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- **JIN, Yun Suk**
Busan 47508 (KR)
- **LEE, Ho Suk**
Bucheon-si
Gyeonggi-do 14720 (KR)
- **LEE, Ki Sik**
Gimhae-si
Gyeongsangnam-do 50959 (KR)
- **KIM, Sang Jin**
Gimhae-si
Gyeongsangnam-do 50897 (KR)
- **YOON, Jong Guk**
Gimhae-si
Gyeongsangnam-do 50801 (KR)

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(71) Applicant: **Taeyoung Industry Corporation**
Miryang-si, Gyeongsangnam-do 50465 (KR)

(72) Inventors:
• **PARK, Seong Yong**
Miryang-si
Gyeongsangnam-do 50465 (KR)

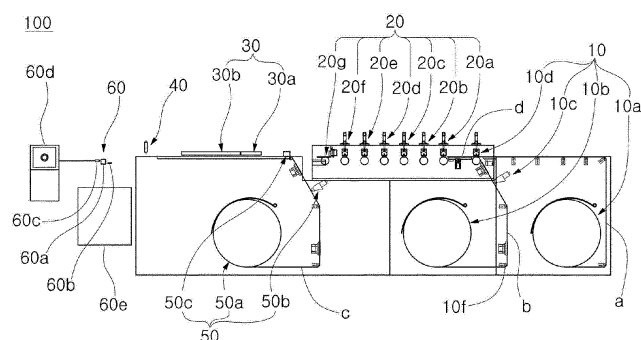
(74) Representative: **Beck & Rössig**
European Patent Attorneys
Cuvilliesstraße 14
81679 München (DE)

(54) **CIGARETTE FILTER, AND MANUFACTURING APPARATUS AND METHOD THEREFOR**

(57) In order to improve the productivity and quality, the present invention provides an apparatus for manufacturing a cigarette filter, the apparatus comprising: a wrapper paper feed unit for continuously feeding double wrapper paper in the longitudinal direction; shaping rolls which are oppositely arranged in pairs one above the other, and shape the fed double wrapper paper in a

rounded shape along the widthwise profiles of the opposite surfaces thereof, so as to continuously form a base paper tube by connecting both widthwise ends of the double wrapper paper to each other while the double wrapper paper is pressed and conveyed between the rolls; and a cutting unit for cutting the formed base paper tube into predetermined lengths.

Fig. 1



Description

[Technical Field]

[0001] The present invention relates to a cigarette filter and an apparatus and method for manufacturing the same, and more specifically, to a cigarette filter having improved productivity and quality, and an apparatus and a method for manufacturing the same.

[Background Art]

[0002] Generally, a cigarette is a product manufactured by wrapping tobacco, such as a tobacco leaf, with cigarette paper and is used in such a manner that a user inhales smoke generated by burning the cigarette paper and the tobacco. A filter is provided at an inhalation end so as to reduce harmful components in the smoke and improve a taste of the smoke.

[0003] Specifically, the cigarette paper may be paper which wraps around the cigarette and may be made of flax or wood pulp. The inhalation end means a rear of the cigarette wrapped by the cigarette paper. Here, the filter may be variously provided as an acetate filter formed by aggregating an acetate tow, a hollow filter having a hollow portion inside an acetate filter, a capsule filter provided with a perfume capsule, and the like. Among the above-described filters, a plurality of filters may be connected in a lengthwise direction to be used.

[0004] However, since the conventional filter is provided to be in direct contact with an end of the cigarette, there is a problem in that the filter is heated by heat generated during combustion of the cigarette. Accordingly, harmful smoke having an unpleasant odor/taste is generated from the filter, and the filter for purifying harmful components generates harmful substances instead, thereby injuring smoker's health.

[Disclosure]

[Technical Problem]

[0005] The present invention is directed to providing a cigarette filter having improved productivity and quality, and an apparatus and a method for manufacturing the same.

[Technical Solution]

[0006] One aspect of the present invention provides an apparatus for manufacturing a cigarette filter, the apparatus including a wrapper paper feeding unit which continuously feeds double wrapper paper in a lengthwise direction thereof, shaping rolls which are each provided with a pair of shaping rolls, which vertically facing to each other such that the fed double wrapper paper is pressed and transferred and a hollow base paper tube is continuously formed, and shape the double wrapper paper into

a rounded shape along widthwise profiles of facing surfaces thereof, wherein the hollow base paper tube is formed by connecting both ends of the double wrapper paper in a lengthwise direction to each other; and a cutting unit which cuts the formed base paper tube at preset intervals.

[Advantageous Effects]

[0007] The present invention provides the following effects.

[0008] First, since double wrapper paper continuously fed in a lengthwise direction thereof is formed in a rounded shape such that both ends thereof in a widthwise direction are connected, a tube-shaped base paper tube can be continuously formed in the lengthwise direction without interruption of the feeding of the double wrapper paper. Accordingly, it is possible to minimize a heat transfer from a cigarette portion through the base paper tube cut at certain intervals, thereby providing a hollow paper tube filter which blocks the generation of harmful substances caused by an acetate filter being heated.

[0009] Second, while the double wrapper paper passes through shaping rolls in multiple stages, the double wrapper paper can be gradually shaped from a flat shape to a circular tube shape according to a gradual change in pressing angle. Accordingly, uniform hardness can be maintained in each portion of a circumference of the double wrapper paper, thereby improving roundness. As a result, the double wrapper paper can be continuously fed and shaped, and tearing thereof due to a sudden change in shape can be prevented. Thus, a production delay or a defect rate of a filter can be minimized to improve the productivity and quality of a product.

[0010] Third, since both ends of sheets of wrapper paper are connected through the superimposition coupling between stepped portions due to coupling margin portions, sealing properties and coupling stability with respect to a joint of a paper tube can be improved, and roundness and hardness of the paper tube can be improved due to a basis weight difference between superimposed sheets of wrapper paper.

[0011] Fourth, unlike a case in which a plurality of joints are formed on a cut surface of a paper tube formed through a conventional spiral winding method, a base paper tube is formed by connecting coupling margin portions at both ends of double wrapper paper in a widthwise direction to each other. Since one joint is formed on a cut surface of the base paper tube and a joint portion is firmly coupled through the superimposition between stepped portions, even when the paper tube is subdivided to have a length applicable to a cigarette, the base paper tube can maintain high hardness.

[0012] [Description of Drawings]

[0012]

FIG. 1 is a side view illustrating an apparatus for manufacturing a cigarette filter according to an exemplary embodiment of the present invention.

FIG. 2 is a front view illustrating an alignment coupling unit in the apparatus for manufacturing the cigarette filter according to the exemplary embodiment of the present invention.

FIG. 3 is a plan view illustrating a shaping roll in the apparatus for manufacturing the cigarette filter according to the exemplary embodiment of the present invention.

FIG. 4 is a cross-sectional view illustrating double wrapper paper in the apparatus for manufacturing the cigarette filter according to the exemplary embodiment of the present invention.

FIG. 5 is an exemplary view illustrating a process of forming double wrapper paper in the apparatus for manufacturing the cigarette filter according to the exemplary embodiment of the present invention.

