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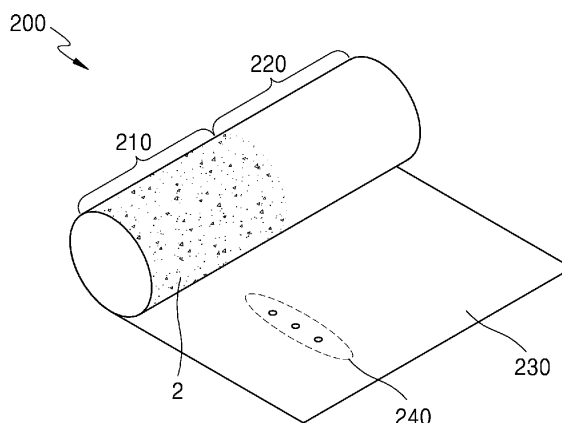
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(54) **FILTER, AEROSOL GENERATING ARTICLE COMPRISING SAME, AND METHOD FOR MANUFACTURING FILTER**

(57) A filter included in an aerosol-generating article, according to embodiments, includes a first filter segment including a first filter element in which at least one heterogeneous material particle is contained, a second filter segment including a second filter element, and a wrapper

wrapping the first filter segment and the second filter segment, wherein the first filter segment and the second filter segment are aligned in a longitudinal direction of the filter, and the first filter segment and the second filter segment are not physically separated.

FIG. 3



Description

TECHNICAL FIELD

[0001] Embodiments relate to a filter, an aerosol-generating article including the filter, and a filter manufacturing method.

BACKGROUND ART

[0002] There is an increasing demand for composite filters that are applied to cigarettes and smoking articles and additionally include a heterogeneous material different from a filtering material. The known composite filter is manufactured by respectively manufacturing a filter including only a filtering material and a filter including the heterogeneous material and by bonding the two types of filters. As such, composite filters are manufactured through a more complicated manufacturing process than filters that do not include the heterogeneous material, and thus, there is a problem in that variations occur in physical properties of the composite filters to be manufactured, or time and cost required for manufacturing the composite filters increase.

DESCRIPTION OF EMBODIMENTS

TECHNICAL PROBLEM

[0003] Provided are a filter that includes a heterogeneous material and reduces variations in physical properties thereof and an aerosol-generating article including the filter.

[0004] In addition, provided is a filter manufacturing method that may reduce variations in physical properties of a filter including a heterogeneous material manufactured by simplifying a process and reduce manufacturing time and cost.

[0005] Objects to be achieved by the embodiments are not limited to the above-described objects, and objects not described may be clearly understood by those skilled in the art to which the embodiments belong from the present specification and the accompanying drawings.

SOLUTION TO PROBLEM

[0006] An embodiment provides a filter included in an aerosol-generating article and including a first filter segment including a first filter element in which at least one heterogeneous material particle is contained, a second filter segment including a second filter element, and a wrapper wrapping the first filter segment and the second filter segment, wherein the first filter segment and the second filter segment are aligned in a longitudinal direction of the filter, and the first filter segment and the second filter segment are not physically separated.

[0007] Another embodiment provides an aerosol-generating article including the filter according to the embod-

iment.

[0008] Another embodiment provides a filter manufacturing method including a first operation of transporting a filter tow in one direction, a second operation of manufacturing a filter tow into which at least one heterogeneous material particle is injected at a preset length interval by injecting the heterogeneous material particle with a preset weight into the filter tow being transported at a preset period, a third operation of wrapping the filter tow into which the heterogeneous material particle is injected at the preset length interval with a wrapper, and a fourth operation of cutting the filter tow wrapped with the wrapper into filters each including the heterogeneous material particles.

[0009] Means for achieving the objects are not limited to the above description and may include all matters that may be inferred by those skilled in the art throughout the present specification.

ADVANTAGEOUS EFFECTS OF DISCLOSURE

[0010] In a filter manufacturing method according to the embodiments, a process may be simplified compared to the known method of manufacturing a filter including heterogeneous material particles, and thus manufacturing time may be reduced. Respective segments of a manufactured filter are not physically separated from each other, and thus, variations that may occur in physical properties, such as suction resistance, the length, and the circumference of the filter, may be reduced.

[0011] In addition, unlike the known composite filter including heterogeneous material particles, the present disclosure may perform wrapping by using only one wrapper, and thus, manufacturing cost may be reduced, and energy consumed to form perforations may be reduced.

[0012] Effects of the embodiments are not limited to the effects described above and may include all effects that may be inferred from configurations to be described below.

BRIEF DESCRIPTION OF DRAWINGS

[0013]

FIG. 1 is a view illustrating an example of a known composite filter including heterogeneous material particles.

FIG. 2 is a view illustrating an example of a process of manufacturing a known composite filter.

FIG. 3 is a view illustrating a filter according to an embodiment.

FIG. 4 is a view illustrating an example of a process of manufacturing a filter, according to an embodiment.

FIG. 5 is a flowchart of a method of manufacturing a filter, according to an embodiment.

FIG. 6A illustrates a process of manufacturing a filter,

according to an embodiment.

FIG. 6B illustrates a process of manufacturing a filter, according to another embodiment.

BEST MODE

[0014] One embodiment provides a filter included in an aerosol-generating article and comprising a first filter segment including a first filter element in which at least one heterogeneous material particle is contained, a second filter segment including a second filter element, and a wrapper wrapping the first filter segment and the second filter segment, wherein the first filter segment and the second filter segment are aligned in a longitudinal direction of the filter, and the first filter segment and the second filter segment are not physically separated.

[0015] The heterogeneous material particle may be at least one selected from a group consisting of activated carbon particles and tobacco particles.

[0016] The heterogeneous material particle may include activated carbon particles, and the first filter segment filter may include the activated carbon particles of 0.5 mg/mm to 5 mg/mm in the longitudinal direction of the filter.

[0017] The heterogeneous material particle may have diameters of 0.1 to 0.7 mm.

[0018] The first filter segment and the second filter segment may have a length ratio of 1:0.5 to 1.5 in the longitudinal direction of the filter.

[0019] The wrapper may include at least one perforation.

[0020] Another embodiment provides an aerosol-generating article including the filter according to the embodiment.

[0021] Another embodiment provides a filter manufacturing method comprising a first operation of transporting a filter tow in one direction, a second operation of manufacturing a filter tow into which at least one heterogeneous material particle is injected at a preset length interval by injecting the heterogeneous material particle with a preset weight into the filter tow being transported at a preset period, a third operation of wrapping the filter tow into which the heterogeneous material particle is injected at the preset length interval with a wrapper, and a fourth operation of cutting the filter tow wrapped with the wrapper into filters each including the heterogeneous material particle.

