wound layers. The areas to be hardened are, for example, areas of the inner wall surface near the hole ends 3a and 3b at the lateral sides of the paper roll 1, such that adequate rigidity for maintaining the roll shape (such as the rigidity in the axial direction of the roll and the rigidity or the like for maintaining the hole diameter of the center hole 3) is produced and that the paper roll 1 can be readily rotated without deforming when the paper roll 1 is set in the one-touch holder.

[0030] Because the heating ends 11a and 11b are tapered, as described above, when the heating ends 11a and 11b are inserted into the center hole 3, the heating ends 11a and 11b are disposed closest to the center hole 3 near the opening ends of the hole ends 3a and 3b and distant from the center hole 3 in the middle thereof. Therefore, the heating and drying process performed near the opening ends of the hole ends 3a and 3b is intense, whereas the heating and drying process performed in the middle of the center hole 3 is relatively moderate. The heating temperature and the drying period or the like are adjusted and controlled so that burning caused by the heating ends 11a and 11b coming into contact with the center hole 3 or the paper roll 1 is prevented from occurring. Furthermore, for example, as described above, when the adhered amount of the adhesive or the like is at the maximum at the hole ends 3a and 3b of the center hole 3 and gradually decreases toward the middle, the heating operation of the heating unit 11 may be particularly controlled such that the heating and drying process is performed most intensely at the opening ends of the hole ends 3a and 3b and the intensity of the heating and drying process is reduced toward the middle of the center hole 3. By drying and hardening only the predetermined positions of the center hole 3 by using the heating unit 11 in this manner, the paper roll 1 is given enough rigidity for preventing it from losing its shape or the like.

(Second Embodiment)

[0031] Figs. 4 and 5 illustrate steps for manufacturing coreless paper roll by using a coreless paper roll manufacturing method according to a second embodiment of the present invention. Paper roll 1a according to the second embodiment

is coreless toilet paper having a narrow hole (not illustrated) as a center hole and is manufactured so as to be settable in, for example, a holder equipped with a dedicated narrow core. The paper roll 1a is similar to the above-described paper roll 1 in being not provided with a core, such as paperboard, and is obtained by winding up paper 2 by using water or an adhesive or the like with extremely low adhesive strength, where necessary, or preferably, without using water or an adhesive or the like in the narrow center hole. The paper roll 1a described above is set in a predetermined manufacturing apparatus (not illustrated), and an adhesive spraying unit 20 provided in the manufacturing apparatus is inserted into the narrow hole (i.e. center hole) of the paper roll 1a, as illustrated in Fig. 4.

[0032] Similar to the adhesive spraying unit 10 described above, the adhesive spraying unit 20 has a tubular shape with sealed tips and is configured such that an insertion end 20a and an insertion end 20b are respectively inserted from opposite ends at the peripheral walls of the paper roll 1a, namely, opposite ends of the narrow center hole, and includes a mechanism (not illustrated) for moving these insertion ends 20a and 20b.

[0033] The adhesive spraying unit 20 has a plurality of ejection holes extending to the surfaces of the insertion ends 20a and 20b from the inner tube holes thereof. Specifically, the adhesive spraying unit 20 is configured to eject, for example, an adhesive, which is sent into the inner tube holes of the adhesive spraying unit 20 by sending means, such as a pump, provided in the manufacturing apparatus (not illustrated), to the surface of, for example, the insertion end 20a (from the ejection holes).

[0034] The insertion ends 20a and 20b have a length similar to that of, for example, tiltable support members used for supporting and fixing the paper roll 1a and provided in a common one-touch holder.

[0035] Furthermore, the insertion ends 20a and 20b are configured to increase the inner diameter of the narrow hole of the paper roll 1a to a predetermined size to form center holes 4a and 4b having a circular shape, and to adhere an adhesive to the inner walls of the center holes 4a and 4b.

[0036] In other words, the insertion ends 20a and 20b at least have a length such that, when the paper roll 1a is fitted to, for example, the one-touch holder, the center holes 4a and 4b can be formed with enough depth that allows the support members of the one-touch holder to be insertable therein, and, for example, an adhesive can be ejected to the areas with which the support members of the one-touch holder come into contact.

[0037] With regard to the paper roll 1a set at a predetermined position of the aforementioned manufacturing apparatus, the insertion end 20a of the adhesive spraying unit 10 is inserted from the center hole 4a side, and the insertion end 20b of the adhesive spraying unit 10 is inserted from the center hole 4b side.

[0038] For example, the insertion ends 10a and 10b respectively inserted into the center holes 4a and 4b are inserted to positions similar to those of the support members of the one-touch holder, as described above, and eject the adhesive or the like.