FIG. 6 is a cross-sectional view illustrating a base paper tube in the apparatus for manufacturing the cigarette filter according to an exemplary embodiment of the present invention.

FIG. 7 is a flowchart of a method of manufacturing a cigarette filter according to an exemplary embodiment of the present invention.

FIG. 8 is a cross-sectional view illustrating a cigarette to which a cigarette filter according to an exemplary embodiment of the present invention is applied.

FIG. 9 is a cross-sectional view taken along line V-V of FIG. 8.

[Modes of the Invention]

[0013] Hereinafter, a cigarette filter and an apparatus and method for manufacturing the same according to exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0014] FIG. 1 is a side view illustrating an apparatus for manufacturing a cigarette filter according to an exemplary embodiment of the present invention. FIG. 2 is a front view illustrating an alignment coupling unit in the apparatus for manufacturing the cigarette filter according to the exemplary embodiment of the present invention. FIG. 3 is a plan view illustrating a shaping roll in the apparatus for manufacturing the cigarette filter according to the exemplary embodiment of the present invention. FIG. 4 is a cross-sectional view illustrating double wrapper paper in the apparatus for manufacturing the cigarette filter according to the exemplary embodiment of the present invention. FIG. 5 is an exemplary view illustrating a process of forming double wrapper paper in the apparatus for manufacturing the cigarette filter according to the exemplary embodiment of the present invention. FIG. 6 is a cross-sectional view illustrating a base paper tube in the apparatus for manufacturing the cigarette filter according to the exemplary embodiment of the present in-

vention.

[0015] As shown in FIGS. 1 to 6, an apparatus 100 for manufacturing a cigarette filter according to the exemplary embodiment of the present invention includes a wrapper paper feeding unit 10, shaping rolls 20, and a cutting unit 40.

[0016] Here, the wrapper paper feeding unit 10 may be provided at a front end of the manufacturing apparatus 100 such that double wrapper paper d is continuously fed in a lengthwise direction thereof and may include a pair of winding rolls 10a and 10b, a gluing nozzle 10c, and an alignment coupling unit 10d. Specifically, the double wrapper paper d has a width corresponding to a reference width preset according to a diameter of the cigarette filter and means wrapper paper which is continuous in a lengthwise direction thereof. The reference width may be set to a length of an outer circumference of the cigarette filter.

[0017] In addition, the double wrapper paper d may be provided with a sheet of wrapper paper and may be provided with one or more sheets of wrapper paper which are coupled so as to be superimposed on each other in a thickness direction thereof. In the present exemplary embodiment, an example will be described in which the double wrapper paper d is provided with a pair of sheets of wrapper paper which are coupled so as to overlap each other.

[0018] Specifically, first wrapper paper a and second wrapper paper b are wound on the winding rolls 10a and 10b in a lengthwise direction thereof. The winding rolls 10a and 10b may be disposed behind and at a front end of the wrapper paper feeding unit 10 so as to be rotated in the lengthwise direction. Here, the first wrapper paper a and the second wrapper paper b may be provided in series in the lengthwise direction thereof and may be made of paper materials having different basis weights. The basis weight means a weight per unit area of paper.

[0019] In this case, the first wrapper paper a and the second wrapper paper b may have a width corresponding to the reference width. The second wrapper paper b, which wraps an outer circumference of the first wrapper paper a when being shaped into a circular shape, may be provided to further have a certain margin width. That is, the second wrapper paper b may be provided to have a width less than or equal to the reference width, and the first wrapper paper a may be provided to have a width less than the reference width and the width of the second wrapper paper b.

[0020] The first wrapper paper a and the second wrapper paper b pulled out from the winding rolls 10a and 10b may be transferred toward the alignment coupling unit 10d along a plurality of guide rollers 10f. That is, the guide rollers 10f may be provided in multiple stages along a path from the first winding roll 10a to a front of the alignment coupling unit 10d and may be provided in multiple stages along a path from the second winding roller 10b to the front of the alignment coupling unit 10d.

[0021] In this case, the gluing nozzle 10c is disposed

at an upper end in front of the second winding roller 10b on which the second wrapper paper b is wound. An adhesive may be applied on an upper surface of the second wrapper paper b pulled out from the second winding roller 10b through the gluing nozzle 10c.

[0022] On the other hand, referring to FIGS. 1 and 2, the alignment coupling unit 10d may be provided with a pair of alignment rollers 11 and 12 disposed so as to vertically face each other.

[0023] Specifically, the first wrapper paper a and the second wrapper paper b are pulled out and transferred in the lengthwise direction along the guide rollers 10f and are interposed in a space between the alignment rollers 11 and 12 in a state in which the first wrapper paper a is superimposed on the upper surface of the second wrapper paper b.

[0024] Here, as the alignment rollers 11 and 12 are rotated, the first wrapper paper a and the second wrapper paper b may be continuously pulled out from the winding rollers 10a and 10b and transferred to the rear of the wrapper paper feeding unit 10.

[0025] The first wrapper paper a and the second wrapper paper b passing through the alignment rollers 11 and 12 may be vertically pressed and coupled. Here, the alignment coupling unit 10d may include a lower alignment roller 11 which is rotated by a rotation driving portion and has an alignment groove 11a formed along an outer circumference thereof and an upper alignment roller 12 which is inserted into the alignment groove 11a and rotated.

[0026] In this case, a width of the alignment groove 11a may have a coupling interval preset to be less than a width of the first wrapper paper a and a width of the second wrapper paper b from the width of the first wrapper paper a or the second wrapper paper b.

[0027] Here, referring to FIGS. 2 to 4, one end of the first wrapper paper a in a widthwise direction is disposed to come into close contact with one end of the alignment groove 11a in a widthwise direction, and the other end of the second wrapper paper b in a widthwise direction is disposed to come into close contact with the other end in the widthwise direction of the alignment groove 11a. As a result, one ends of the first wrapper paper a and the second wrapper paper b in the widthwise directions may be aligned and spaced apart from each other so as to correspond to the coupling interval. The first wrapper paper a and the second wrapper paper b may be vertically pressed and coupled so as to be superimposed on each other in a mutually aligned state.

[0028] Here, an interval between the alignment groove 11a and the upper alignment roller 12 may be formed to correspond to the sum of thicknesses of the first wrapper paper a and the second wrapper paper b. A rotational direction of the lower alignment roller 11 and a formation direction of the alignment groove 11a may be the same as a lengthwise direction or a transfer direction of each wrapper paper a or b.

[0029] As a result, the first wrapper paper a and the

second wrapper paper b may be continuously pulled out, aligned, and coupled so as to be superimposed on each other. The double wrapper paper d may be continuously formed in the lengthwise direction thereof and thus may be fed to the rear of the wrapper paper feeding unit 10. That is, the double wrapper paper d means that the first wrapper paper a and the second wrapper paper b are coupled.

[0030] A first coupling margin portion d1 is formed at one end of the double wrapper paper d in a widthwise direction due to the first wrapper paper a which protrudes from one end of the second wrapper paper b in the widthwise direction to one side thereof in the widthwise direction. In addition, a second coupling margin portion d2 is formed at the other end of the double wrapper paper d in the widthwise direction due to the second wrapper paper b which protrudes from the other end of the first wrapper paper a in the widthwise direction to the other side thereof in the widthwise direction.

