(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 861 868 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
11.08.2021 Bulletin 2021/32

(21) Application number: **18936079.5**

(22) Date of filing: **05.10.2018**

(51) Int Cl.:
A24C 5/52 *(2006.01)*

(86) International application number:
PCT/JP2018/037336

(87) International publication number:
WO 2020/070872 (09.04.2020 Gazette 2020/15)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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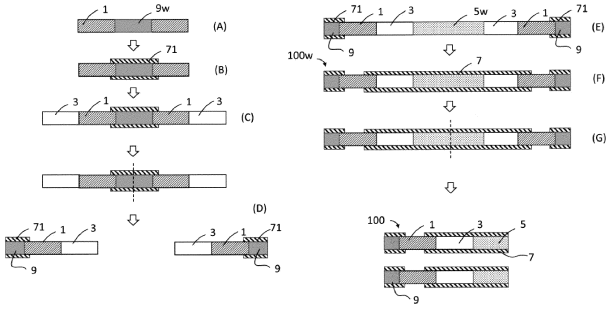
(54) PRODUCTION METHOD FOR SMOKING ARTICLE

(57) Provided is a method of manufacturing a smoking article that has a functional segment, a tobacco rod, a cooling segment, and a filter segment, including (A) preparing a segment A that contains a double-length functional segment, which has a double length of the functional segment, and the tobacco rods at either end of the double-length functional segment; (C) preparing a pair of the cooling segments and placing the cooling segments in contact with either end of the segment A to prepare a segment C; (D) cutting and separating the segment C in the central part in the longitudinal direction to prepare a pair of segments D and inverting the segments D, thereby placing the segments D via a gap to align the longitudinal axes of the segments D and allow the cooling segments to face each other; (E) preparing a double-length filter segment, which has a double length of the filter segment, and placing the double-length filter segment in the gap such that both ends of the double-length filter segment come into contact with the end on the cooling segment side of either of the segments D, thereby preparing a segment E; (F) integrating the segment E by wrapping in one tipping paper to produce a double-length smoking article, which has a double length of the smoking article; and (G) cutting the double-length smoking article in the central part in the longitudinal direction to yield smoking articles.

Fig. 2



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Description

TECHNICAL FIELD

[0001] The present invention relates to a method of manufacturing a smoking article.

BACKGROUND ART

[0002] A smoking article, such as a cigarette, that includes a tobacco rod, a cooling segment, and a filter segment has a problem of falling tobacco shreds or the like from the leading end, in other words, the end opposite to the mouth end. To prevent this, it has been proposed to apply an adhesive on the inner side of a paper wrapper near the leading end (Patent Literature (PTL) 1).

CITATION LIST

PATENT LITERATURE

[0003] Japanese Patent No. 3202221

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0004] Since a filter for preventing such falling from the leading end is generally shorter than a tobacco rod, the handling thereof in the manufacturing process is not easy. In view of this, an object of the present invention is to provide a method of efficiently manufacturing a smoking article that includes a functional segment for functionalizing the end opposite to the mouth end of a tobacco rod.

SOLUTION TO PROBLEM

[0005] The inventors resolved the above-mentioned problem by placing a functional segment in the center, followed by separating and inverting. In other words, the above-mentioned problem is resolved by the present invention below.

[Embodiment 1] A method of manufacturing a smoking article that has a functional segment, a tobacco rod, a cooling segment, and a filter segment, including

(A) preparing a segment A that contains a double-length functional segment, which has a double length of the functional segment, and the tobacco rods at either end of the double-length functional segment;
(C) preparing a pair of the cooling segments and placing the cooling segments in contact with either end of the segment A to prepare a segment C;
(D) cutting and separating the segment C in the central part in the longitudinal direction to prepare a pair of segments D and inverting the segments D, thereby placing the segments D via a gap to align the longitudinal axes of the segments D and allow the cooling segments to face each other;
(E) preparing a double-length filter segment, which has a double length of the filter segment, and placing the double-length filter segment in the gap such that both ends of the double-length filter segment come into contact with the end on the cooling segment side of either of the segments D, thereby preparing a segment E;
(F) integrating the segment E by wrapping in one tipping paper to produce a double-length smoking article, which has a double length of the smoking article; and
(G) cutting the double-length smoking article in the central part in the longitudinal direction to yield smoking articles.

[Embodiment 2] The method according to Embodiment 1, where the functional segment comprises a filter member.
[Embodiment 3] The method according to Embodiment 1 or 2, where the functional segment contains a flavor.
[Embodiment 4] The method according to any of Embodiments 1 to 3, where a step of A is a step of preparing a double-length functional tobacco segment by

(A1) preparing a pair of the tobacco rods and placing the tobacco rods via a gap to align the longitudinal axes of the tobacco rods; and
(A2) preparing a double-length functional segment, which has a double length of the functional segment, and placing the double-length functional segment in the gap such that both ends of the double-length functional segment come into contact with either of the tobacco rods.

[Embodiment 5] The method according to any of Embodiments 1 to 4, where a step of A is a step of preparing a double-length functional tobacco segment by

(A1') preparing a double-length tobacco rod, which has a double length of the tobacco rod, and cutting then separating the double-length tobacco rod in the central part in the longitudinal direction, thereby placing the tobacco rods via a gap to align the longitudinal axes of the tobacco rods; and
(A2') preparing a double-length functional segment, which has a double length of the functional segment, and placing the double-length func-

tional segment in the gap such that both ends of the double-length functional segment come into contact with either of the tobacco rods.

[Embodiment 6] The method according to any of Embodiments 1 to 5, further including, between steps of A and C, (B) integrating the segment A by wrapping in one second tipping paper.
[Embodiment 7] The method according to any of Embodiments 1 to 6, where the filter segment includes an acetate filter and a center hole filter.
[Embodiment 8] The method according to any of Embodiments 1 to 7, where the smoking article includes the functional segment, the tobacco rod, the cooling segment, and the filter segment in this order toward the downstream direction.
[Embodiment 9] The method according to any of Embodiments 1 to 8, where the tobacco rod has a diameter larger than a neighboring member.
[Embodiment 10] The method according to Embodiment 9, where the tobacco rod has a diameter 0.05 to 0.15 mm larger than the neighboring member.
[Embodiment 11] The method according to Embodiment 9, where the tobacco rod has a diameter 0.5 to 2.5% larger than the neighboring member.
[Embodiment 12] The method according to any of Embodiments 1 to 11, where a member neighboring the tobacco rod has stiffness higher than the tobacco rod.
[Embodiment 13] The method according to any of Embodiments 1 to 12, where the cooling segment includes a paper tube having a plurality of holes in the circumferential direction.
[Embodiment 14] The method according to Embodiment 13, where the cooling segment includes a paper tube; and the method further includes forming a plurality of holes in the circumferential direction of the paper tube by laser processing.
[Embodiment 15] The method according to any of Embodiments 1 to 14, where
a step of F is a step performed by preparing a precursor in which part of the tipping paper is attached to a circumferential surface of the segment E, placing the precursor between a rolling drum and a rolling hand that is provided facing a circumferential surface of the rolling drum, and rotating the precursor on the circumferential surface of the rolling drum; and
the rolling drum or the rolling hand has, in a portion facing a section of the tobacco rod, a depression for forming a gap from the section of the tobacco rod.