[0022] The heterogeneous material particle may be selected from a group consisting of activated carbon particles and tobacco particles.

[0023] The heterogeneous material particle may include activated carbon particles, and the preset weight may be 0.5 mg/mm to 5 mg/mm in a longitudinal direction of the filter tow.

[0024] The heterogeneous material particle may have diameters of 0.1 to 0.7 mm.

[0025] The preset length interval may be 5 to 30 mm.

[0026] The second operation may include an operation

of manufacturing the filter tow into which the at least one heterogeneous material particle is injected at the preset length interval by injecting at least one heterogeneous material particle with the preset weight into the filter tow being transported at the preset period, and an operation of causing the filter tow into which the at least one heterogeneous material particle is injected at the preset length interval to pass through a compressor and compressing the filter tow.

[0027] The second operation may include an operation of manufacturing a compressed filter tow by passing the filter tow through the compressor, an operation of manufacturing the filter tow into which the at least one heterogeneous material particle is injected at the preset length interval by injecting the heterogeneous material particle with the preset weight into the filter tow being transported at the preset period, and an operation of dispersing the heterogeneous material particle into the filter tow by spraying gas to the filter tow into which the heterogeneous material particle is injected at the preset length interval.

[0028] The filter manufacturing method according to the embodiment may further comprise a fifth operation of forming at least one perforation in the wrapper.

MODE OF DISCLOSURE

[0029] With respect to the terms used to describe in the various embodiments, the general terms which are currently and widely used are selected in consideration of functions of structural elements in the various embodiments of the present disclosure. However, meanings of the terms can be changed according to intention, a judicial precedence, the appearance of a new technology, and the like. In addition, in certain cases, a term which is not commonly used can be selected. In such a case, the meaning of the term will be described in detail at the corresponding portion in the description of the present disclosure. Therefore, the terms used in the various embodiments of the present disclosure should be defined based on the meanings of the terms and the descriptions provided herein.

[0030] In addition, unless explicitly described to the contrary, the word "comprise" and variations such as "comprises" or "comprising" will be understood to imply the inclusion of stated elements but not the exclusion of any other elements. In addition, the terms "-er", "-or", and "module" described in the specification mean units for processing at least one function and operation and can be implemented by hardware components or software components and combinations thereof.

[0031] Also, as used herein, terms including an ordinal number such as "first" or "second" may be used to describe various components, but the components should not be limited by the terms. Terms are used only for the purpose of distinguishing one component from another component.

[0032] Throughout the specification, an "aerosol-gen-

erating article" means an article used for smoking. For example, an aerosol-generating article may be a regular combustion cigarette used in a manner that is ignited and combusted or may be a heated cigarette used in a manner that is heated by an aerosol-generating device.

[0033] Throughout the specification, a "longitudinal direction of a filter" means a direction in which a length of the filter extends.

[0034] Throughout the specification, a "tobacco material" means any form of material including components derived from tobacco leaves.

[0035] Throughout the specification, a "filter element" means an element including a filtering material. For example, the filter element may include a plurality of fiber strands.

[0036] Hereinafter, the present disclosure will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the present disclosure are shown such that one of ordinary skill in the art may easily work the present disclosure. The disclosure may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein.

[0037] Hereinafter, embodiments of the present disclosure will be described in detail with reference to the drawings.

[0038] FIG. 1 is a view illustrating an example of a known composite filter including heterogeneous material particles, and FIG. 2 is a view illustrating an example of a process of manufacturing a known composite filter.

[0039] Referring to FIG. 1, a known composite filter 100 including heterogeneous material particles 2 includes only a first filter segment 110 including a filter element in which the heterogeneous material particles 2 are contained and a second filter segment 120 including only a filter element. The filter element of the first filter segment 110 includes a plurality of fiber strands, and the heterogeneous material particles 2 may be randomly dispersed between the plurality of fiber strands.

[0040] The known composite filter 100 including the heterogeneous material particles 2 includes a first inner wrapper 131 that wraps the first filter segment 110 and a second inner wrapper 132 that wraps the second filter segment 120. In addition, the known composite filter 100 including the heterogeneous material particles 2 includes an outer wrapper 133 that wraps both the first filter segment 110 wrapped by the first inner wrapper 131 and the second filter segment 120 wrapped by the second inner wrapper 132.

[0041] At least one perforation 140 may be formed in the outer wrapper 133 through which outside air flows into the filter 100 or internal air flows out of the filter 100. The same type of perforations may also be formed in positions of the first inner wrapper 131 or the second inner wrapper 132 corresponding to the at least one perforation 140 of the outer wrapper 133.

[0042] Referring to FIGS. 1 and 2, the known composite filter 100 including heterogeneous material particles

2 is manufactured by bonding a filter including a filter element in which the heterogeneous material particles 2 are contained to a filter including only a filter element. That is, respective filters are manufactured through two processes and two types of manufactured filters are bonded to each other through one process, and thus, a total of three processes are required. There may be variations in physical properties, such as suction resistance, the length, and the circumference of a filter, manufactured through multiple processes. In addition, the time required for manufacturing the filter may increase.

[0043] In addition, in manufacturing two types of filters, two wrappers are used for the two types of filters, and one wrapper is additionally used in the process of bonding the two types of filters. Accordingly, the number of wrappers required for manufacturing the filter is unnecessarily increased, which causes an increase in manufacturing cost.

[0044] Here, the perforations 140 of the wrappers are formed by a mechanical method, such as laser etching, and the known composite filter 100 including the heterogeneous material particles 2 is wrapped by overlapped multiple layers of wrappers, and thus, much energy may be unnecessarily consumed in forming the perforations 140.

[0045] FIG. 3 is a view illustrating a filter according to an embodiment, and FIG. 4 is a view illustrating an example of a process of manufacturing a filter, according to an embodiment.

[0046] Referring to FIG. 3, a filter 200 according to an embodiment includes a first filter segment 210 including a first filter element in which at least one heterogeneous material particle 2 is contained and a second filter segment 220 including a second filter element. The first filter segment 210 and the second filter segment 220 may be aligned in a longitudinal direction of the filter 200.

[0047] The filter 200 according to an embodiment may be included in an aerosol-generating article (not illustrated). The filter 200 may be included at one end of the aerosol-generating article, the generated aerosol may pass through the first filter segment 210 and the second filter segment 220 to form an airflow, and thus, a smoker may inhale the aerosol from the second filter segment 220.