[0031] Meanwhile, referring to FIGS. 1 to 6, the shaping roll 20 is disposed behind the wrapper paper feeding unit 10 and is provided with a pair of shaping rolls vertically facing each other. Here, the shaping roll 20 may be provided with a plurality of pairs of shaping rolls disposed in multiple stages in a direction in which the double wrapper paper d is fed and transferred, i.e., the lengthwise direction of the double wrapper paper d.

[0032] Specifically, one shaping roll 20 may be provided to include a lower shaping roller 21 and an upper shaping roller, which are disposed to vertically face each other. The double wrapper paper d may be pressed and transferred between the lower shaping roller 21 and the upper shaping roller.

[0033] Here, the lower shaping roller 21 may be rotated integrally with the lower alignment roller 11. That is, a pulley 23 provided at one side of the lower shaping roller 21 and a pulley 13 provided at one side of the lower alignment rollers 11 may be connected through a tension belt or the like and thus may be rotated integrally with each other.

[0034] A shaping groove 21a is formed so as to be recessed inward in a radial direction of the lower shaping roller 21 from a surface thereof, and the upper shaping roller is inserted into the shaping groove 21a. In this case, the upper shaping roller may be a member configured to press the double wrapper paper d against a surface of the shaping groove 21a and may be provided as a roller member or a bar member which has a surface shape corresponding to a widthwise profile of the surface of the shaping groove 21a.

[0035] Here, the double wrapper paper d is shaped into a rounded shape along a widthwise profile of facing surfaces of the lower shaping roller 21 and the upper shaping roller. That is, the double wrapper paper d may be pressed between the lower shaping roller 21 and the upper shaping roller and thus may be shaped to correspond to the surface shape of the shaping groove 21a.

[0036] In this case, an interval between the facing sur-

faces of the lower shaping roller 21 and the upper shaping roller may be less than or equal to the sum of the thicknesses of the first wrapper paper a and the second wrapper paper b. The double wrapper paper d may be pressed and accurately shaped between the rollers.

[0037] The double wrapper paper d passing through the shaping rolls 20 may be shaped into a rounded shape. Both ends of the double wrapper paper d in the widthwise direction may be connected to each other to form a base paper tube e. That is, the base paper tube e means that both ends of the double wrapper paper d in the widthwise direction are connected to each other. In this case, as the double wrapper paper d is transferred in the lengthwise direction thereof and is shaped into a rounded shape by the shaping rolls 20, the base paper tube e may be continuously formed.

[0038] Here, a rotational direction of the lower shaping roller 21 and a formation direction of the shaping groove 21a may be the same as the lengthwise direction of the double wrapper paper d, i.e., a transfer direction or a feeding direction of the double wrapper paper d. Therefore, unlike a conventional method of manufacturing a paper tube such as a spiral winding method or a lengthwise rotating method, the base paper tube e may be continuously formed in the lengthwise direction without interruption of the feeding of the double wrapper paper d, thereby considerably improving productivity of a product.

[0039] On the other hand, referring to FIGS. 3 to 5, the shaping rolls 20 may be provided in multiple stages along the transfer direction of the double wrapper paper d.

[0040] That is, one shaping roll 20 may be provided with the pair of shaping rolls which vertically face each other. A plurality of pairs of shaping rolls 20a, 20b, 20c, 20d, 20e, 20f, and 20g may be disposed in multiple stages in the transfer direction of the double wrapper paper d.

[0041] In this case, gradient indexes in widthwise profiles of the shaping rolls 20 disposed in the multiple stages with respect to surfaces of shaping grooves 21a, 21b, 21c, 21d, 21e, 21f, and 21g may be gradually increased in a direction opposite to the transfer direction of the double wrapper paper d.

[0042] Here, the gradient index is similar in concept to curvature, and it may be understood that as a shape approaches a plane, a gradient index thereof becomes lower, and as a shape approaches a circle, a gradient index thereof becomes higher.

[0043] Specifically, the shaping groove 21a of the front shaping roll 20a adjacent to the alignment coupling unit 10d is provided in a shape (with a low gradient index) close to a plane. The shaping groove 21g, which has a widthwise profile (with a high gradient index) close to a circle, is formed in the shaping roll 20g far away from the alignment coupling unit 10d.

[0044] Specifically, the shaping groove 21a of the first shaping roll 20a in the forefront is provided in a shape in which both ends thereof in a widthwise direction are inclined upward at a certain angle. The double wrapper paper d passing through the first shaping roll 20a is

formed into a shape in which both ends thereof in the widthwise direction are inclined upward.

[0045] The shaping groove 21b of the second shaping roll 20b behind the first shaping roll 20a is provided in a shape in which both ends thereof in a widthwise direction are inclined upward. The double wrapper paper d passing through the second shaping roll 20b is shaped into a shape in which both ends thereof in a widthwise direction are inclined upward. In addition, the shaping groove 21c of the third shaping roll 20c behind the second shaping roll 20b is provided in a shape in which both ends thereof in a widthwise direction are inclined upward. The shaping groove 21c is provided in a shape in which a central portion thereof is bent downward at a certain angle.

[0046] The shaping groove 21d of the fourth shaping roll 20d behind the third shaping roll 20c is provided in a shape in which both ends thereof in a widthwise direction are inclined upward. The shaping groove 21d is provided in a shape in which a central portion thereof is recessed in a rounded shape.

[0047] In addition, recessed depths of central portions are gradually increased in the order of the fifth shaping roll 20e, the sixth shaping roll 20f, and the seventh shaping roll 20g, and widths between both ends thereof are gradually decreased. The shaping groove 21g having a widthwise profile close to a circle is formed in the seventh shaping roll 20g.

[0048] In this case, while the double wrapper paper d passes through each shaping roll, the double wrapper paper d is formed such that respective portions such as both ends and a central portion thereof in the widthwise direction are sequentially rounded. The double wrapper paper d may be gradually shaped from a flat shape to a circular shape.

[0049] As described above, while the double wrapper paper d is being passed through the shaping rolls 20 provided in the multiple stages, the double wrapper paper d may be shaped from a flat shape into a circular tube shape according to a gradual change in pressing angle. Accordingly, uniform hardness may be maintained in each portion of a circumference of the double wrapper paper d, thereby accurately shaping the double wrapper paper d so as to have high roundness.

[0050] Furthermore, a buffer region may be formed between the double wrapper paper d fed in a flat shape and the base paper tube e shaped into a circular shape through the plurality of shaping rolls 20. Thus, the double wrapper paper d may be continuously fed and shaped, and tearing thereof due to a sudden change in shape may be prevented. As a result, it is possible to minimize a production delay due to tearing of the double wrapper paper d and a defect rate due to low roundness, thereby improving the productivity and quality of a product.

[0051] In addition, since the double wrapper paper d is formed by coupling the pair of sheets of wrapper paper a and b having different basis weights so as to be superimposed on each other, hardness of the base paper tube e may be increased, and roundness of the base paper

tube e may be further improved due to a hardness difference between inner wrapper paper and outer wrapper paper. That is, since the second wrapper paper b having low hardness is coupled so as to be superimposed on an outer circumference of the first wrapper paper a having high hardness, the second wrapper paper b may be pressed outward in a radial direction thereof by a hardness difference between two sheets of wrapper paper a and b, thereby forming the high quality base paper tube e having flattened outer and inner circumferences.