[0039] When the adhesive or the like is to be ejected into the center holes 4a and 4b, the adhered amount of the adhesive or the like may be large at the lateral ends (i.e. the openings of the center holes 4a and 4b) of the paper roll 1a and may gradually decrease toward the deep areas of the center holes 4a and 4b (i.e. the middle of the paper roll 1), so that the adhesive strength decreases toward the deep areas of the center holes 4a and 4b to eventually become null.

[0040] The adhered amount of the adhesive or the like may be adjusted in this manner so that the wound paper 2 becomes the hardest near the lateral ends of the paper roll 1a, the middle section of the paper roll 1a in the width direction is prevented from being hardened by the adhesive or the like, and a hardened section that facilitates peeling of the paper 2 is also formed near the terminal ends (i.e. the center holes 4a and 4b) of the paper roll 1a.

[0041] After the adhesive, for example, is sprayed onto the predetermined positions of the center holes 4a and 4b, the insertion ends 20a and 20b are respectively removed from the center holes 4a and 4b, and a heating unit 21 provided in the manufacturing apparatus (not illustrated) is inserted into the center holes 4a and 4b, as illustrated in Fig. 5.

[0042] Similar to the heating unit 11, the heating unit 21 includes, for example, a heating element therein and has heating ends 21a and 21b with tapered tips. The heating ends 21a and 21b are disposed facing each other and include a mechanism (not illustrated) for enabling insertion to and removal from the center holes 4a and 4b, respectively. The heating ends 21a and 21b have a length substantially similar to that of the insertion ends 20a and 20b described above, and have, for example, a shape and size such as not to directly come into contact with the areas to which the adhesive or the like is adhered by the insertion ends 20a and 20b.

[0043] After the adhesive or the like is adhered to the predetermined positions of the center holes 4a and 4b by the adhesive spraying unit 20, for example, the heating unit 21 is immediately inserted into the center holes 4a and 4b, and the adhesive or the like adhered to the predetermined positions of the center holes 4a and 4b penetrates into the paper fibers. Accordingly, the aforementioned areas are quickly dried and predetermined areas are hardened so that, for example, the adhesive does not spread more than necessary along the wound peripheral surface and does not spread to a large number of wound layers. The areas to be hardened are, for example, areas of the inner wall surfaces of the center holes 4a and 4b at the lateral sides of the paper roll 1a, such that adequate rigidity for maintaining the roll shape (such as the rigidity in the axial direction of the roll and the rigidity for maintaining the hole diameter of the center holes 4a and 4b) is produced and that the paper roll 1a can be readily rotated without deforming when the paper roll 1a is set in the one-touch holder.

[0044] Because the heating ends 21a and 21b are tapered, as described above, when the heating ends 21a and 21b are inserted into the respective center holes 4a and 4b, the heating ends 21a and 21b are disposed closest to the center holes 4a and 4b near the opening ends thereof and distant from the center holes 4a and 4b at the deep areas thereof. Therefore, the heating and drying process performed near the opening ends of the center holes 4a and 4b is intense, whereas the heating and drying process performed in the deep areas of the center holes 4a and 4b is relatively moderate. The heating temperature, the drying period and the like are adjusted and controlled so that burning caused by the heating ends 21a and 21b coming into contact with the center holes 4a and 4b or the paper roll 1a is prevented from occurring. Furthermore, for example, as described above, when the adhered amount of the adhesive or the like is at the maximum at the opening ends of the center holes 4a and 4b and gradually decreases toward the middle of the paper roll 1a or the paper 2 in the width direction, the heating operation of the heating unit 21 may be particularly controlled such that the heating and drying process is performed most intensely at the opening ends of the center holes 4a and 4b and the intensity of the heating and drying process is reduced toward the deep areas of the center holes 4a and 4b (i.e. toward the middle).

[0045] By drying and hardening the center holes 4a and 4b by using the heating unit 21 in this manner, the paper roll 1a is given enough rigidity for preventing it from losing its shape.

[0046] When the coreless paper roll 1 or 1a is to be manufactured in this manner, the opening ends of the center hole or holes formed in the center of the roll are hardened the most, and the adhesive strength is reduced or eliminated in the middle section of the paper 2 in the width direction, so that the paper 2 can be peeled and used even in the central section of the roll (i.e. the section of the paper 2 to be completely used up).