ADVANTAGEOUS EFFECTS OF INVENTION

[0006] According to the present invention, it is possible to provide a method of efficiently manufacturing a smoking article that includes a functional segment for functionalizing the end opposite to the mouth end of a tobacco rod.

BRIEF DESCRIPTION OF DRAWINGS

[0007]

Fig. 1 schematically illustrates smoking articles.
Fig. 2 illustrates an embodiment of the manufacturing method of the present invention.
Fig. 3 illustrates an embodiment of step A in the manufacturing method of the present invention.
Fig. 4 is a view for illustrating a measurement method for stiffness.
Fig. 5 illustrates an embodiment of an apparatus for performing the manufacturing method of the present invention.
Fig. 6 illustrates an embodiment of step D.
Fig. 7 illustrates an embodiment of step F.
Fig. 8 illustrates embodiments of step F.

DESCRIPTION OF EMBODIMENTS

[0008] The present invention relates to a method of manufacturing a smoking article that includes a tobacco rod, a cooling segment, and a filter segment. Hereinafter, the present invention will be described in detail. In the present invention, the expression "X to Y" includes the lower and the upper limits of X and Y.

1. Smoking Article

[0009] A smoking article of the present invention includes a functional segment, a tobacco rod, a cooling segment, and a filter segment. Fig. 1 (i) illustrates an embodiment of the smoking article of the present invention. In the figure, 100 is a smoking article, 1 is a tobacco rod, 3 is a cooling segment, 5 is a filter segment, 7 is a tipping paper, and 9 is a functional segment.

(1) Tobacco Rod

[0010] A tobacco rod is an almost cylindrical member for generating smoking flavor components contained in tobacco raw materials and includes tobacco filler and a paper wrapper wrapped therearound. The tobacco filler is not limited, and tobacco shreds or tobacco sheets, for example, may be used therefor. Specifically, tobacco shreds prepared by cutting dry tobacco leaves into a width of 0.8 to 1.2 mm may be packed inside a paper wrapper. Alternatively, those prepared by uniformly pulverizing dry tobacco leaves into an average particle size of about 20 to 200 μm, forming into sheets, and cutting the sheets into a width of 0.8 to 1.2 mm may be packed inside a paper wrapper. Moreover, such sheets may be gathered, folded, or spirally rolled without cutting and packed inside a paper wrapper. Further, such sheets may be cut into strips and packed inside a paper wrapper concentrically or with the longitudinal direction of the strips aligned parallel to the longitudinal direction of a tobacco rod.

[0011] The tobacco rod 1 may generate an aerosol upon heating. To promote the generation of an aerosol, it is preferable to add an aerosol source, such as glycerol, propylene glycol, 1,3-butanediol, or other polyols, to the tobacco filler. The amount of an aerosol source to be added is preferably 5 to 50 weight% and more preferably 10 to 30 weight% based on the dry weight of the tobacco filler. In addition, the tobacco rod may contain a flavor, such as menthol. The length of the tobacco rod 1 is not limited but is preferably 15 to 25 mm. The diameter is also not limited but is preferably 6.5 to 7.5 mm. Meanwhile, when a neighboring member has stiffness higher than the tobacco rod, the tobacco rod preferably has a diameter larger than the neighboring member. As a result, deformation of the tobacco rod can be suppressed. In this view, the tobacco rod has a diameter preferably 0.5 to 2.5% larger and more preferably 1.0 to 2.0% larger than the neighboring member. In actual dimension, the tobacco rod preferably has a diameter about 0.05 to 0.15 mm larger than the neighboring member. Exemplary neighboring members include a cooling segment and a filter segment.

[0012] The term "stiffness" in the present invention means the resistance of a member to deformation as disclosed in paragraphs [0010] to [0014] of Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2016-523565. Stiffness can be obtained from a change in diameter before and after applying a load F on the side surface of a tobacco rod. When the diameter of a tobacco rod before applying a load F is denoted by Ds and the diameter after applying the load is denoted by Dd as in Fig. 4, the amount depressed is d = Ds - Dd and the stiffness is defined by the following formula. The same applies to other members.

$$\text{Stiffness (\%)} = Dd/Ds \times 100$$

(2) Cooling Segment

[0013] A cooling segment is a member for cooling an aerosol and smoking flavor components generated in the tobacco rod 1. The cooling segment 3 may be a hollow paper tube. The paper tube is preferably made of cardboard having stiffness higher than paper wrappers and tipping papers. The paper tube may be provided with holes (ventilation holes). A plurality of holes are preferably formed along the circumference of the paper tube. In view of efficient operations, such holes are preferably formed by laser processing of a finished smoking article. Moreover, to enhance heat exchange efficiency, gathered sheets may be packed inside the cooling segment 3. Although the dimensions of the cooling segment 3 are not limited, the length is preferably 15 to 25 mm and the diameter is preferably 5.5 to 7.5 mm. Meanwhile, when a member neighboring the cooling segment 3 has stiffness lower than the cooling segment 3, the cooling segment 3 has a diameter preferably 0.5 to 2.5% smaller and preferably 1.0 to 2.0% smaller than the neighboring member. When the cooling segment 3 includes a paper tube made of cardboard, the segment generally has stiffness higher than a tobacco rod.

(3) Filter Segment

[0014] A filter segment is a member including a filter. As the filter, a publicly known filter member, such as an acetate filter or a paper filter, may be used. A paper filter is a paper-filled filter prepared by creasing paper through processing with a crepe roller or the like and by rolling the paper using a plug wrapper. An acetate filter is a filter filled with cellulose acetate fibers. As illustrated in Fig. 1 (ii), a filter segment 5 is preferably composed of a plurality of members, and more preferably includes a filter 51 and a center hole filter 53. The center hole filter may be a space provided in the central part of an acetate filter, for example. The length of the filter segment 5 is not limited but is preferably 10 to 20 mm. When both a center hole filter and an acetate filter are arranged as a filter segment, the order is not limited. Moreover, individual members may be wrapped in each filter inner wrapper and joined with a filter outer wrapper. The diameter of the filter segment is not limited but is preferably almost the same as those of other segments excluding a tobacco rod. As a result, tearing and creasing of tipping paper can be suppressed.