[0052] Meanwhile, when the double wrapper paper d passes through the shaping rolls 20 and is shaped into a rounded shape, the coupling margin portions d1 and d2 provided at both ends of the double wrapper paper d in the widthwise direction may be coupled so as to be superimposed on each other, and thus, the base paper tube e may be formed.

[0053] That is, the second coupling margin portion d2 protruding from the other end of the double wrapper paper d in a stepped manner may be superimposed on an upper surface of the first coupling margin portion d1 protruding from one end of the double wrapper paper d in a stepped manner, and thus, both ends of the double wrapper paper d in the widthwise direction may be connected to each other. Both ends of the base paper tube e may be firmly coupled to each other through the superimposition coupling between stepped portions, and sealing properties of a joint portion of the base paper tube e may be improved.

In addition, the cutting unit 40 may be disposed behind the shaping rolls 20 and may cut the formed base paper tube e at preset intervals. The base paper tube e may be cut to manufacture a paper tube filter.

[0054] In this case, the paper tube filter may be disposed between a cigarette portion and a base filter made of an acetate material, thereby reducing a heat transfer toward the base filter when the cigarette portion is burned and minimizing the formation of hazardous substances caused by the base filter being heated.

[0055] Here, the interval at which the base paper tube e is cut may be set to a size which is applicable to one cigarette and may also be set differently according to demands of individual cigarette manufacturers. Here, since the base paper tube e is formed by connecting both ends of the double wrapper paper d in the widthwise direction, one joint is formed on a cut surface of the base paper tube e. That is, unlike a case in which a plurality of joints are expansively formed in an oblique shape on a cut surface of a paper tube formed through a conventional spiral winding method, one joint is formed on the cut surface of the paper tube filter.

[0056] Furthermore, since the joint portion of the paper tube filter is firmly coupled through the superimposition between stepped portions due to the coupling margin portions d1 and d2, even when the paper tube filter is subdivided to have a length applicable to a cigarette, the paper tube filter may maintain high hardness.

[0057] A wrapper paper addition unit 50 may be pro-

vided between the shaping roll 20 and the cutting unit 40 to feed third wrapper paper c coated with an adhesive to an outer circumference of the base paper tube e in a lengthwise direction thereof such that the coupling margin portions d1 and d2 are covered.

[0058] Specifically, the wrapper paper addition unit 50 may include a third winding roll 50a on which the third wrapper paper c is wound, a gluing nozzle 50b configured to apply an adhesive on one surface of the third wrapper paper c pulled out from the third winding roll 50a, and an entry unit 50c configured to feed and press the third wrapper paper against the outer circumference of the base paper tube e.

[0059] In this case, the third wrapper paper c is made of a paper material which has a preset reference width so as to correspond to a diameter of the paper tube filter and is continuous in a lengthwise direction thereof. The third wrapper paper c is wound on the third winding roll 50a in the lengthwise direction thereof. That is, the third wrapper paper c may be provided to further have a certain margin width from the width of the first wrapper paper a or the second wrapper paper b and may be coupled to surround the outer circumference of the base paper tube e.

[0060] In this case, a hollow shaping hole may be formed in the entry unit 50c. That is, in a state in which the third wrapper paper c is disposed along an inner circumference of the shaping hole, the base paper tube e ejected from the shaping rolls 20 is inserted into the shaping roll hole, and the third wrapper paper c may be added along the outer circumference of the base paper tube e and transferred.

[0061] Here, the third wrapper paper c may be made of a paper material having a basis weight lower than that of the first wrapper paper a and the second wrapper paper b. As described above, since the third wrapper paper c is added to the outer circumference of the base paper tube e, hardness of the base paper tube e may be increased, and a joint portion between the coupling margin portions d1 and d2 may be more stably sealed.

[0062] In this case, a finishing unit 30 may be provided behind the entry unit 50c. Specifically, the finishing unit 30 may include a shaping frame 30a which has an inner diameter corresponding to an outer diameter of the paper tube filter and a heating chamber 30b which heats the base paper tube e such that the adhesive is cured. That is, the base paper tube e ejected from the shaping roll 20 is inserted into the shaping frame 30a in a state in which the third wrapper paper c is added thereto. In this case, the base paper tube e may be pressed against the inner circumference of the shaping frame 30a and may be aligned in a precise circular tube shape.

[0063] The heating chamber 30b may have an inner diameter corresponding to the outer diameter of the base paper tube e like the shaping frame 30a and may be heated to a certain temperature. Here, the adhesive is provided as a thermosetting adhesive, and a shape of the base paper tube e introduced into the heating cham-

ber 30b may be fixed as the adhesive is cured in a state in which the base paper tube e is aligned in the circular tube shape.

[0064] In this case, in a state in which finish treatment is performed on the base paper tube e through the finishing unit 30, the base paper tube e may be transferred to the cutting unit 40 and cut.

[0065] Meanwhile, a filter ejection unit 60 may be provided behind the cutting unit 40. Here, the filter ejection unit 60 may include a pickup drum 60a, a reject air gun 60b, a vision camera 60c, a discrimination unit 60d, and an accommodation unit 60e.

[0066] Specifically, a plurality of pickup grooves configured to pick up the cut paper tube filters are formed on an outer circumference of the pickup drum 60a, and the cut paper tube filters may be picked up through the pickup grooves one by one and thus may be rotated and transferred.

[0067] In this case, the vision camera 60c configured to capture a cross-sectional image of the paper tube filter is provided at one side of one pickup groove, and the cross-sectional image captured by the vision camera 60c may be transferred to the discrimination unit 60d. Here, the discrimination unit 60d may determine whether the paper tube filter is defective by measuring a position or the like of a hollow portion of the paper tube filter from the captured cross-sectional image.

[0068] The reject air gun 60b is operated according to a discrimination result of the discrimination unit 60d, and thus, a defective paper tube filter is ejected to the outside of the pickup groove, and a non-defective paper tube filter, which is not ejected by the reject air gun 60b, may be collected in the accommodation unit 60e.

[0069] Accordingly, since it is automatically determined whether the manufactured paper tube filter is defective and the defective paper tube filter is automatically removed, an additional inspection process or human consumption may be minimized, thereby considerably improving the productivity of a product.

[0070] On the other hand, FIG. 7 is a flowchart of a method of manufacturing a cigarette filter according to an exemplary embodiment of the present invention.

[0071] As shown in FIG. 7, the method of manufacturing a cigarette filter includes the following operations.

[0072] First, referring to FIGS. 1 to 7, the first wrapper paper a and the second wrapper paper b are pulled out from the winding rolls 10a and 10b in the widthwise directions thereof, and an adhesive is applied on one surface of facing surfaces of sheets of wrapper paper a and b (s10).

[0073] That is, the first wrapper paper a and the second wrapper paper b are disposed to vertically face each other. The adhesive may be applied on one surface of a lower surface of the first wrapper paper a and an upper surface of the upper surface of the second wrapper paper b, which face each other when the first wrapper paper a and the second wrapper paper b are disposed so as to face each other.