Reference Signs List

[0047]

1, 1a	paper roll
2	paper
3, 4a, 4b	center hole
3a, 3b	hole end
10, 20	adhesive spraying unit
10a, 10b, 20a, 20b	insertion end
11, 21	heating unit
11a, 11b, 21a, 21b	heating end

Claims

1. A paper roll manufacturing method comprising:

a first step for winding up paper to form paper roll having a roll shape;
 a second step for inserting an insertion section, which ejects an adhesive, into a center hole of the paper roll;
 a third step for causing the adhesive to adhere to a predetermined position of the center hole; and
 a fourth step for performing a heating and drying process on an area to which the adhesive is adhered so as to harden opposite ends of the center hole,
 wherein the third step includes causing the adhesive to adhere to near opposite extending ends of the center hole, the adhesive having adhesive strength to an extent that the paper wound up into the roll shape is peelable when the paper roll is to be used, and
 wherein the fourth step includes drying the adhesive adhered to the center hole before the adhesive spreads from the predetermined position of the center hole.

2. The paper roll manufacturing method according to Claim 1,
 wherein the second step includes inserting the insertion section toward a middle of the center hole from the opposite extending ends of the center hole and increasing a hole diameter at the opposite ends of the center hole to a predetermined size, and
 wherein the third step includes causing the adhesive to adhere to areas of the center hole with the increased hole diameter.

3. The paper roll manufacturing method according to Claim 1 or 2,
 wherein the third step includes decreasing an adhered amount of the adhesive toward a middle of the center hole

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from the opposite extending ends of the center hole, and wherein the fourth step includes performing heating and drying such that the opposite ends of the center hole are maximally hardened.