(4) Functional Segment

[0015] A functional segment is a segment for functionalizing the smoking article 100. For example, the functional segment 9 acts to prevent falling of tobacco shreds or the like from the leading end of the tobacco rod 1 or acts to impart a unique flavor by carrying the flavor. In the former case, the functional segment 9 preferably comprises a filter, such as an acetate filter. Meanwhile, the functional segment 9 of the latter is preferably a filter or a paper tube embedded with flavor capsules. The length of the functional segment 9 is not limited but is preferably 5 to 10 mm

(5) Tipping Paper

[0016] The term "tipping paper" refers to a paper used for joining two or more of a tobacco rod, a cooling segment, and a filter segment. Meanwhile, the term "paper wrapper" refers to a paper for wrapping individual members that constitute a tobacco rod, a cooling segment, or a filter segment. For example, when a filter segment includes a center hole filter and an acetate filter as in the foregoing, a paper for wrapping the center hole filter and a paper for wrapping the acetate filter are each paper wrapper.

[0017] Exemplary base paper for tipping papers and paper wrappers includes, but is not limited to, paper using cellulose fibers. Such cellulose fibers may be either de-

rived from plants or chemically synthesized, or may be a mixture thereof. Exemplary plant-derived fibers include pulp of flax fibers, wood fibers, or seed fibers, for example. Such pulp may be colored unbleached pulp. However, from a viewpoint of obtaining white clean appearance, it is preferable to use bleached pulp, which is prepared using a bleaching agent, such as an oxidant or a reductant.

[0018] For a typical paper wrapper for cigarettes, a citric acid alkali metal salt or the like is used as a common burning chemical (combustion aid, for example) that can affect the spontaneous combustion rate of the paper wrapper. In the present invention, a heating-type smoking article but not a combustion-type is preferable. In this case, since the combustion of a paper wrapper is unnecessary, the paper wrapper need not contain a burning chemical.

[0019] The lower limit of the basis weight of a paper wrapper is preferably 30 g/m^2 or more, more preferably 35 g/m^2 or more, and further preferably 40 g/m^2 or more. The upper limit is preferably 65 g/m^2 or less and more preferably 50 g/m^2 or less. Meanwhile, the lower limit of the basis weight of a tipping paper is preferably 20 g/m^2 or more, more preferably 25 g/m^2 or more, and further preferably 30 g/m^2 or more. The upper limit is preferably 50 g/m^2 or less, more preferably 45 g/m^2 or less, and further preferably 40 g/m^2 or less. The basis weight can be measured by the method specified in JIS P 8124.

2. Manufacturing Method

[0020] The outline of the present process is illustrated in Fig. 2. In the figure, "w" indicates "double-length." For example, 5w represents a double-length filter segment.

(1) Step A

[0021] This step prepares a segment A that includes a double-length functional segment 9w, which has a double length of the functional segment 9, and the tobacco rods 1 at either end of the double-length functional segment. The double-length functional segment 9w and the tobacco rods 1 may be in mere contact with each other and need not be attached.

[0022] Step A may include the following steps as illustrated in Fig. 3:

(A1) a step of preparing a pair of tobacco rods 1 and placing via a gap to align the longitudinal axes of the tobacco rods; and

(A2) a step of preparing a double-length functional segment 9w and placing in the gap such that both ends of the double-length functional segment come into contact with either of the tobacco rods 1.

[0023] Moreover, step A may include the following steps:

(A1') a step of preparing a double-length tobacco rod 1w, which has a double length of the tobacco rod 1, and cutting then separating the double-length tobacco rod 1w in the central part in the longitudinal direction, thereby placing the tobacco rods via a gap to align the longitudinal axes of the tobacco rods; and

(A2') a step of preparing a double-length functional segment 9w, which has a double length of the functional segment 9, and placing in the gap such that both ends of the double-length functional segment come into contact with either of the tobacco rods 1, thereby preparing a double-length functional tobacco segment.

[0024] Through this step, it is possible to easily functionalize the upstream portion of a smoking article. For example, when the functional segment 9 is a filter, falling from the leading end can be prevented.

[0025] The manufacturing method of the present invention can be performed using any appropriate apparatus but is preferably performed using, for example, an apparatus that includes a plurality of drums and that feeds each member from above as illustrated in Fig. 5. One drum preferably has one function rather than a plurality of functions since defect generation can be suppressed in high-speed manufacture. For example, step A can be performed in the first unit 81 of Fig. 5 where 81f is a feeder for tobacco rods 1, 81p is a picking-up drum, and 81s is a separating drum. A pair of tobacco rods 1 fed from the feeder 81f are passed to a holding section provided on the circumferential surface of the picking-up drum 81p. Subsequently, the pair of the tobacco rods 1 are passed to the separating drum 81s and placed via a gap in a holding section while being transferred. Further, the pair of the tobacco rods 1 placed via a gap are passed in this state to a receiving drum 81a by a transfer drum 81t.

[0026] Here, 81'f is a feeder for a double-length functional segment 9w and 81'p is a picking-up drum. A double-length functional segment 9w fed from the feeder 81'fis passed to a holding section provided on the circumferential surface of the picking-up drum 81'p. Meanwhile, the pair of the tobacco rods 1 are placed via a gap on the receiving drum 81a. The double-length functional segment 9w is placed in the gap to come into contact with the tobacco rods 1. In each unit of the apparatus, one or a plurality of drums may have a feeding, receiving, transferring, or separating function.

(2) Step B

[0027] The manufacturing method of the present invention preferably includes, between steps A and C, step B of integrating the segment A by wrapping in one second tipping paper 71. For convenience, the integrated segment A is also referred to as segment B. As the second tipping paper 71, paper common in the field concerned can be used. The second tipping paper 71 may be coated with a publicly known adhesive. As a result, the functional

segment and the tobacco rods in the separable state are integrated into the inseparable state.

[0028] By adjusting the length of the second tipping paper used in this step, it is possible to functionalize a smoking article. For example, when the second tipping paper has a length that can cover the entire tobacco rods 1, it is possible to maintain satisfactory appearance since stains, even if formed on the tobacco rods 1, can be hidden. Alternatively, it is also possible to set a region covered with the second tipping paper 71 to a region, when the length of the tobacco rod 1 is denoted by X, from the bonding face between the tobacco rod 1 and the functional segment 9 to the position of 0.1X to 0.3X in the longitudinal direction of the tobacco rod 1. By setting the wrapped region within this range, lowering in thermal conductivity can be avoided during heating of the tobacco rod 1.

[0029] This step can be performed in the second unit 82 of Fig. 5 where 82f is a feeder for a second tipping paper 71, 82t is a transfer drum, 82r is a rolling drum, and 82h is a rolling hand. Since this step is the same as step F, the details will be described in step F.

(3) Step C

[0030] In this step, a pair of cooling segments 3 are prepared and placed in contact with either end of the segment B to prepare a segment C.