[0074] In this case, the first wrapper paper a and the second wrapper paper b may have different basis weights in order to increase hardness of the double wrapper paper d. The basis weight of the first wrapper paper a may be greater than that of the second wrapper paper b.

[0075] In addition, the first wrapper paper a and the second wrapper paper b may have a preset margin width such that one thereof surrounds the other thereof. Each of the first wrapper paper a and the second wrapper paper b may have a width less than a reference width preset according to a diameter of the paper tube filter. That is, the second wrapper paper b may have a width less than or equal to the reference width, and the first wrapper paper a may have a width less than the reference width and the width of the second wrapper paper b.

[0076] The first wrapper paper a and the second wrapper paper b are coupled so as to be superimposed on each other, and thus, the double wrapper paper d is continuously formed in a lengthwise direction thereof (s20). Specifically, the first wrapper paper a and the second wrapper paper b are aligned such that one ends thereof in the widthwise directions are spaced apart from each other by a preset coupling interval. In this case, when the aligned first wrapper paper a and second wrapper paper b are vertically pressed such that facing surfaces thereof come into close contact with each other, the first wrapper paper a and the second wrapper paper b are coupled to form the double wrapper paper d.

[0077] In this case, the coupling margin portions d1 and d2, which are not superimposed on each other, are formed at both ends of the double wrapper paper d so as to correspond to the coupling interval.

[0078] The double wrapper paper d is pressed and transferred in a lengthwise direction thereof and is gradually shaped into a rounded shape by the shaping rolls 20 which are each provided with a pair of shaping rolls so as to vertically face each other and are disposed in multiple stages such that gradient indexes in widthwise profiles of surfaces thereof are gradually increased in a transfer direction of the double wrapper paper (s30). The coupling margin portions d1 and d2 at both ends of the double wrapper paper d in a widthwise direction may be connected to each other, and thus, the base paper tube e may be continuously formed.

[0079] As described above, while the double wrapper paper d passes through the shaping rolls 21 provided in the multiple stages, the double wrapper paper d may be formed from a flat shape into a circular tube shape according to a gradual change in pressing angle. Accordingly, uniform hardness may be maintained in each portion of a circumference of the double wrapper paper d, thereby accurately shaping the double wrapper paper d so as to have high roundness.

[0080] Furthermore, a buffer region may be formed between the double wrapper paper d fed in a flat shape and the base paper tube e shaped into a circular shape through the plurality of shaping rolls 20. Thus, processes of feeding and shaping the double wrapper paper d may

be continuously performed without tearing of the double wrapper paper d due to a sudden change in shape. As a result, it is possible to minimize a production delay due to the tearing of the double wrapper paper d or a defective ratio due to low roundness, thereby improving the productivity and quality of a product

In this case, when the coupling margin portions d1 and d2 at both ends of the double wrapper paper d may be coupled so as to be superimposed on each other, the third wrapper paper c may be added along an outer surface of the coupled coupling margin portions d1 and d2.

[0081] Specifically, the third wrapper paper c may be selected to have a basis weight lower than that of the second wrapper paper b. In this case, the third wrapper paper c may be selected to have a reference width preset according to a diameter of the paper tube filter, the second wrapper paper b may be provided to have a width less than that of the third wrapper paper c, and the first wrapper paper a may be provided to have a width less than that of the second wrapper paper b.

[0082] As described above, since the double wrapper paper d is formed by coupling a pair of sheets of wrapper paper a and b having different basis weights so as to be superimposed on each other, hardness of the base paper tube e may be increased, and roundness of the base paper tube e may be further improved due to a hardness difference between inner wrapper paper and outer wrapper paper.

[0083] In addition, both ends of the base paper tube e are connected by a pair of coupling margin portions d1 and d2 being superimposed on each other, and the third wrapper paper is added to a portion at which the coupling margin portions d1 and d2 are connected. Accordingly, the hardness of the base paper tube e is increased, and sealing properties from an inner hollow portion in a radial direction of the base paper tube e may be significantly improved.

[0084] Finally, finish treatment is performed on the base paper tube e by the finishing unit 30, and the finish-treated base paper tube e is cut at preset intervals to manufacture a paper tube filter (s40).

[0085] As described above, unlike a case in which a plurality of joints are formed on a cut surface of a paper tube formed through a conventional spiral winding method, one joint is formed on a cut surface of the base paper tube e formed by connecting both ends of the double wrapper paper d in a widthwise direction, and a joint portion is firmly coupled through the superimposition between stepped portions by the coupling margin portions d1 and d2. Thus, even when the paper tube filter is subdivided to have a length applicable to a cigarette, the paper tube filter may maintain high hardness.

[0086] On the other hand, FIG. 8 is a cross-sectional view illustrating a cigarette to which a cigarette filter according to an exemplary embodiment of the present invention is applied, and FIG. 9 is a cross-sectional view taken along line V-W of FIG. 8.

[0087] As shown in FIGS. 8 and 9, a cigarette filter 200

includes a paper tube filter 220, a base filter 230, and tip paper 240.

[0088] Here, the paper tube filter 220 may include a first wrapper paper portion 220a and a second wrapper paper portion 220b. Specifically, it may be understood that the first wrapper paper portion 220a means an inner circumferential side of the paper tube filter 220 formed by first wrapper paper a and the second wrapper paper portion 220b means an outer circumferential side of the paper tube filter 220 formed by second wrapper paper b.

[0089] Meanwhile, the first wrapper paper portion 220a may be formed by connecting both ends of the first wrapper paper a in a widthwise direction which is formed in a rounded shape such that a hollow portion is formed therein. In this case, the first wrapper paper a may be made of a paper material having a first basis weight.

[0090] The second wrapper paper portion 220b may be formed to surround an outer circumference of the first wrapper paper portion 220a due to the second wrapper paper portion b made of a paper material having a second basis weight different from the first basis weight. Here, the second basis weight may be less than the first basis weight.

[0091] Accordingly, the second wrapper paper portion 220b having relatively low hardness may be coupled so as to be superimposed on an outer circumference of the first wrapper paper portion 220a having relatively high hardness, a circular shape may be maintained due to a hardness difference between the wrapper paper portions 220a and 220b, and overall hardness of the paper tube filter 220 may be improved.

[0092] In this case, the second wrapper paper portion 220b may be coupled so as to be superimposed such that the second wrapper paper b surrounds the outer circumference of the first wrapper paper portion 220a. The second wrapper paper portion 220b may be formed by connecting both ends of the second wrapper paper b in a widthwise direction to each other. Here, both ends of the second wrapper paper portion 220b in a circumferential direction are connected to each other at positions which are spaced a coupling interval preset from a portion, at which both ends of the first wrapper paper portion 220a are connected, in a circumferential direction.

[0093] Specifically, in a state in which the first wrapper paper a and the second wrapper paper b are aligned such that one ends thereof in the widthwise directions are spaced apart from each other by the preset coupling interval, the first wrapper paper a and the second wrapper paper b are coupled so as to be superimposed on each other.