[0048] The first filter segment 210 may include a first filter element in which at least one heterogeneous material particle 2 is contained. The at least one heterogeneous material particle 2 may be randomly dispersed inside and outside the first filter segment 210.

[0049] The heterogeneous material particle 2 may include at least one selected from a group consisting of activated carbon particles and tobacco particles and may include activated carbon. Activated carbon may be included in the filter 200 to adsorb gaseous materials based on strong adsorbability thereof and may be mainly used together with cellulose acetate fibers that filter out particulate materials, thereby performing a complementary function.

[0050] Tobacco particles may include particles including tobacco material. The tobacco material may include, for example, a tobacco leaf, a tobacco lateral vein, puffed tobacco, cut tobacco, cut plate leaf, reconstituted tobacco, tobacco extract, and combinations thereof. When the filter 200 including the first filter segment 210 in which tobacco particles are included is applied to an aerosol-generating article, nicotine may be generated from the tobacco particles by a high-temperature aerosol passing through the filter 200, and a taste of smoke may be increased.

[0051] In an embodiment, the heterogeneous material particles 2 may include activated carbon particles, and the first filter segment 210 may include activated carbon particles of about 0.5 mg/mm to about 5 mg/mm in a longitudinal direction of the filter. When the first filter segment 210 includes activated carbon particles with a weight in the numerical range described above, the filter 200 may have an appropriate suction resistance and have an increased adsorption effect of a gaseous material due to the activated carbon particles. The first filter segment 210 may include activated carbon particles of about 1 mg/mm to about 4 mg/mm in a longitudinal direction of the filter and include activated carbon particles of about 1.5 mg/mm to about 5 mg/mm.

[0052] The heterogeneous material particles 2 may each have a diameter of about 0.1 mm to about 0.7 mm. As the heterogeneous material particles 2 each have a diameter in the range described above, the heterogeneous material particles 2 may be uniformly distributed throughout the first filter element and at the same time, deviation of a circumference measured in a direction perpendicular to a longitudinal direction of the first filter segment 210 may be reduced. When diameters of the heterogeneous material particles 2 are less than 0.1 mm, the heterogeneous material particles 2 may be aggregated so as not to be uniformly distributed throughout the first filter element. In addition, when the diameters of the heterogeneous material particles 2 exceed about 0.7 mm, deviation of a circumference measured in a direction perpendicular to a longitudinal direction of the first filter segment 210 may increase. In addition, as the diameters of the heterogeneous material particles increase, weights of heterogeneous material particles increase, and thus, the heterogeneous materials may fall off the filter without being safely placed thereon, which may increase a weight of the filter and variation in suction resistance. The heterogeneous material particle 2 may have diameters of about 0.1 mm to about 0.7 mm, for example, about 0.15 mm to about 0.6 mm.

[0053] The first filter segment 210 may not be physically separated from the second filter segment 220. Here, "not physically separated" means that respective filter elements included in the first filter segment 210 and the second filter segment 220 are not bonded to each other in a separate state. That is, the first filter element and the second filter element may differ from each other only in whether the heterogeneous material particles 2 are in-

cluded therein and may include the same filter material. For example, the first filter element of the first filter segment 210 and the second filter element of the second filter segment 220 may include the same fiber strands, and the fiber strands may extend from one end of the filter 200 to the other end thereof. The first filter element and the second filter element may include cellulose acetate fibers but are not limited thereto and may include various types of filter materials known in the art.

[0054] The filter 200 may include a wrapper 230 wrapping the first filter segment 210 and the second filter segment 220. The wrapper 230 may include at least one perforation 240. Positions in which the at least one perforation 240 is formed may be appropriately adjusted according to characteristics of the aerosol-generating article to which the filter 200 is applied. For example, the at least one perforation 240 may be formed in positions corresponding to the first filter segment 210 to achieve a high aerosol dilution rate but is not limited thereto.

[0055] The first filter segment 210 and the second filter segment 220 may have a length ratio of 1:0.5 to 1.5 in a longitudinal direction of the filter 200.

[0056] As the first filter segment 210 and the second filter segment 220 have a length ratio in the numerical range described above, the filter 200 may have appropriate suction resistance. The first filter segment 210 and the second filter segment 220 may have a length ratio of 1:0.6 to 1.4, for example, 1:0.7 to 1.3, in the longitudinal direction of the filter 200.

[0057] The first filter segment 210 and the second filter segment 220 may each have a length of about 5 mm to about 30 mm in the longitudinal direction of the filter 200. Also, the first filter segment 210 and the second filter segment 220 may each have a length of about 6 mm to about 18 mm. For example, the first filter segment 210 may have a length of about 15 mm, and the second filter segment 220 may have a length of about 12 mm. In another example, the first filter segment 210 may have a length of about 12 mm, and the second filter segment 220 may have a length of about 15 mm.

[0058] Referring to FIGS. 3 and 4, the filter 200 according to an embodiment is manufactured by using a method by which a filter tow into which at least one heterogeneous material particle 2 is injected at a preset length interval is manufactured and then the filter tow is cut into a plurality of filters 200 each including the heterogeneous material particles 2. Therefore, because the filter 200 is manufactured through only a process of manufacturing a filter tow into which the heterogeneous material particles 2 are injected at a preset length interval and a process of cutting the filter tow, a manufacturing process may be simplified compared to the known composite filter 100 including the heterogeneous material particles 2 described above, and thus, manufacturing time may be reduced. Also, in the filter 200 according to an embodiment, the first filter segment 210 is not physically separated from the second filter segment 220, and thus, deviation that may occur in physical properties, such as suction

resistance, the length, and the circumference of the filter 200, may be reduced.

[0059] In addition, unlike the known composite filter 100 including the heterogeneous material particles 2 described above, packaging may be made by using only one wrapper 230, and thus, manufacturing cost may be reduced, and energy consumed to form the at least one perforation 240 may be reduced.

[0060] FIG. 5 is a flowchart of a method of manufacturing a filter, according to an embodiment.

[0061] Referring to FIG. 5, the method of manufacturing a filter may include a first operation S110, a second operation S120, a third operation S130, and a fourth operation S140.

[0062] The method of manufacturing a filter, according to the embodiment, will be described in detail with reference to FIGS. 6A and 6B.

[0063] FIG. 6A illustrates a process of manufacturing a filter, according to an embodiment, and FIG. 6B illustrates a process of manufacturing a filter, according to another embodiment.

