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(54) **METHOD AND APPARATUS FOR MAKING A FILTER ELEMENT**

(57) There is disclosed a method for making a filter element (200) comprising the steps of: advancing two or more sheets of filtering material (102) in a longitudinal direction; separating the two or more sheets of longitudinally advancing filtering material (102); gathering the separated sheets of longitudinally advancing filtering material to form a partially gathered rod of filtering material

having a longitudinally extending recess; inserting an additive release vessel (204) into the longitudinally extending recess; gathering the filtering material around the additive release vessel to close the recess and thereby form a rod comprising a longitudinally extending core of filtering material and one or more additive release vessels (204).

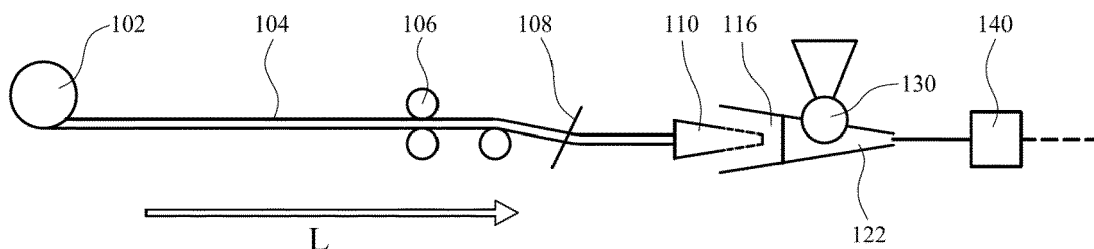


Figure 1

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Description

[0001] The present invention relates filter elements and filters, methods for making filter elements, and an apparatus for making filter elements.

[0002] Tobacco filter elements or filters which include a frangible capsule are known in the art. The frangible capsule typically contains a liquid additive which may modify the properties of the tobacco smoke which passes through the filter or filter element. For example, the capsule may contain a flavourant such as menthol that modifies the flavour and other sensory properties of the tobacco smoke. Typically, the capsule is broken by the user prior to smoking such that the contents of the capsule is released into the surrounding filtering material.

[0003] Tobacco filter elements or filters typically include a core comprising cellulose acetate filtering material. Cellulose acetate filtering material can be slow to degrade under normal environmental conditions. Filtering material made from paper or other non-woven materials can have improved degradability and other properties.

[0004] Methods for making a filter element containing a capsule in which the filter element is formed from cellulose acetate tow are known in the art. Inserting a capsule into a filter element formed from sheet filtering material such as paper or a nonwoven material is more challenging, and problems relating to capsule placement and filtering material homogeneity are common. To date, the applicant is not aware of any commercially available capsule containing filters or filter elements formed from paper filtering material.

[0005] There is a need for new methods and apparatus for making filter elements including capsules and that are formed from sheet filtering material such as paper or non-woven materials. There is also a need for new filters or filter elements which include capsules and are formed from sheet filtering material such as paper or non-woven materials.

[0006] In a first aspect of the present invention there is provided a method for making a filter element comprising the steps of: advancing two or more sheets of filtering material in a longitudinal direction; separating the two or more sheets of longitudinally advancing filtering material; gathering the separated sheets of longitudinally advancing filtering material to form a partially gathered rod of filtering material having a longitudinally extending recess; inserting an additive release vessel into the longitudinally extending recess; gathering the filtering material around the additive release vessel to close the recess and thereby forming a rod comprising a longitudinally extending core of filtering material and one or more additive release vessels.

[0007] The applicant has found that using two or more sheets of filtering material and separating the two or more sheets before these are gathered leads to a partially gathered rod of filtering material which has a longitudinally extending recess, into which one or more capsules can

be inserted. The formation of the recess leads to improved capsule positioning in filter elements made from sheet filtering material, such as paper or a non-woven material. The applicant has also found that the process of the invention leads to a filter element formed from sheet filtering material having improved homogeneity.

[0008] The two or more sheets of filtering material advancing longitudinally may be continuously advancing longitudinally.

[0009] The two or more sheets of longitudinally advancing filtering material may be separated such that there is a gap between the two or more sheets of longitudinally advancing filtering material, and the size of the gap may reduce as the two or more sheets are partially gathered. Prior to capsule insertion, the two or more sheets of filtering material are not completely gathered, and the size of the gap between the two sheets reduces to form a recess in the rod of partially gathered filtering material. As the two or more sheets are gathered, the two or more sheets may remain substantially vertically aligned. Herein vertically aligned means aligned in the plane perpendicular to the plane in which the sheets of filtering material longitudinally advance and perpendicular to the plane that is transverse to plane in which the sheets of filtering material longitudinally advance.

[0010] Preferably, the two or more sheets of longitudinally advancing filtering material are separated by a separator. Preferably, the step of gathering the separated two or more sheets of longitudinally advancing filtering material comprises drawing the separated two or more sheets of longitudinally advancing filtering material into a gathering chamber.