[0094] That is, a first coupling margin portion d1 corresponding to one end of the first wrapper paper a in a widthwise direction, which protrudes from one end of the second wrapper paper b in a widthwise direction to one side thereof, may be coupled so as to be superimposed on a second coupling margin portion d2 corresponding to the other end of the second wrapper paper b in the

widthwise direction, which protrudes from the other end of the first wrapper paper a in the widthwise direction to the other side thereof in the widthwise direction. Accordingly, a portion d3, at which both ends of the first wrapper paper portion 220a in the circumferential direction are connected, and a portion d4, at which both ends of the second wrapper paper portion 220b in the circumferential direction are connected, may be disposed so as to be misaligned with each other. Sealing properties from a hollow portion 221 of the paper tube filter 220 in a radial direction may be significantly improved.

[0095] Furthermore, unlike a conventional case in which wrapper paper has been spirally wound a plurality of times, a paper tube having sufficient hardness may be formed only by winding two sheets of wrapper paper having two different basis weights in a widthwise direction and connecting both ends thereof.

[0096] In addition, since one joint is formed at a front end and a rear end of the formed paper tube and joint portions are coupled so as to be superimposed on each other in a stepped manner by the coupling margin portions d1 and d2, the paper tube filter 220 subdivided to have a length applicable to a cigarette may maintain high hardness.

[0097] Of course, a third wrapper paper portion may be further formed by coupling third wrapper paper so as to be superimposed on an outer circumference of the paper tube filter 220.

[0098] The paper tube filter 220 is coupled to a rear end of a cigarette portion 210 filled with a tobacco. In addition, the base filter 230 is connected to the paper tube filter 220 so as to be spaced apart from the cigarette portion 210 with the hollow portion 221 of the paper tube filter 220 between the base filter 239 and the cigarette portion 210. Here, the base filter 230 may be variously provided as an acetate filter formed by aggregating an acetate tow, a hollow filter having a hollow portion inside an acetate filter, a capsule filter provided with a perfume capsule, or the like. It may be understood that the base filter 230 includes a complex filter in which a plurality of filters among the above-described filters are connected in a lengthwise direction thereof.

[0099] The tip paper 240 is fixed to the rear end of the cigarette portion 210 to surround outer circumferences of the paper tube filter 220 and the base filter 230. In this case, the tip paper 240 is made of a thin paper material having a plurality of pores and is coupled to the rear end of the cigarette portion 210 to integrally surround the outer circumferences of the paper tube filter 220 and the base filter 230.

[0100] As described above, since the hollow paper tube filter 220 is disposed between the cigarette portion 210 and the base filter 230, combustion heat of the cigarette portion 210 may be prevented from being directly transferred to the base filter 230, thereby preventing generation of hazardous substances caused by the base filter 230 being heated and burned.

[0101] As described above, the present invention is

not limited to the above-described exemplary embodiments, and variations and modifications may be made by those skilled in the art without departing from the scope of the present invention. The modified embodiments are within the scope of the present invention.

[Industrial applicability]

[0102] The present invention may be applied to an industry for manufacturing cigarettes by providing a cigarette filter and an apparatus and method for manufacturing the same.

Claims

1. An apparatus for manufacturing a cigarette filter, the apparatus comprising:

a wrapper paper feeding unit which continuously feeds double wrapper paper in a lengthwise direction thereof;

shaping rolls which are each provided with a pair of shaping rolls, which vertically face each other such that the fed double wrapper paper is pressed and transferred and a hollow base paper tube is continuously formed, and shape the double wrapper paper into a rounded shape along widthwise profiles of facing surfaces thereof, wherein the hollow base paper tube is formed by connecting both ends of the double wrapper paper in a lengthwise direction to each other; and

a cutting unit which cuts the formed base paper tube at preset intervals.

2. The apparatus of claim 1, wherein the shaping rolls are disposed in multiple stages in a transfer direction of the double wrapper paper such that gradient indexes of the widthwise profiles of the respective surfaces disposed in the multiple stages are increased in a direction opposite to the transfer direction of the double wrapper paper.

3. The apparatus of claim 1, wherein:

the wrapper paper feeding unit includes a pair of winding rolls on which first wrapper paper and second wrapper paper are wound;

a gluing nozzle which applies an adhesive to the wrapper paper pulled out from each of the winding rolls; and

an alignment coupling unit which couples the first wrapper paper and the second wrapper paper so as to be superimposed on each other, wherein the first wrapper paper and the second wrapper paper are aligned in a state in which both ends thereof in widthwise directions are

spaced apart from each other by a preset coupling interval such that coupling margin portions are formed at both ends of the double wrapper paper.

4. The apparatus of claim 3, further comprising a wrapper paper addition unit which is provided between the shaping roll and the cutting unit and feeds third wrapper paper coated with an adhesive to an outer circumference of the base paper tube in a lengthwise direction thereof such that the coupling margin portions are covered.

5. A method of manufacturing a cigarette filter, the method comprising:

a first operation of pulling out first wrapper paper and second wrapper paper so as to face each other and applying an adhesive on one surface of facing surfaces of sheets of wrapper paper; a second operation of continuously forming double wrapper paper in which the first wrapper paper and the second wrapper paper are coupled so as to be superimposed on each other; a third operation of pressing and transferring, by shaping rolls, the double wrapper paper in a lengthwise direction thereof, gradually shaping the double wrapper paper into a rounded shape, and connecting both ends of the double wrapper paper in a widthwise direction to continuously form a base paper tube, wherein the shaping rolls are each provided with a pair of shaping rolls vertically facing each other and are disposed in multiple stages such that gradient indexes of widthwise profiles of surfaces thereof are gradually increased in a transfer direction of the double wrapper paper; and a fourth operation of performing finish treatment on the base paper tube and cutting the finish-treated base paper tube at preset intervals to manufacture a hollow paper tube filter.

6. A cigarette filter comprising:

a hollow paper tube filter which includes a first cigarette filter portion made of a paper material with a first basis weight, formed in a rounded shape such that a hollow portion is formed therein, and having both ends connected to each other and a second wrapper paper portion made of a paper material with a second basis weight and superimposed on first wrapper paper to surround an outer circumference of the first wrapper paper, wherein the hollow paper tube filter is connected to a rear end of a cigarette portion filled with a tobacco; a base filter which is connected to the paper tube filter so as to be spaced apart from the cigarette

portion with the hollow portion of the paper tube filter between the base filter and the cigarette portion; and tip paper which surrounds outer circumferences of the paper tube filter and the base filter and fixes the paper tube filter and the base filter to the rear end of the cigarette portion.

7. The cigarette filter of claim 6, wherein the first basis weight is different from the second basis weight.

8. The cigarette filter of claim 7, wherein the second basis weight is less than the first basis weight.

9. The cigarette filter of claim 6, wherein both ends of the second wrapper paper portion are connected to each other at positions which are spaced a coupling interval preset from a portion, at which both ends of the first wrapper paper are connected, in a circumferential direction.