[0064] The first operation S110 is an operation of transporting a filter tow 1 in one direction.

[0065] Referring to FIGS. 6A and 6B, in the first operation S110, a filter tow 1 may be fed into a transporter of a filter manufacturing apparatus to be transported in one direction at a constant speed. The filter tow 1 may include, for example, a tow made of cellulose acetate. However, the present disclosure is not limited thereto and may include various types of tows known in the art.

[0066] In a detailed example, the first operation may be performed by providing the filter tow 1 from a filter tow storage tank 10 in which the filter tow 1 is stored to the transporter. Here, the transporter may include at least one rollers 21, 22, and 23. The rollers 21, 22, and 23 may appropriately adjust a transport speed of the provided filter tow 1 such that respective fibers constituting the filter tow 1 may maintain a constant arrangement during transport.

[0067] The rollers 21, 22, 23 may include pairs of rollers 21, 22, and 23 arranged in a direction perpendicular to a transport direction of the filter tow 1, as illustrated in FIGS. 6A and 6B. The pairs of rollers 21, 22, and 23 may transport the provided filter tow 1 in one direction by rotating in opposite directions to each other.

[0068] For example, the pairs of rollers 21, 22, and 23 may include the rollers 21, 22, and 23 of which surfaces in contact with the filter tow 1 are formed of a rubber material and the rollers 21, 22, and 23 having a plurality of grooves formed at regular intervals in surfaces thereof in contact with the filter tow 1. The rollers 21, 22, and 23 of which surfaces are formed of a rubber material may transport the filter tow 1 by using friction with the filter tow 1. The rollers 21, 22, and 23 having a plurality of grooves formed at regular intervals in surfaces thereof allow fibers to maintain a uniform arrangement while the filter tow 1 is transported.

[0069] The method of manufacturing a filter, according

to the embodiment, may further include an operation of adding a plasticizer to the filter tow 1 being transported. Referring to FIGS. 6A and 6B, the filter tow 1 transported by the transport rollers 21, 22, and 23 may pass through a plasticizer injector 30. The plasticizer injector 30 may spray a plasticizer onto a surface of the filter tow 1 being transported.

[0070] The plasticizer may aggregate a plurality of fiber strands of the filter tow 1, and as the plurality of fiber strands are aggregated, the heterogeneous material particles 2 injected in a subsequent operation do not fall off from the filter tow 1 and maintain positions thereof. The plasticizer may include at least one materials selected from a group consisting of triacetin, triethyl citrate, and polyethylene glycol but is not limited thereto and may include various types of filter materials known in the art.

[0071] In the second operation S120, the filter tow 1 into which the heterogeneous material particles 2 are injected at a preset length interval is manufactured by injecting at least one heterogeneous material particle 2 with a preset weight into the filter tow 1 being transported at a preset period.

[0072] The heterogeneous material particles 2 may include at least one selected from a group consisting of activated carbon particles and tobacco particles and may include activated carbon. Activated carbon may be included in a filter to adsorb gaseous materials based on strong adsorbability thereof and may be mainly used together with cellulose acetate fibers that filter out particulate materials, thereby performing a complementary function.

[0073] Tobacco particles may include particles including tobacco material. The tobacco material may include, for example, a tobacco leaf, a tobacco lateral vein, puffed tobacco, cut tobacco, cut plate leaf, reconstituted tobacco, tobacco extract, and combinations thereof. When a filter including tobacco particles is applied to an aerosol-generating article, nicotine may be generated from the tobacco particles by a high-temperature aerosol passing through the filter 200, and a taste of smoke may be increased.

[0074] The second operation S120 may be performed by injecting the heterogeneous material particles 2 with a preset weight at a preset period into the filter tow 1 being transported at a fixed position. When the heterogeneous material particles 2 are repeatedly injected at a constant period at a fixed position, a portion including the heterogeneous material particles 2 and a portion that does not include the heterogeneous material particles 2 are repeatedly formed at regular length intervals in the filter tow 1 being transported. The injected heterogeneous material particles 2 may be randomly arranged between the plurality of fiber strands of the filter tow 1.

[0075] In a detailed example, referring to FIGS. 6A and 6B, the heterogeneous material particles 2 may be stored in a heterogeneous material particle storage tank 40 and may be injected into the filter tow 1 being transported from the heterogeneous material particle storage tank 40

by the heterogeneous material particle injector 41. The heterogeneous material particle injector 41 may be in the form of a gear wheel in which a plurality of grooves capable of accommodating the heterogeneous material particles 2 with a preset weight are formed at regular intervals. The heterogeneous material particle injector 41 in the form of a gear wheel may be provided at a lower portion of the heterogeneous material particle storage tank 40. As the heterogeneous material particle injector 41 in the form of a gear wheel accommodates the heterogeneous material particles 2 with a preset weight in the grooves formed at regular intervals and rotates, the heterogeneous material particles 2 may freely fall toward the filter tow 1 being transported.

[0076] Here, the preset period may mean a time interval between points in time when the heterogeneous material particles 2 start to be injected. The preset period may be adjusted by intervals between the plurality of grooves formed in the heterogeneous material particle injector 41 in the form of a gear wheel and a rotation speed of the heterogeneous material particle injector 41. For example, as the intervals between the plurality of grooves formed in the heterogeneous material particle injector 41 in the form of a gear wheel increases, the preset period may also increase. In addition, as the rotation speed of the heterogeneous material particle injector 41 increases, the preset period may be reduced.

[0077] The preset weight may mean a weight of the heterogeneous material particles 2 that are injected during injection of the heterogeneous material particles 2 once. For example, the preset weight may mean a weight of the heterogeneous material particle 2 accommodated in grooves of the heterogeneous material particle injector 41 in the form of a gear wheel.

[0078] In an embodiment, the heterogeneous material particles 2 may include activated carbon particles, and the preset weight may be about 0.5 mg/mm to about 5 mg/mm in a longitudinal direction of a filter tow. Here, the longitudinal direction of the filter tow refers to a direction in which a length of the filter tow extends. When the preset weight is in the numerical range described above, a manufactured filter may have an appropriate suction resistance, and at the same time, an adsorption effect of a gaseous material due to activated carbon particles may be increased. The preset weight may be about 1 mg/mm to about 4 mg/mm in a longitudinal direction of a filter tow, and for example, about 1.5 mg/mm to about 5 mg/mm.