[0031] This step can be performed in the third unit 83 of Fig. 5 where 83f is a feeder for cooling segments 3, 83ps is a picking-up and separating drum, and 83a is a receiving drum. A pair of cooling segments 3 fed from the feeder 83f are passed to a holding section provided on the circumferential surface of the picking-up and separating drum 83ps while being placed via a gap. Meanwhile, the segment B prepared in the preceding step is passed to the receiving drum 83a via a transfer drum 83t. The pair of the cooling segments 3 are passed to the receiving drum 83a and placed at either end of the segment B to come into contact with the end face of either of the tobacco rods 1.

(4) Step D

[0032] In this step, the segment C is cut and separated in the central part in the longitudinal direction to prepare a pair of segments D. Subsequently, the segments D are inverted to be placed via a gap to align the longitudinal axes of the segments D and allow the cooling segments 3 to face each other.

[0033] This step can be performed in the fourth unit 84 of Fig. 5 where 84c is a cutter drum and 84c' is a cutter. The segment B is passed to the cutter drum 84c and cut with the cutter 84c' in the central part in the longitudinal direction. Subsequently, the cut segments are passed to two inverting drums 84i and inverted. With reference to Fig. 6, the mechanism of inversion will be described. A guide G on the inverting drum 84i is a holding section for a segment D, which is either of the segment C divided into two, and is provided in a rotatable manner around one corner on the drum. The segment D held in the guide G illustrated with a dotted line is moved to the solid-line position through the rotation of the guide G as the inverting drum 84i rotates. Subsequently, the segment D is passed to a guide G' illustrated with a dotted line on the inverting drum 84i'. The guide G' slides on the inverting drum 84i' to the solid-line position where the distance between a pair of the segments D is a desirable value. The pair of the divided segments C are thus inverted.

(5) Step E

[0034] In this step, a double-length filter segment 5w, which has a double length of the filter segment 5, is prepared and placed in the gap such that both ends of the double-length filter segment come into contact with the end on the cooling segment side of either of the segments D, thereby preparing a segment E.

[0035] This step can be performed in the fifth unit 85 of Fig. 5 where 85f is a feeder for a double-length filter segment 5w, 85p is a picking-up drum, and 85a is a receiving drum. A double-length filter segment 5w fed from the feeder 85f is passed to a holding section provided on the circumferential surface of the picking-up drum 85p. Meanwhile, the pair of the segments D placed via a gap are passed in this state to the receiving drum 85a. The double-length filter segment 5w from the picking-up drum 85p is placed in the gap between the pair of the segments D on the receiving drum 85a.

(6) Step F

[0036] In this step, the segment E is integrated by wrapping in one tipping paper 7 to prepare a double-length smoking article 100w, which has a double length of the smoking article 100. As the tipping paper 7, the same as the second tipping paper 71 may be used. As a result, the segment E in the separable state is integrated into the inseparable state. On this occasion, the tipping paper 7 need not cover the entire range of the tobacco rods 1. When the length of the tobacco rod 1 is denoted by X, a region covered with the tipping paper 7 is preferably a region extending from the bonding face between the tobacco rod 1 and the cooling segment 3 to the position of 0.2X to 0.4X in the longitudinal direction of the tobacco rod 1. By setting the wrapped region within this range, lowering in thermal conductivity can be avoided during heating of the tobacco rod 1.

[0037] This step can be performed in the sixth unit 86 of Fig. 5 where 86f is a feeder for a tipping paper, 86t is a transfer drum, 86r is a rolling drum, and 86h is a rolling hand. A rolling drum is a drum having a holding section that is for holding a member on the circumferential surface and that enables a segment or another member to rotate on its central axis in the longitudinal direction. A rolling hand is a means that is disposed facing the cir-

cumferential surface of the rolling drum and that is for forming a gap of a constant distance from the circumferential surface. The segment E is passed to the transfer drum 86t and then passed to the rolling drum 86r. Meanwhile, part of the tipping paper 7 fed from the feeder 86f is attached to the circumferential surface of the segment E on the rolling drum 86r, thereby forming a precursor 92 (see Fig. 7). The precursor 92 includes the tipping paper 7 attached, like a flag, to the segment denoted by 90. In other words, part of the tipping paper 7 is attached to the circumferential surface of the segment E while leaving the remainder free. The precursor 92 is fixed to the holding section on the circumferential surface of the rolling drum 86r through suction or the like and transferred to the gap formed between the rolling drum 86r and the rolling hand 86h. While passing through this gap, the entire circumferential surface of the precursor 92 is wrapped in the tipping paper 7 to form a double-length smoking article 100w (see Fig. 7).

[0038] As in the foregoing, the tobacco rod 1 preferably has a diameter larger than the neighboring cooling segment 3 in the present invention. In this case, if the surfaces of the rolling drum 86r and the rolling hand 86h are flat, excessive contact arises between these surfaces and the tobacco rod 1 (Fig. 8 (1)). This results in a problem of falling fillings from the leading end under the impact on the tobacco rod 1. In addition, the difference in circumference causes twisting, thereby developing defects, such as creases, in a product. For these reasons, it is preferable in the present invention to form a gap from the tobacco rod 1 by providing a depression on the rolling drum 86r or rolling hand 86h surface that faces the tobacco rod 1 as illustrated in Figs. 8 (2) and (3). Although Figs. 8 (2) and (3) illustrate embodiments in which a depression is provided on the rolling hand 86h, a depression may be provided on the rolling drum 86r or both the rolling drum and the rolling hand. The depth of the depression (T in Figs. 8 (2) and (3)) is appropriately adjusted and is preferably 0.05 to 0.15 mm. Such a depression need not be provided on the entire surface that faces the tobacco rod 1. As illustrated in Fig. 8, a depression may be provided on part of the surface that faces the tobacco rod 1. Meanwhile, to reliably attach a tobacco rod to another member by using a tipping paper, a depression is preferably absent near the boundary between these two members.

[0039] In the present invention, the segment E is wrapped in one tipping paper in the final stage. Accordingly, it is possible to avoid steps formed on a product due to the use of many tipping papers and consequently reduce the occurrence of defects in manufacture.

(7) Step G

[0040] In this step, the double-length smoking article 100w is cut in the central part in the longitudinal direction to yield smoking articles 100. This step may further include aligning two smoking articles 100 in the same direction by inverting either of the smoking articles 100.

[0041] This step can be performed in the seventh unit 87 of Fig. 5 where 87c is a cutter drum, 87c' is a cutter, and 87a is a receiving drum. The cutting is performed as described in step D.

[0042] In the present invention, the double-length functional segment 9w is placed in the center, cut and separated in the central part, and inverted. As a result, efficient operations are possible when the leading end of a smoking article is functionalized.