Fig. 1

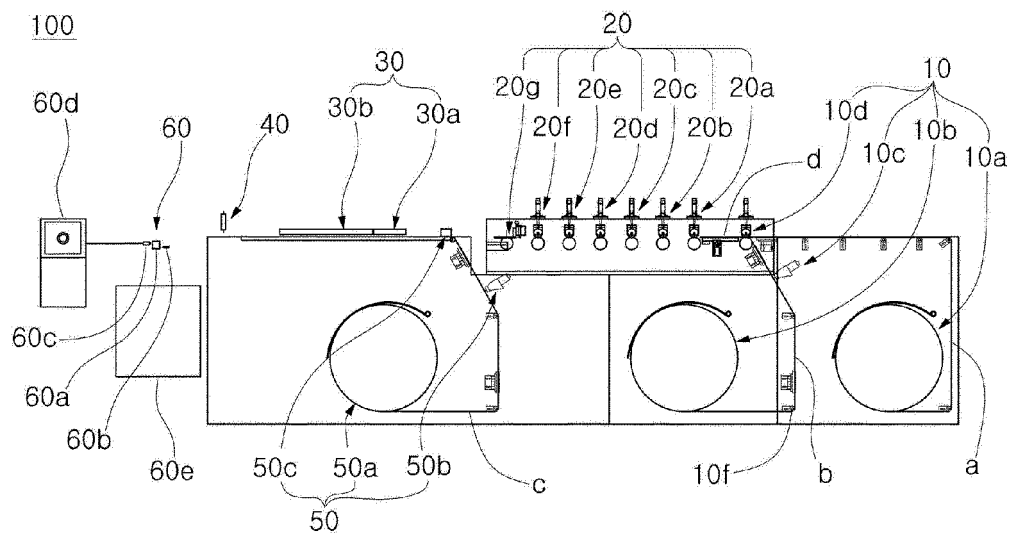


Fig. 2

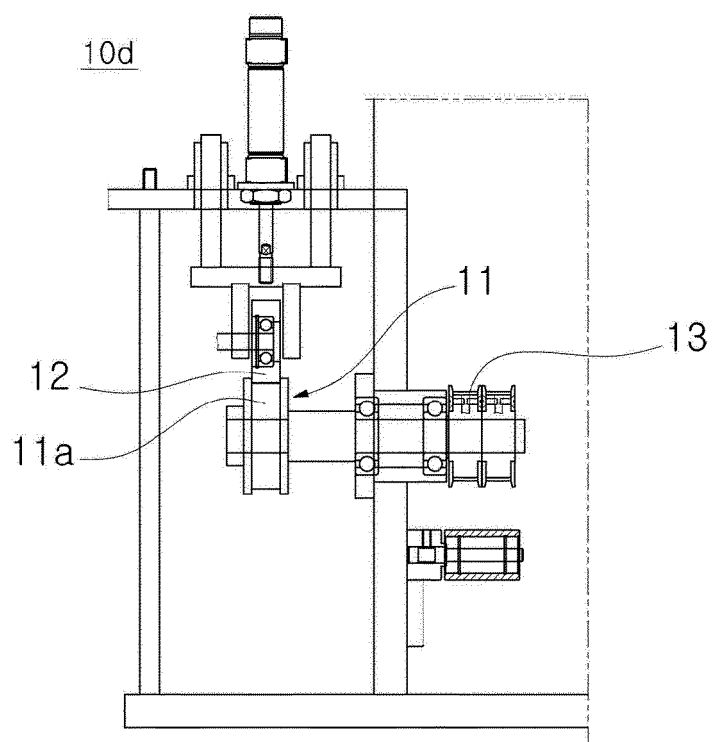


Fig. 3

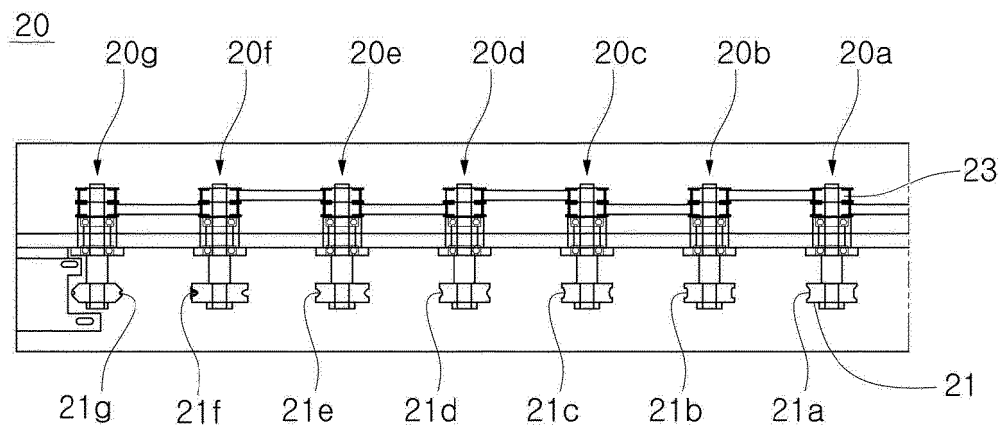


Fig. 4

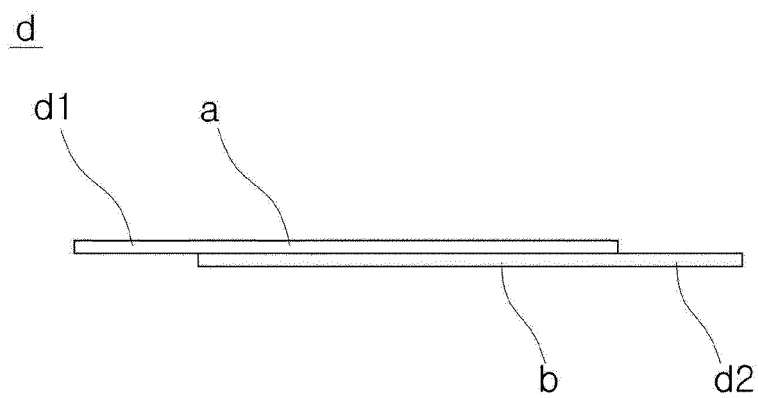


Fig. 5

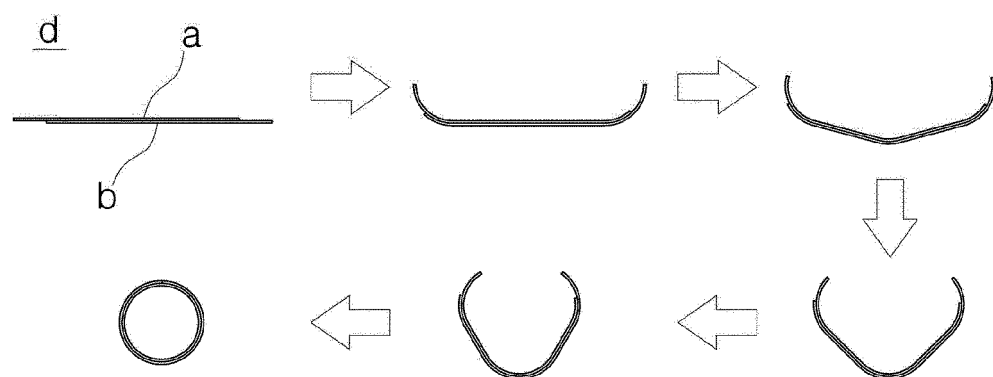


Fig. 6

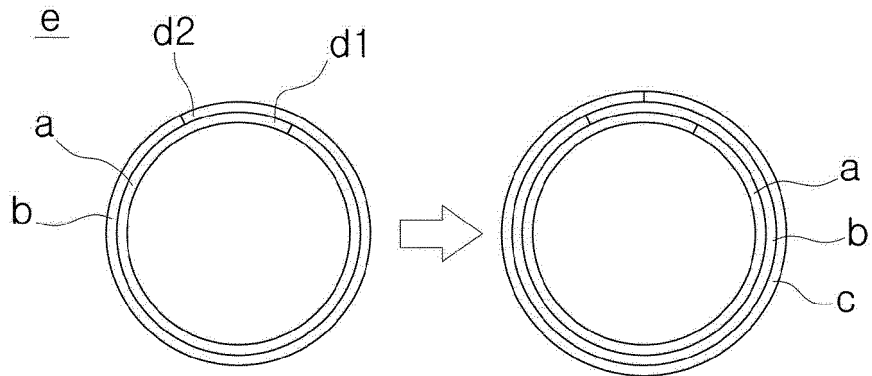


Fig. 7

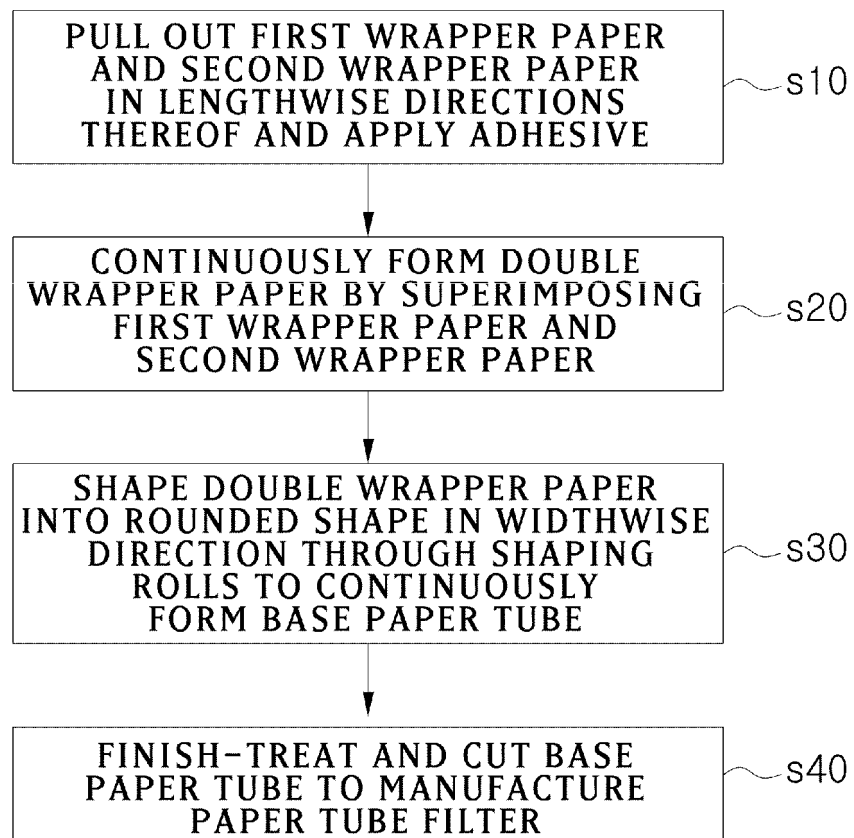


Fig. 8

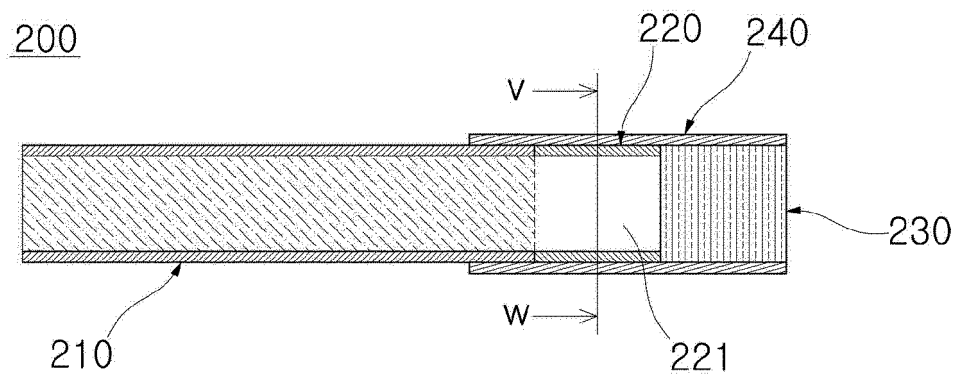
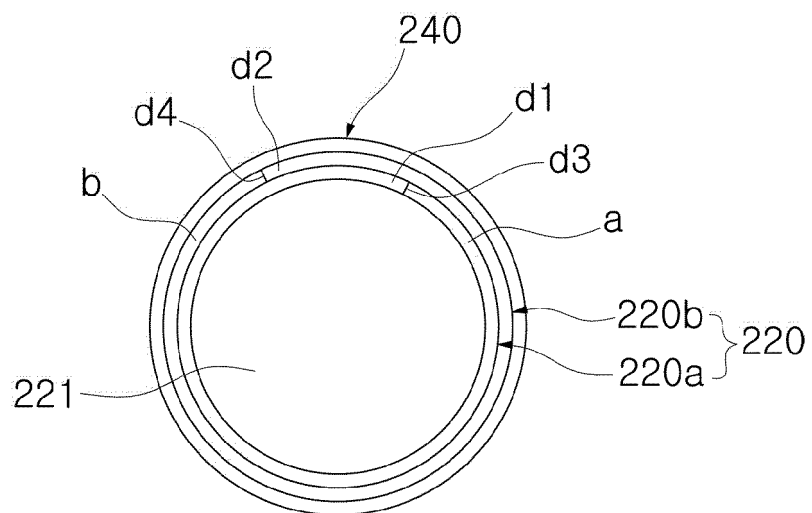


Fig. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2017/011812

A. CLASSIFICATION OF SUBJECT MATTER

A24D 3/02(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)

A24D 3/02; A24D 3/04; A24C 5/47; A24D 1/04; A24C 5/56; A24D 1/02; A24D 3/06; A24D 1/00

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

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: cigarette, winding paper, filter, cutting, adhesion, overlap

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-1506628 B1 (TAEYOUNG INDUSTRY CORP.) 27 March 2015 See claims 1-4; and figures 1-6.	1-9
A	JP 3921485 B2 (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 30 May 2007 See claims 1-28; and figures 1-7.	1-9
A	KR 10-2007-0005648 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) 10 January 2007 See claims 1-57; and figures 1-10.	1-9
A	KR 20-2014-0003734 U (KT & G CORPORATION) 18 June 2014 See claims 1-10; and figures 1-3.	1-9
A	JP 5877570 B2 (JAPAN TOBACCO INC.) 08 March 2016 See claims 1-7; and figures 1-14.	1-9

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents:

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“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

31 JANUARY 2018 (31.01.2018)

Date of mailing of the international search report

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Name and mailing address of the ISA/KR


 Korean Intellectual Property Office
 Government Complex-Daejeon, 189 Soonsa-ro, Daejeon 302-701,
 Republic of Korea

Facsimile No. +82-42-481-8578

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2017/011812

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