[0079] The heterogeneous material particles 2 may have diameters of about 0.1 mm to about 0.7 mm. As the heterogeneous material particles 2 have diameters in the range described above, the heterogeneous material particles 2 may be uniformly distributed in the filter tow 1, and at the same time, deviation of a circumference measured in a direction perpendicular to a longitudinal direction of a filter may be reduced. When diameters of the heterogeneous material particles 2 are less than 0.1 mm, the heterogeneous material particles 2 may be aggregat-

ed so as not to be uniformly distributed in the filter tow 1. In addition, when the diameters of the heterogeneous material particles 2 exceed about 0.7 mm, deviation of a circumference measured in a direction perpendicular to a longitudinal direction of a manufactured filter may increase. In addition, as the diameters of the heterogeneous material particles increase, weights of heterogeneous material particles increase, and thus, the heterogeneous materials may fall off the filter without being safely placed thereon, which may increase a weight of the filter and variation in suction resistance. The heterogeneous material particle 2 may have diameters of about 0.1 mm to about 0.7 mm, for example, about 0.15 mm to about 0.6 mm.

[0080] Here, a preset length interval may mean a distance (that is, a length of a portion that does not include the heterogeneous material particles 2) between portions including the heterogeneous material particles 2. The preset length interval may be changed by adjusting a transport speed and a free fall distance of the filter tow 1. For example, as the transport speed of the filter tow 1 increases, a length of a portion including the heterogeneous material particles 2 may increase, and the distance between the portions including the heterogeneous material particles 2 may also increase. In addition, as the free fall distance increases, the length of the portion including the heterogeneous material particles 2 may increase, and the distance between the portions including the heterogeneous material particles 2 may be reduced.

[0081] For example, the preset length interval may be about 5 mm to about 30 mm. That is, the length of the portion that does not include the heterogeneous material particles 2 may be about 5 mm to about 30 mm. Here, the length of the portion including the heterogeneous material particles 2 may be about 5 mm to about 30 mm.

[0082] The portion including the heterogeneous material particles 2 and the portion that does not include the heterogeneous material particles 2 may have a length ratio of 1:0.5 to 1.5. By having a length ratio in the numerical range described above, a manufactured filter may have an appropriate suction resistance. A filter may have a length ratio of 1:0.6 to 1.4, for example, 1:0.7 to 1.3.

[0083] The second operation S120 may include an operation of manufacturing the filter tow 1 into which the heterogeneous material particles 2 are injected at a preset length interval by injecting at least one heterogeneous material particle 2 with a preset weight into the filter tow 1 being transported at a preset period, and an operation of causing the filter tow 1 into which the heterogeneous material particles 2 are injected at a preset length interval to pass through a compressor 50 and compressing the filter tow 1.

[0084] Referring to FIG. 6A, the filter tow 1 into which the heterogeneous material particles 2 are injected may pass through the compressor 50. The compressor 50 may provide more uniform density of a tow by compressing the filter tow 1 into which the heterogeneous material

particles 2 are injected, and in a subsequent third operation of wrapping the filter tow 1 with a wrapper (S130), it is possible to prevent a problem that the wrapper is damaged by pressure transferred from a great thickness of the filter tow 1. The compressor 50 may include a compression jet but is not limited thereto, and various types of compression devices known in the art may be used.

[0085] In addition, referring to FIG. 6B, the second operation S120 may include an operation of manufacturing a compressed filter tow 1 by passing the filter tow 1 through the compressor 50, an operation of manufacturing the filter tow 1 into which the heterogeneous material particles 2 are injected at a preset length interval by injecting at least one heterogeneous material particle 2 with a preset weight into the filter tow 1 being transported at a preset period, and an operation of dispersing the at least one heterogeneous material particle 2 into the filter tow 1 by spraying gas to the filter tow 1 into which the heterogeneous material particle 2 is injected at a preset length interval.

[0086] When the filter tow 1 is compressed before the heterogeneous material particles 2 are injected therein, the heterogeneous material particles 2 may not be injected into the filter tow 1 because the compressed filter tow 1 has a high density. Accordingly, the operation of dispersing the heterogeneous material particles 2 into the filter tow 1 by spraying gas to the filter tow 1 into which the heterogeneous material particles 2 are injected.

[0087] The operation of dispersing the heterogeneous material particles 2 into the filter tow 1 by spraying gas may be performed by a gas sprayer 80 including an air jet, but the present disclosure is not limited thereto, and various types of gas devices known in the art may be used.

[0088] The third operation S130 is an operation of wrapping the filter tow 1 into which the heterogeneous material particles 2 are injected at a preset length interval with a wrapper.

[0089] Referring to FIGS. 6A and 6B, the filter tow 1 into which the heterogeneous material particles 2 are injected at a preset length interval may be transported to a wrapping machine 60. The wrapping machine 60 may wrap the outside of the filter tow 1 with a wrapper. The wrapping machine 60 may wrap the filter tow 1 in a cylindrical shape with a wrapper and may fix the wrapper by using an adhesive. For example, after wrapping the filter tow 1 with a wrapper partially coated with a hot-melt adhesive, heat may be applied to fix the wrapper, but the present disclosure is not limited thereto, and various adhesives known in the art may be used.

[0090] The fourth operation S140 is an operation of cutting the filter tow 1 wrapped by a wrapper into filters each including heterogeneous material particles 2.

[0091] Referring to FIGS. 6A and 6B, the filter tow 1 wrapped by a wrapper may be transported to a cutter 70. The cutter 70 may cut the filter tow 1 wrapped by a wrapper in a preset length, and thus, filters may be manufactured. The cutter 70 may cut the filters to respectively

include the heterogeneous material particles 2. For example, as described above with reference to FIGS. 2 and 3, the filter tow 1 may be cut to include the first filter segment 210 including a first filter element in which at least one heterogeneous material particle 2 is contained and the second filter segment 220 including a second filter element.

[0092] The method of manufacturing a filter, according to the embodiment, may further include a fifth operation of forming at least one perforation in a wrapper. For example, formation of the perforations may be performed by using laser etching but is not limited thereto, and various methods known in the art may be used. As described above, in a method of manufacturing a filter according to an embodiment, the filter may be manufactured by using only one wrapper without overlapping a plurality of wrappers, and thus, energy consumed for forming the perforations may be reduced.

[0093] Those of ordinary skill in the art related to the present embodiments may understand that various changes in form and details can be made therein without departing from the scope of the characteristics described above. Therefore, the disclosed methods should be considered in a descriptive point of view, not a restrictive point of view. The scope of the present disclosure is defined by the appended claims rather than by the foregoing description, and all differences within the scope of equivalents thereof should be construed as being included in the present disclosure.