[Example 1]

[0043] The following members were prepared.

Tobacco rod of 7.0 mm in diameter and 20.0 mm in length (from Japan Tobacco Inc.)

Acetate filter of 6.9 mm in diameter and 16 mm in length as a double-length functional segment

Paper tube of 6.9 mm in diameter and 20.0 mm in length as a cooling segment

Double-length filter segment of 6.9 mm in diameter consisting of a center hole filter (8.0 mm)/a double-length acetate filter (14.0 mm)/a center hole filter (8.0 mm)

Second tipping paper of 24 mm × 26 mm

First tipping paper of 24.0 mm × 80.0 mm

[0044] A double-length tobacco rod was prepared and cut then separated in the central part in the longitudinal direction, thereby placing tobacco rods via a gap to align the longitudinal axes of the tobacco rods. Subsequently, a double-length functional segment was placed in the gap to prepare a segment A that includes the double-length functional segment and the tobacco rods at either end of the double-length functional segment (step A).

[0045] The segment A was integrated by wrapping in one second tipping paper to prepare a segment B (step B). A pair of paper tubes were prepared and placed in contact with either end of the segment B to prepare a segment C (step C). The segment C was cut and separated in the central part in the longitudinal direction to prepare a pair of segments D, and the segments D were inverted to be placed via a gap to align the longitudinal axes of the segments D and allow the paper tubes to face each other (step D). A double-length filter segment, which has a double length of a filter segment, was prepared and placed in the gap such that both ends of the double-length filter segment come into contact with the end on the paper tube side of either of the segments D to prepare a segment E (step E). The segment E was integrated by wrapping in one tipping paper to produce a double-length smoking article, which has a double length of a smoking article (step F). The double-length smoking article was cut in the central part in the longitudinal direction to manufacture smoking articles (step G).

REFERENCE SIGNS LIST

[0046]

1	Tobacco rod
1w	Double-length tobacco rod
3	Cooling segment
5	Filter segment
5w	Double-length filter segment
	51 Acetate filter
	53 Center hole filter
7	Tipping paper
71	Second tipping paper
9	Functional segment
9w	Double-length functional segment
10	Tobacco segment
80	Manufacturing apparatus
81	First unit
	81f, 81'f Feeder
	81p, 81'p Picking-up drum
	81s Separating drum
	81t Transfer drum
	81a Receiving drum
82	Second unit
	82f Tipping paper feeder
	82t Transfer drum
	82h Rolling hand
	82r Rolling drum
83	Third unit
	83f Feeder
	83ps Picking-up and separating drum
	83t Transfer drum
	83a Receiving drum
84	Fourth unit
	84c Cutter drum
	84c' Cutter
	84i Inverting drum
	84'i Inverting drum
85	Fifth unit
	85f Feeder
	85p Picking-up drum
	85a Receiving drum
86	Sixth unit
	86f Tipping paper feeder
	86t Transfer drum
	86r Rolling drum
	86h Rolling hand
87	Seventh unit
	87c Cutter drum
	87c' Cutter
	87a Receiving drum
90	Segment E
92	Precursor
100	Smoking article
100w	Double-length smoking article

Claims

1. A method of manufacturing a smoking article that includes a functional segment, a tobacco rod, a cooling segment, and a filter segment, comprising

(A) preparing a segment A that includes a double-length functional segment, which has a double length of the functional segment, and the tobacco rods at either end of the double-length functional segment;

(C) preparing a pair of the cooling segments and placing the cooling segments in contact with either end of the segment A to prepare a segment C;

(D) cutting and separating the segment C in the central part in the longitudinal direction to prepare a pair of segments D and inverting the segments D, thereby placing the segments D via a gap to align the longitudinal axes of the segments D and allow the cooling segments to face each other;

(E) preparing a double-length filter segment, which has a double length of the filter segment, and placing the double-length filter segment in the gap such that both ends of the double-length filter segment come into contact with the end on the cooling segment side of either of the segments D, thereby preparing a segment E;

(F) integrating the segment E by wrapping in one tipping paper to produce a double-length smoking article, which has a double length of the smoking article; and

(G) cutting the double-length smoking article in the central part in the longitudinal direction to yield smoking articles.

2. The method according to Claim 1, wherein the functional segment comprises a filter member.

3. The method according to Claim 1 or 2, wherein the functional segment contains a flavor.

4. The method according to any of Claims 1 to 3, wherein a step of A is a step of preparing a double-length functional tobacco segment by

(A1) preparing a pair of the tobacco rods and placing the tobacco rods via a gap to align the longitudinal axes of the tobacco rods; and

(A2) preparing a double-length functional segment, which has a double length of the functional segment, and placing the double-length functional segment in the gap such that both ends of the double-length functional segment come into contact with either of the tobacco rods.

5. The method according to any of Claims 1 to 4, wherein a step of A is a step of preparing a double-length functional tobacco segment by

(A1') preparing a double-length tobacco rod, which has a double length of the tobacco rod, and cutting then separating the double-length

tobacco rod in the central part in the longitudinal direction, thereby placing the tobacco rods via a gap to align the longitudinal axes of the tobacco rods; and

(A2') preparing a double-length functional segment, which has a double length of the functional segment, and placing the double-length functional segment in the gap such that both ends of the double-length functional segment come into contact with either of the tobacco rods.

6. The method according to any of Claims 1 to 5, further comprising, between steps of A and C, (B) integrating the segment A by wrapping in one second tipping paper.

7. The method according to any of Claims 1 to 6, wherein the filter segment includes an acetate filter and a center hole filter.

8. The method according to any of Claims 1 to 7, wherein the smoking article includes the functional segment, the tobacco rod, the cooling segment, and the filter segment in this order toward the downstream direction.

9. The method according to any of Claims 1 to 8, wherein the tobacco rod has a diameter larger than a neighboring member.

10. The method according to Claim 9, wherein the tobacco rod has a diameter 0.05 to 0.15 mm larger than the neighboring member.

11. The method according to Claim 9, wherein the tobacco rod has a diameter 0.5 to 2.5% larger than the neighboring member.

12. The method according to any of Claims 1 to 11, wherein a member neighboring the tobacco rod has stiffness higher than the tobacco rod.

13. The method according to any of Claims 1 to 12, wherein the cooling segment includes a paper tube having a plurality of holes in the circumferential direction.

14. The method according to Claim 13, wherein the cooling segment includes a paper tube; and the method further comprises forming a plurality of holes in the circumferential direction of the paper tube by laser processing.

15. The method according to any of Claims 1 to 14, wherein

a step of F is a step performed by preparing a precursor in which part of the tipping paper is attached to a circumferential surface of the segment E, placing the precursor between a rolling drum and a rolling hand that is provided facing a circumferential surface of the rolling drum, and rotating the precursor on the circumferential surface of the rolling drum; and

the rolling drum or the rolling hand has, in a portion facing a section of the tobacco rod, a depression for forming a gap from the section of the tobacco rod.