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FIG.1

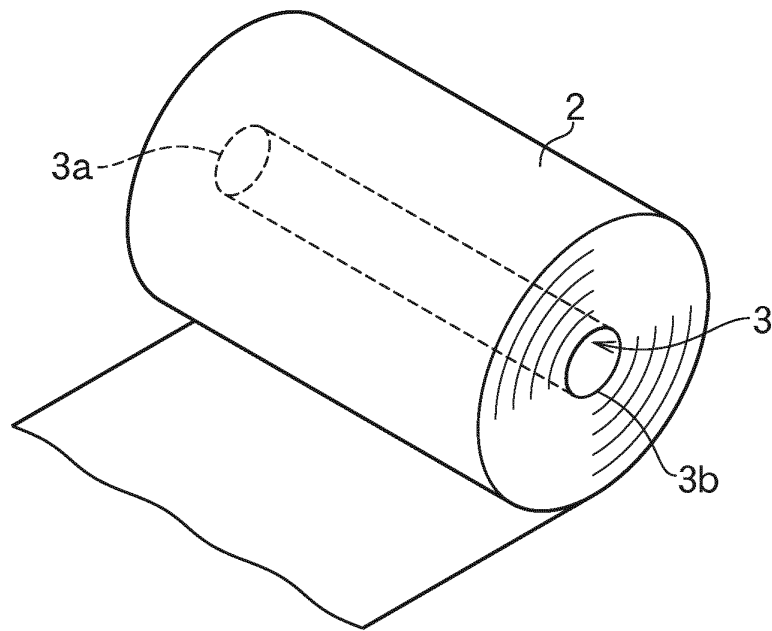


FIG.2

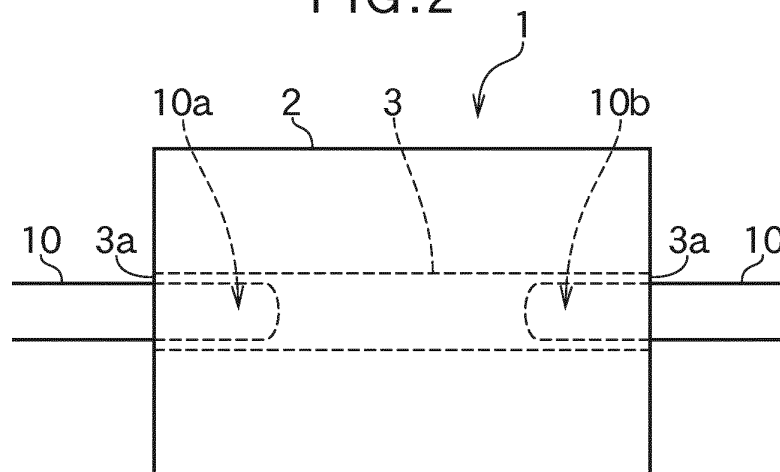


FIG.3

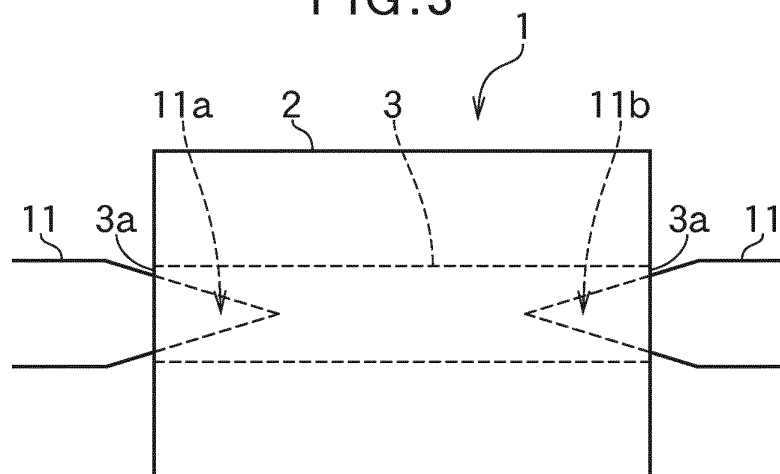


FIG. 4

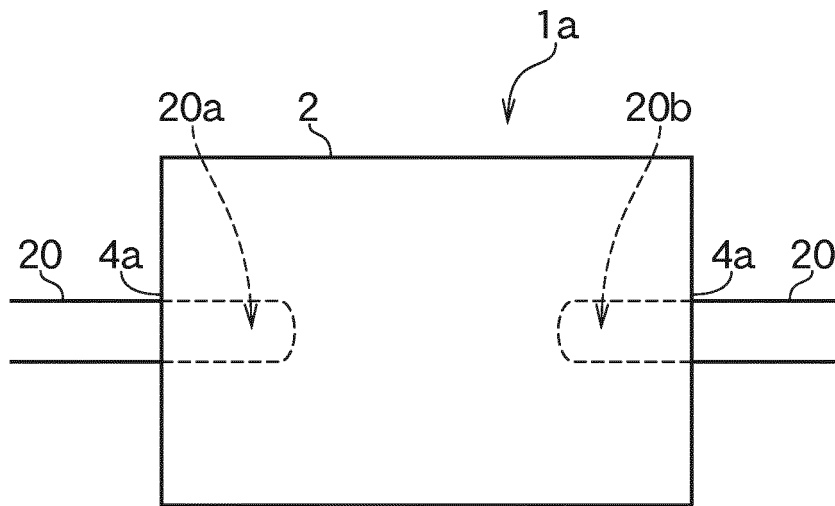
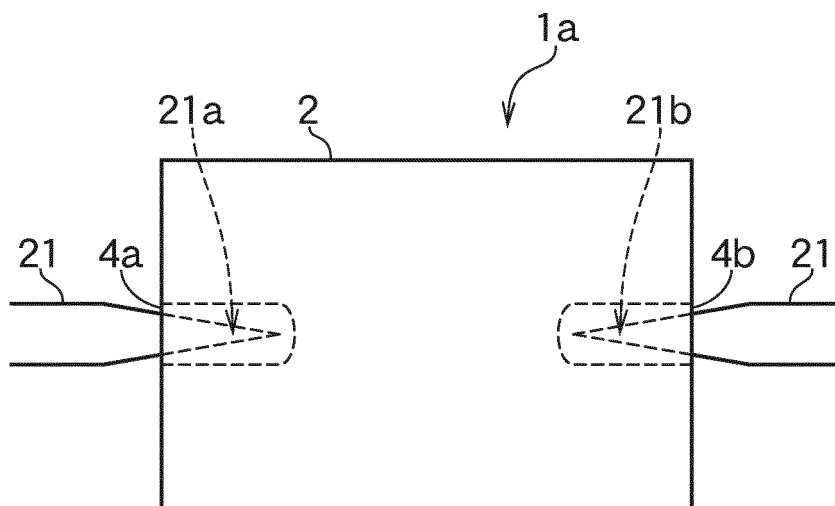


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/010889

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. A47K10/16 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl. A47K10/16

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2018

Registered utility model specifications of Japan 1996-2018

Published registered utility model applications of Japan 1994-2018

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 9-216755 A (YAMAZAKI, Tokushichi) 19 August 1997, paragraphs [0009]-[0023], fig. 1, 2 (Family: none)	1-3
A	JP 11-501836 A (KIMBERLY-CLARK CORPORATION) 16 February 1999, page 8, line 3 to page 9, line 13, fig. 2A-3 & US 5620148 A, columns 3-4, fig. 2A-3 & CN 1183032 A	1-3
A	JP 2007-61144 A (DAIO PAPER CORP.) 15 March 2007, paragraphs [0033]-[0037], fig. 1-3 (Family: none)	1-3
A	WO 2012/105135 A1 (NIPPON PAPER CRECIA CO., LTD.) 09 August 2012, paragraphs [0020]-[0027], fig. 1-5 (Family: none)	1-3



Further documents are listed in the continuation of Box C.



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Patent documents cited in the description

- JP 6199452 A [0006]
- JP 9216755 A [0006]