Claims

1. A filter included in an aerosol-generating article, the filter comprising:

a first filter segment including a first filter element in which at least one heterogeneous material particle is contained;
a second filter segment including a second filter element; and
a wrapper wrapping the first filter segment and the second filter segment,
wherein the first filter segment and the second filter segment are aligned in a longitudinal direction of the filter, and
the first filter segment and the second filter segment are not physically separated.

2. The filter of claim 1, wherein the heterogeneous material particle is at least one selected from a group consisting of activated carbon particles and tobacco particles.

3. The filter of claim 1, wherein

the heterogeneous material particle includes activated carbon particles, and

- the first filter segment filter includes the activated carbon particles of 0.5 mg/mm to 5 mg/mm in the longitudinal direction of the filter.
4. The filter of claim 1, wherein the heterogeneous material particle has a diameter of 0.1 to 0.7 mm. 5
 5. The filter of claim 1, wherein the first filter segment and the second filter segment have a length ratio of 1:0.5 to 1.5 in the longitudinal direction of the filter. 10
 6. The filter of claim 1, wherein the wrapper includes at least one perforation.
 7. An aerosol-generating article comprising the filter of claim 1. 15
 8. A filter manufacturing method comprising:
 - a first operation of transporting a filter tow in one direction; 20
 - a second operation of manufacturing a filter tow into which at least one heterogeneous material particle is injected at a preset length interval by injecting the heterogeneous material particle with a preset weight into the filter tow being transported at a preset period; 25
 - a third operation of wrapping the filter tow into which the heterogeneous material particle is injected at the preset length interval with a wrapper; and 30
 - a fourth operation of cutting the filter tow wrapped with the wrapper into filters each including the heterogeneous material particle. 35
 9. The filter manufacturing method of claim 8, wherein the heterogeneous material particle is selected from a group consisting of activated carbon particles and tobacco particles. 40
 10. The filter manufacturing method of claim 8, wherein
 - the heterogeneous material particle includes activated carbon particles, and
 - the preset weight is 0.5 mg/mm to 5 mg/mm in a longitudinal direction of the filter tow. 45
 11. The filter manufacturing method of claim 8, wherein the heterogeneous material particle has a diameter of 0.1 to 0.7 mm. 50
 12. The filter manufacturing method of claim 8, wherein the preset length interval is 5 to 30 mm.
 13. The filter manufacturing method of claim 8, wherein the second operation includes
 - an operation of manufacturing the filter tow into
 14. The filter manufacturing method of claim 8, wherein the second operation includes
 - an operation of manufacturing a compressed filter tow by passing the filter tow through the compressor,
 - an operation of manufacturing the filter tow into which the at least one heterogeneous material particle is injected at the preset length interval by injecting the heterogeneous material particle with the preset weight into the filter tow being transported at the preset period, and
 - an operation of dispersing the heterogeneous material particle into the filter tow by spraying gas to the filter tow into which the heterogeneous material particle is injected at the preset length interval.
 15. The filter manufacturing method of claim 8, further comprising a fifth operation of forming at least one perforation in the wrapper.
- which the at least one heterogeneous material particle is injected at the preset length interval by injecting at least one heterogeneous material particle with the preset weight into the filter tow being transported at the preset period, and an operation of causing the filter tow into which the at least one heterogeneous material particle is injected at the preset length interval to pass through a compressor and compressing the filter tow.