Fig. 1

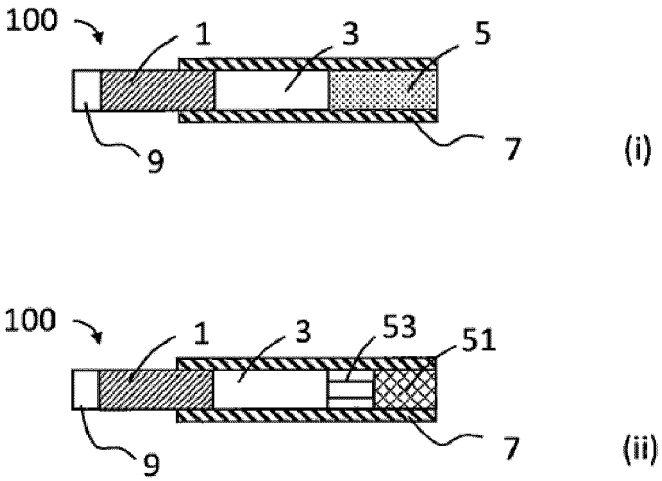


Fig. 2

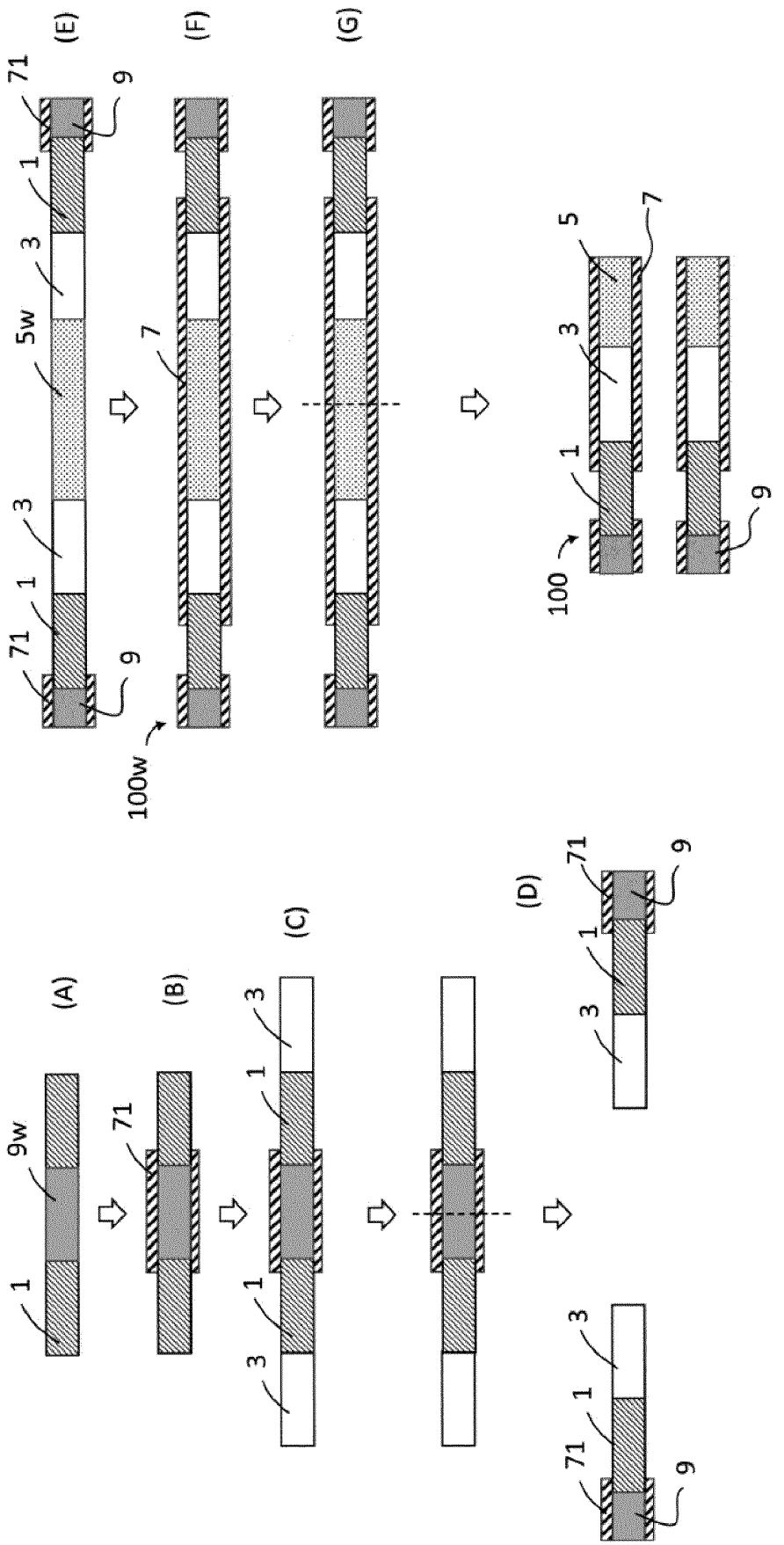
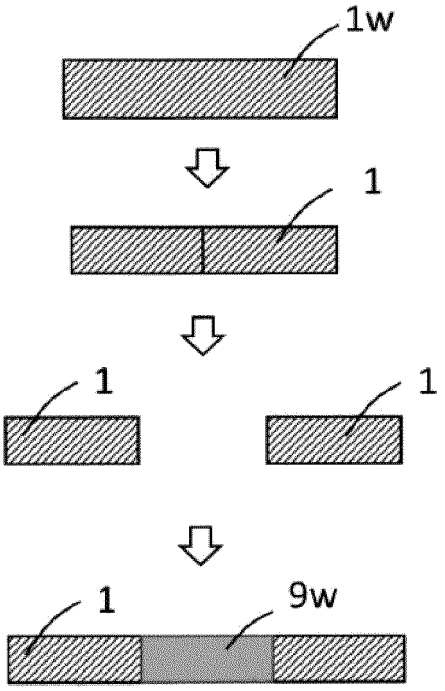


Fig. 3



(A)