[0011] The applicant has found that the separator keeps the folds of the sheet material apart such that the capsule can be placed into the centre of the partially gathered filtering material, so leading to improved capsule positioning.

[0012] Preferably, the gathering chamber is a hollow element configured to gather or condense filtering material.

[0013] Preferably, the separator is coupled to the gathering chamber such that the two or more sheets of longitudinally advancing filtering material are separated before entering the gathering chamber, and the separator prevents complete gathering of the two or more sheets of longitudinally advancing filtering material to thereby form a longitudinally extending recess in the partially gathered filtering material.

[0014] The gathering chamber may comprise an inlet for receiving the separated sheets of filtering material and an outlet for the gathered or partially gathered filtering material to exit. Preferably, the gathering chamber is tapered longitudinally from the inlet, such that the inlet has a larger internal diameter than the outlet. The gathering chamber acts to gather (for example condense) the two or more sheets of filtering material into a partially gathered rod of filtering material having a longitudinally extending recess. The gathering chamber may comprise

an aperture for receiving an inserter for inserting one or more additive release vessels into the longitudinally extending recess. The aperture may be positioned between the inlet and the outlet.

[0015] Following insertion of the or each additive release vessel, the gathering chamber may further gather the partially gathered filtering material around the additive release vessel to close the recess and thereby form a rod comprising a longitudinally extending core of filtering material and one or more additive release vessels. The gathering chamber may be tapered after or from the aperture to thereby further gather the partially gathered filtering material. The further gathering may alternatively be performed by a further gathering chamber joined to the first gathering chamber.

[0016] A further step of applying an outer wrapper may help to complete the gathering of the partially gathered rod of filtering material and complete the closing of the longitudinally extending recess.

[0017] Preferably, the separator is longitudinally tapered. The separator may have a first end having a first diameter, and a second end having a second diameter, wherein the second diameter is smaller than the first diameter. The separator may extend into and along at least part of the length of the gathering chamber. The first end of the separator may protrude from the gathering chamber and the second end of the separator may be positioned inside the gathering chamber. The separator may be tapered in the same direction as the gathering chamber. The separator may be substantially conical or frustoconical. The tapered shape of the separator separates the two or more sheets of filtering material while also facilitating the partial gathering of the sheets of filtering material. The gathering chamber may be tapered in the same direction as the separator so thereby partially gathering the two or more sheets of filtering material. The applicant has found that even at the point at which the separator is narrowest, the two or more sheets of filtering material remain separated, and after the sheets of filtering material advance beyond the separator, a recess remains in the partially gathered rod, and the recess can receive the or each additive release vessels.

[0018] The applicant has found that the configuration of the separator and the gathering chamber maintains alignment of the two or more sheets of filtering material. For example, vertical alignment of the two or more sheets of filtering material is maintained. Herein vertical alignment means alignment in the plane perpendicular to the plane in which the sheets of filtering material longitudinally advance and perpendicular to the plane that is transverse to plane in which the sheets of filtering material longitudinally advance. The applicant has found that maintaining the alignment of the two or more sheets of filtering material whilst the filtering material is gathered leads to a core of filtering material having improved homogeneity and assists with capsule placement.

[0019] In one embodiment, the separated two or more longitudinally advancing sheets of filtering material may

be drawn into a preliminary chamber before entering the gathering chamber. The preliminary chamber may comprise an inlet and an outlet. The preliminary chamber may be tapered longitudinally away from the inlet. The inlet may have a larger internal diameter than the outlet. The outlet of the preliminary chamber may be joined to the inlet of the gathering chamber, and the separator may extend into and along at least part of the length of the preliminary chamber. The first end of the separator may protrude from the preliminary chamber and the second end of the separator may be positioned inside the preliminary chamber. The preliminary chamber and the separator may be configured such that the two or more sheets of longitudinally advancing filtering material are separated before entering the preliminary chamber, and the separator prevents complete gathering of the two or more sheets of longitudinally advancing filtering material to thereby form a longitudinally extending recess in the partially gathered filtering material.

[0020] The applicant has found that the presence of a preliminary chamber helps to partially gather the filtering material before it enters the gathering chamber. In the case of the method of the invention utilising a preliminary chamber, the gathering chamber comprises an inlet joined to the outlet of the preliminary chamber and, the gathering chamber comprises an aperture for receiving the inserter. The gathering chamber may taper longitudinally from or after the aperture to thereby gather the two or more sheets of filtering material around the additive release vessel to close the recess and thereby form a continuous rod comprising a longitudinally extending core of filtering material and one or more additive release vessels.

[0021] The additive release vessel inserter may comprise a rotating drum or wheel that rotates to thereby insert an additive release vessel into the recess at regular intervals.