FIG. 1

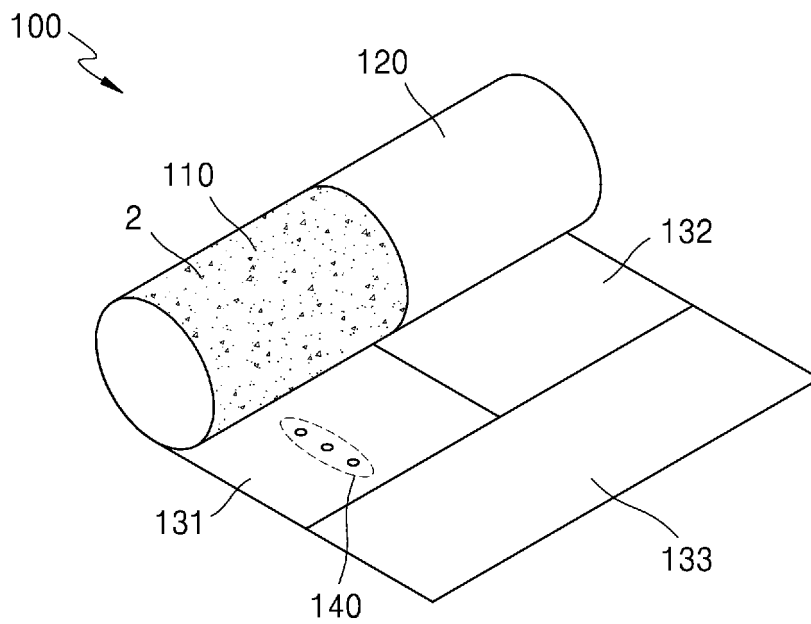


FIG. 2

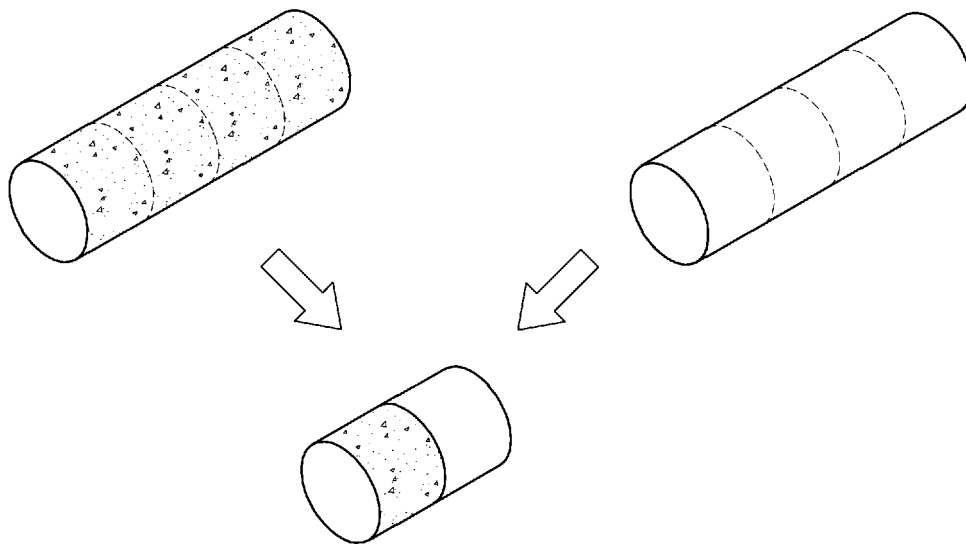


FIG. 3

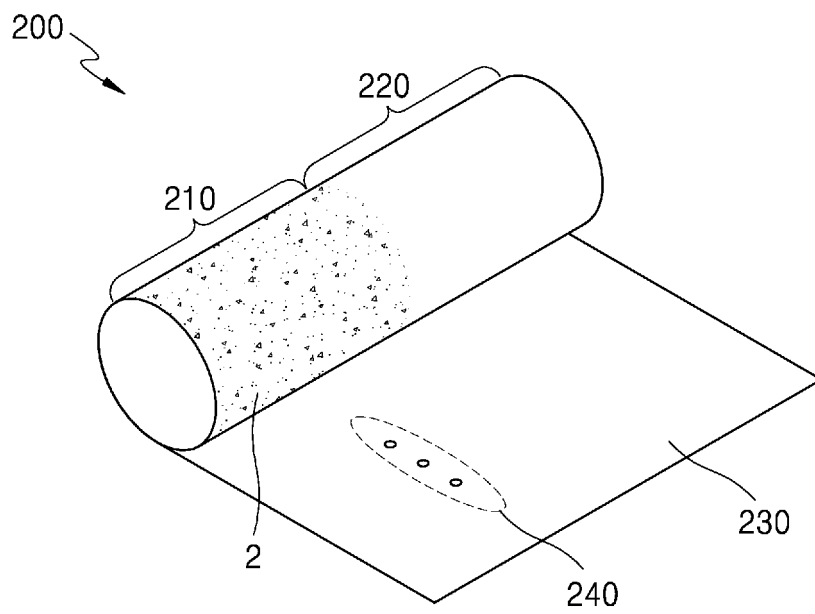


FIG. 4

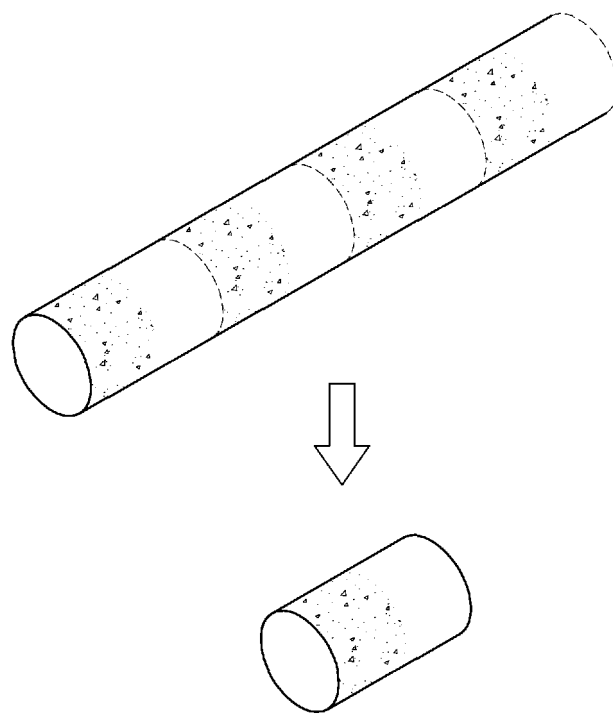


FIG. 5

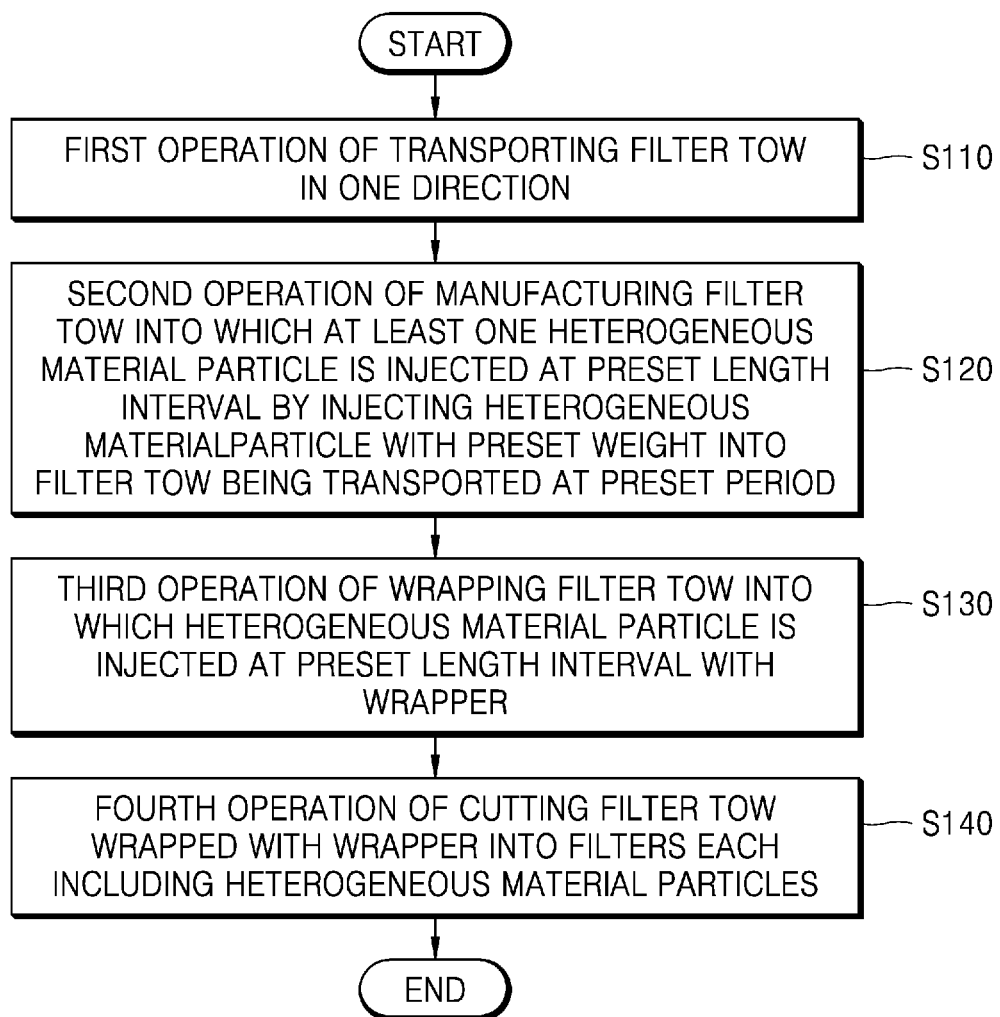


FIG. 6A

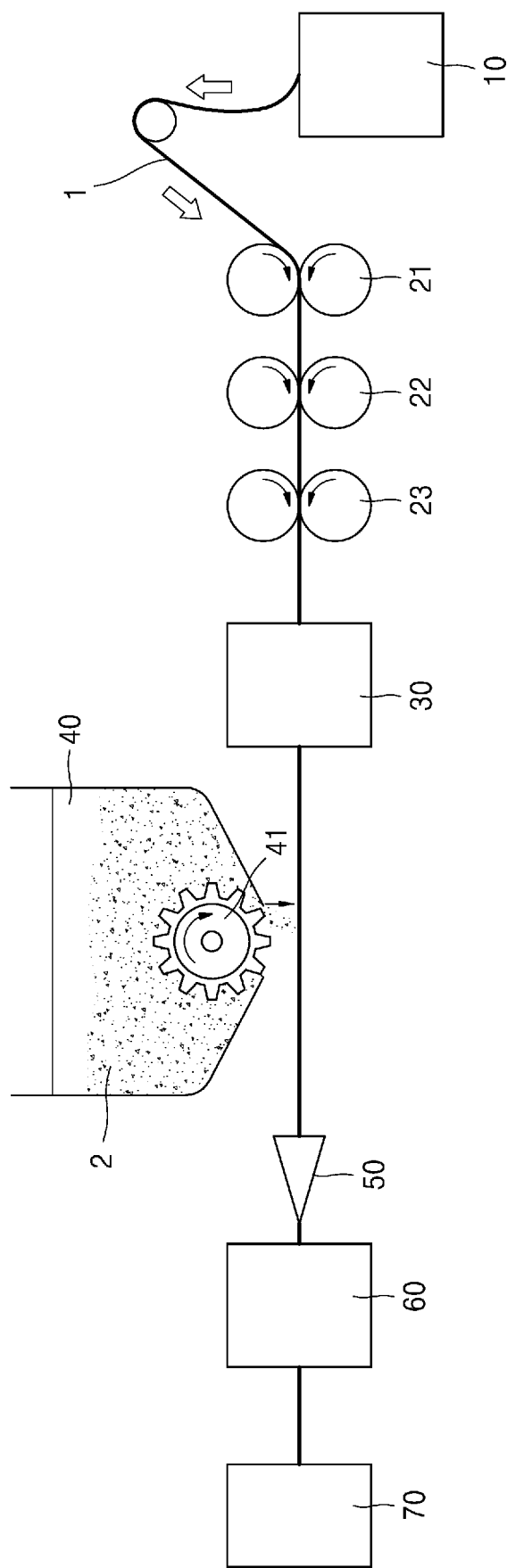
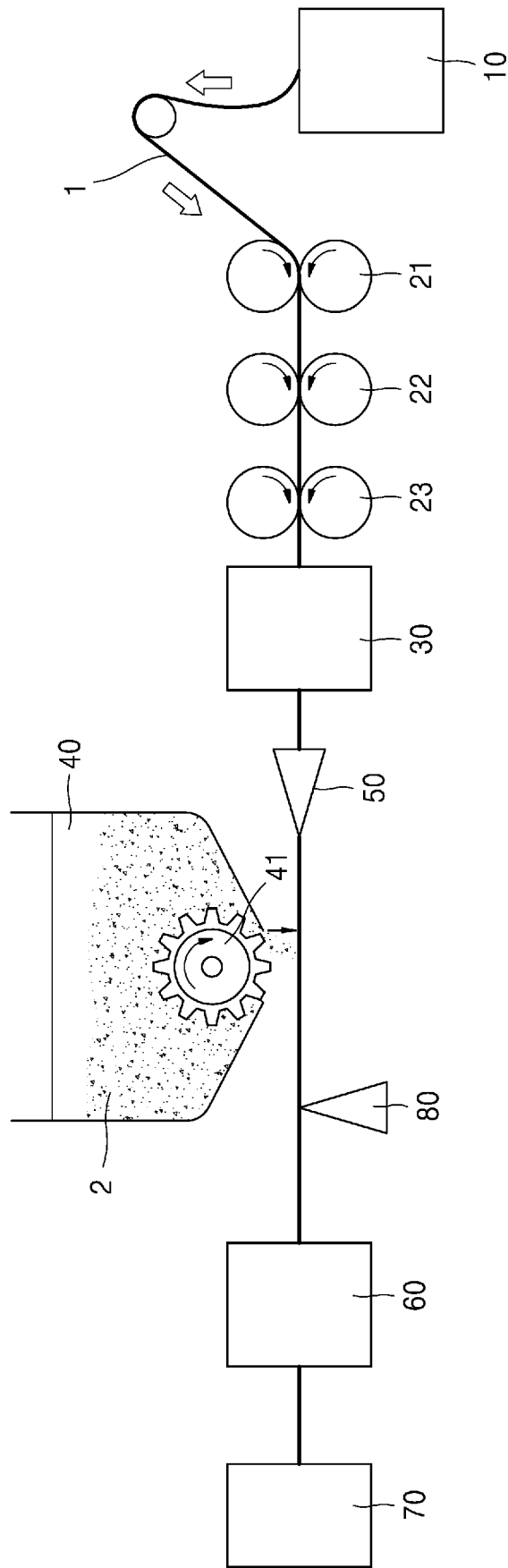


FIG. 6B



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2022/005697

A. CLASSIFICATION OF SUBJECT MATTER

A24D 3/02(2006.01)i; A24D 1/04(2006.01)i; A24D 1/02(2006.01)i; A24D 3/04(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(2006.01); A24B 15/28(2006.01); A24D 3/04(2006.01); A24D 3/06(2006.01); A24D 3/12(2006.01);
A24D 3/17(2020.01); A24F 40/70(2020.01)

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: 에어로졸(aerosol), 담배(cigarette), 필터(filter), 래퍼(wrapper), 천공(perforation),
활성탄(activated carbon)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“D” document cited by the applicant in the international application

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“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

20 July 2022

Date of mailing of the international search report

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Name and mailing address of the ISA/KR

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International application No.

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