Fig. 4

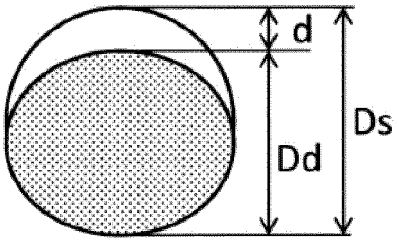
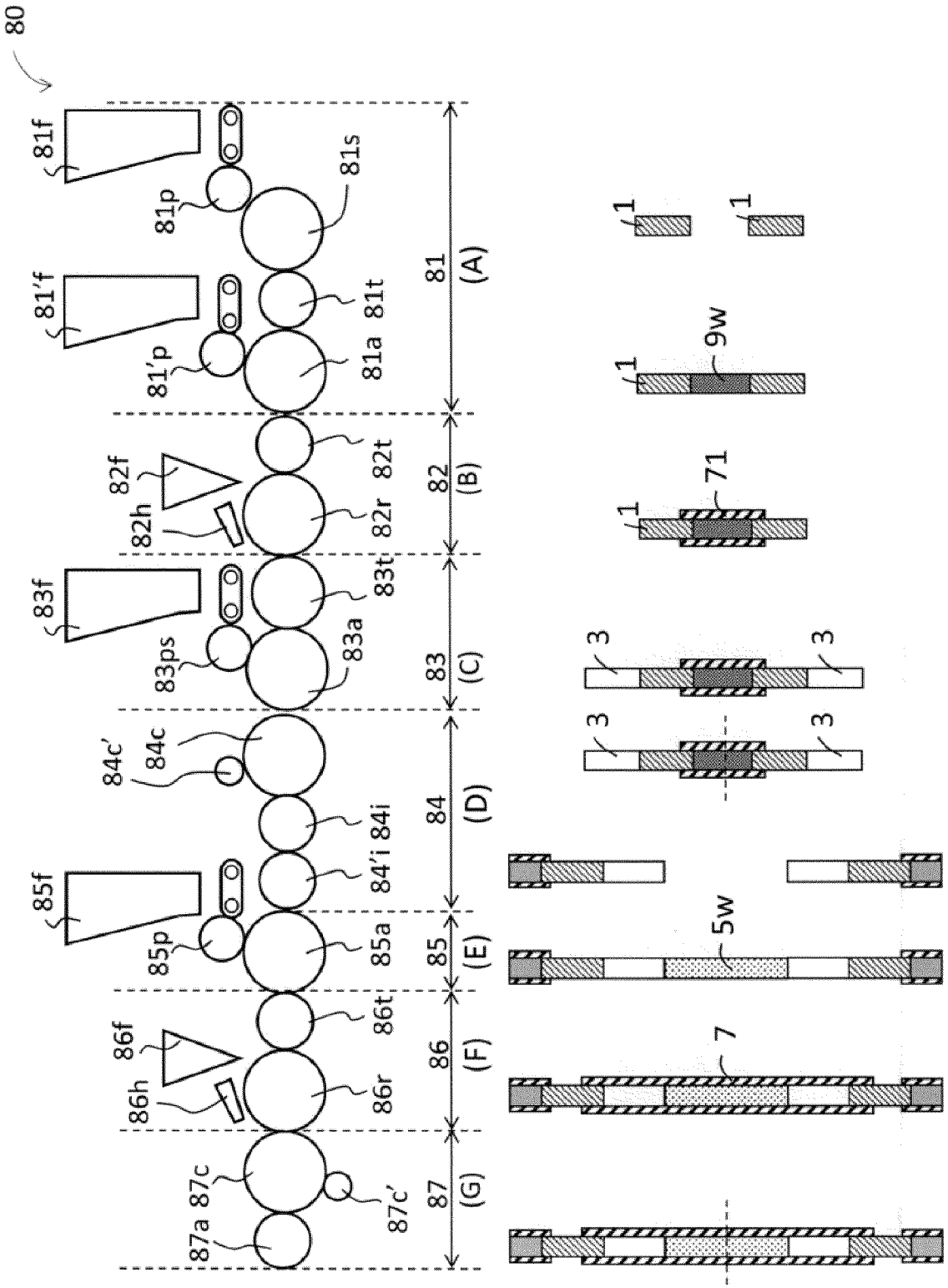


Fig. 5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81f
81p
81s
81'f
81'p
81t
81a
81
(A)
82f
82h
82t
82r
82
(B)
83f
83ps
83t
83a
83
(C)
84c'
84c
84i
84'i
84
(D)
85f
85p
85a
85
(E)
86f
86h
86t
86r
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(F)
87a
87c
87c'
87
(G)
1
9w
71
3
5w
7

Fig. 6

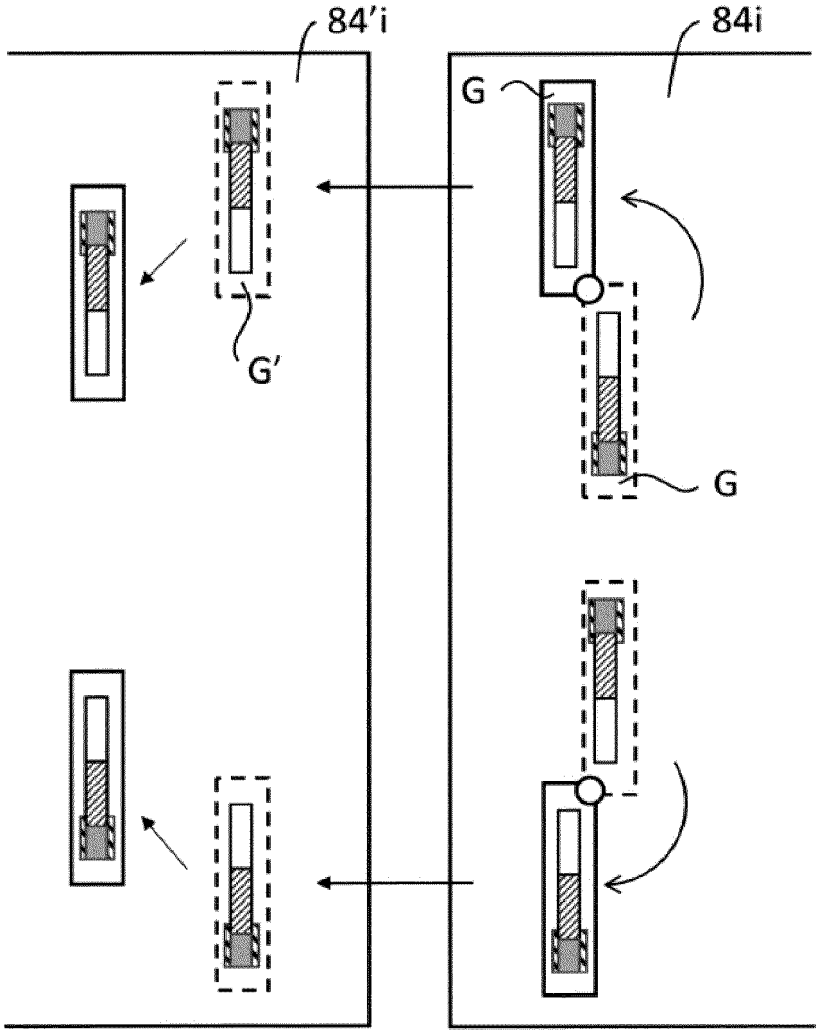


Fig. 7

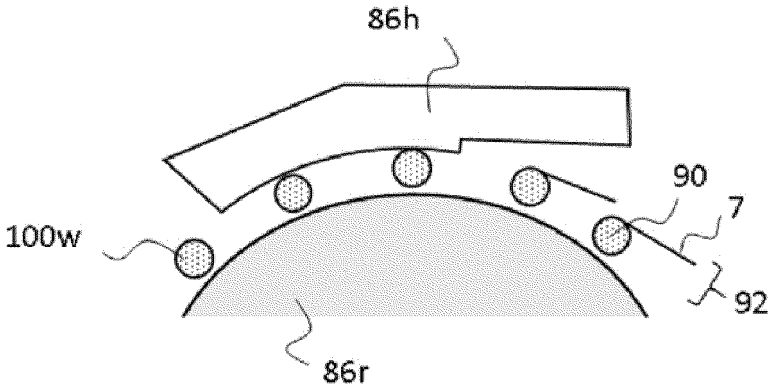
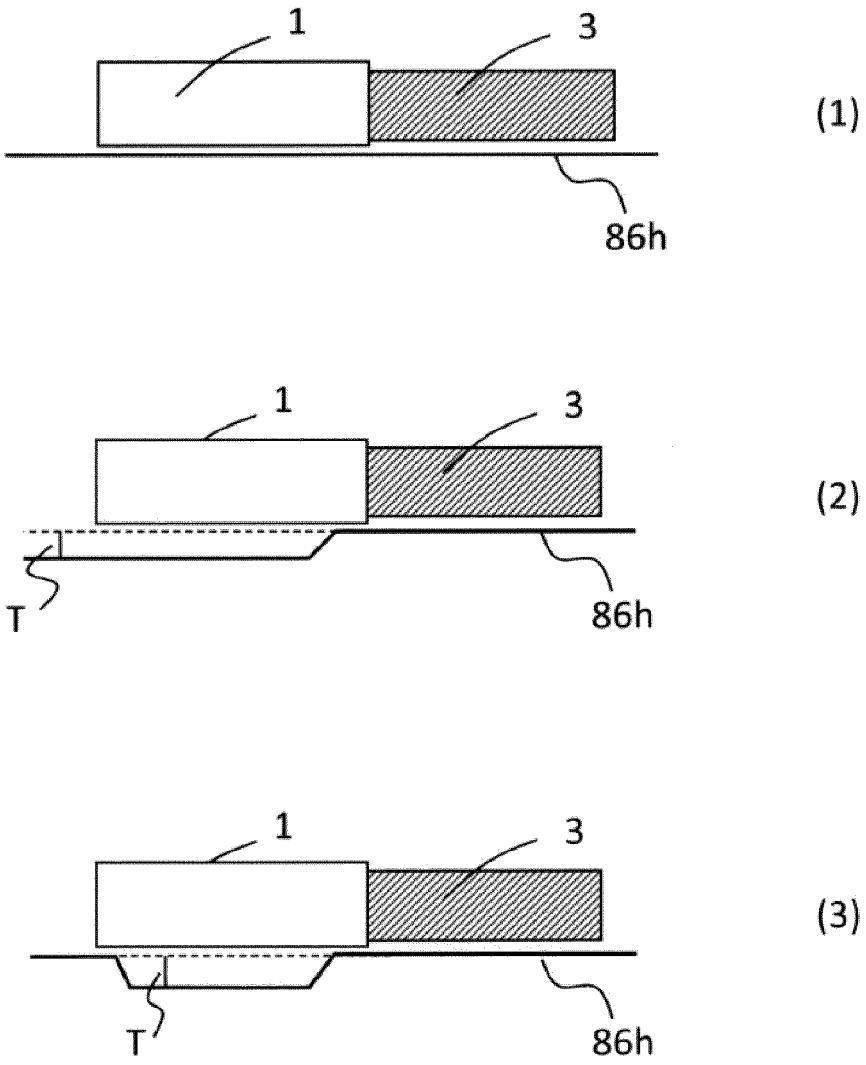


Fig. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/037336

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. A24C5/52(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. A24C5/00-5/60, A24D3/00-3/18

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.
Y	WO 2016/143128 A1 (JAPAN TOBACCO INC.) 15 September 2016, paragraphs [0021]-[0027], fig. 3, 7 & EP 3231300 A1, paragraphs [0027]-[0033], fig. 3, 7	1-15
Y	JP 2010-508864 A (PHILIP MORRIS PRODUCTS S.A.) 25 March 2010, paragraphs [0005], [0012] & US 2007/0235050 A1, paragraphs [0042], [0047] & WO 2007/110650 A1 & EP 2007233 A1 & KR 10-2009-0008277 A & CN 101442917 A	1-15

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19.11.2018	27.11.2018
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/037336

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2015-517822 A (G.D SOCIETA' PER AZIONI) 25 June 2015, paragraphs [0012]-[0015], [0029], fig. 1-4 & US 2015/0090274 A1, paragraphs [0018]-[0021], [0035], fig. 1-4 & WO 2013/179228 A1 & EP 2854572 A1 & CN 104349685 A	2
Y	JP 2002-176965 A (JAPAN TOBACCO INC.) 25 June 2002, paragraphs [0003], [0017]-[0022], fig. 1-4 (Family: none)	9-11, 15
A	JP 7-165 A (PHILIP MORRIS PRODUCTS INC.) 06 January 1995, paragraphs [0015]-[0021], [0038]-[0042], fig. 3 & US 5425383 A, column 2, line 38 to column 3, line 15, column 7, line 41 to column 8, line 34, fig. 3 & EP 588555 A1 & DE 69316811 C	1-15
A	US 3384094 A (MOLINS, Desmond Walter) 21 May 1968, column 1, lines 45-65, column 2, line 5-54, fig. 1-7 & GB 1088503 A & DE I277093 B & FR 1428865 A	1-15
A	JP 63-3782 A (JAPAN TOBACCO INC.) 08 January 1988, page 4, lower left column, line 20 to lower right column, line 19, page 17, upper left column, line 5 to lower right column, line 13, fig. 10 & US 4815481 A, column 14, line 25 to column 15, line 31, fig. 10 & EP 250727 A1 & DE 3776819 A	1-15
A	GB 2259847 A (MOLINS PLC) 31 March 1993, column 4, line 37 to column 5, line 15, fig. 1, 2 (Family: none)	1-15
A	JP 2015-532837 A (G.D SOCIETA' PER AZIONI) 16 November 2015, entire text, all drawings & US 2015/0289559 A1 & WO 2014/064655 A2 & EP 2911536 A2 & CN 104754963 A	1-15

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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