[0022] The method may comprise a step of cutting the rod to form a filter element comprising a longitudinally extending core of filtering material and one or more additive release vessels.

[0023] The method may comprise a step of advancing a sheet of filtering material in the longitudinal direction; and cutting the sheet longitudinally to thereby form two or more sheets of longitudinally extending filtering material. The two or more sheets of filtering material continue to advance longitudinally following the cutting. The sheet of longitudinally advancing filtering material may be cut to form two, three four or more sheets of longitudinally extending filtering material. Alternatively, the filtering material may be cut by a separate process and wound on to a reel for use in the methods of the invention.

[0024] The two or more sheets of filtering material may be embossed. For example, the method may comprise a step of embossing the two or more sheets of longitudinally extending filtering material. The embossing imparts an embossed profile onto the two or more sheets of filtering material. The embossing may be carried out

by an embosser. The embosser may comprise a rotating drum (for example an embossing roller) comprising projections (e.g. spikes) extending away from the surface of the drum (for example the surface of the embossing roller). The applicant has found that the step of embossing the two or more sheets leads to a filter element having a desired pressure drop and a compact or dense end visual appearance.

[0025] The two or more sheets of filtering material may comprise 2, 3 or 4 sheets of filtering material.

[0026] The two or more sheets of filtering material may each have a width of 50 to 200mm, for example 75 to 175mm, for example 80 to 150mm, for example 90 to 125mm, for example 100 to 120mm, for example 110mm.

[0027] The two or more sheets of filtering material may have a thickness of from 50 μm to 100 μm , for example 60 μm to 90 μm , for example, 70 μm to 90 μm , for example 80 μm to 90 μm , for example 82 μm to 88 μm , for example 83 μm to 87 μm , for example 84 μm to 86 μm , for example 85 μm .

[0028] The filtering material may be tobacco filtering material. The filtering material may comprise paper or a non-woven material such as an air laid non-woven materials such as McAirLaid material, a melt-spun non-woven material, and/or a melt-blown non-woven material.

[0029] Preferably, the filtering material comprises or is paper.

[0030] The paper may have a basis weight of from 25 g/m^2 to 65 g/m^2 , for example 30 to 60 g/m^2 , for example 30 to 50 g/m^2 , for example 30 to 40 g/m^2 , for example 32 to 38 g/m^2 , for example 33 to 37 g/m^2 , for example 36 g/m^2 .

[0031] Preferably, the additive release vessel may be a capsule, for example a frangible capsule. The additive release vessel, such as a capsule, such as a frangible capsule, may comprise an additive. The additive may comprise a smoke modifying agent such as a flavourant and/or a liquid, solid or other material e.g. to aid smoke filtration. The flavourant may, for example, be menthol, spearmint, peppermint, nutmeg, cinnamon, clove, lemon, chocolate, peach, strawberry, vanilla or the like.

[0032] The method may comprise a step of wrapping the continuous rod comprising a longitudinally extending core of filtering material and one or more additive release vessels before the continuous rod is cut. The step of wrapping may comprise applying an outer wrapper, for example a plug wrap, which surrounds the continuous rod.

[0033] The method may comprise a step of applying an additive material to the two or more sheets of filtering material. The additive may be applied following the step of embossing. The additive may be a taste modifying agent and/or a flavourant. The flavourant may, for example, be menthol, spearmint, peppermint, nutmeg, cinnamon, clove, lemon, chocolate, peach, strawberry, vanilla or the like.

[0034] In a further aspect of the present invention, there is provided a filter element obtained according to

the method of the present invention, for example according to the method of any statement set out above.

[0035] In a further aspect of the present invention, there is provided a filter element comprising a longitudinally extending core of filtering material and an additive release vessel within the longitudinally extending core of filtering material; wherein the longitudinally extending core of filtering material is formed from two or more sheets of filtering material.

[0036] The additive release vessel may be a capsule such as a frangible capsule. The additive release vessel, such as a capsule, such as a frangible capsule, may comprise an additive. The additive may comprise a smoke modifying agent such as a flavourant and/or a liquid, solid or other material e.g. to aid smoke filtration. The flavourant may, for example, be menthol, spearmint, peppermint, nutmeg, cinnamon, clove, lemon, chocolate, peach, strawberry, vanilla or the like. The amount of additive, for example flavourant, may be less than 35 mg per filter element.

[0037] The additive release vessel, such as a capsule or frangible capsule, may be spherical. The additive release vessel (such as a capsule or frangible capsule) may have a width at its broadest point of 2.0 to 4mm, for example 2.8 to 3.5 mm.

[0038] The filter element may be formed from 2, 3, 4 or more sheets of filtering material.

[0039] The two or more sheets of filtering material may each have a width of 50 to 200mm, for example 75 to 175mm, for example 80 to 150mm, for example 90 to 125mm, for example 100 to 120mm, for example 110mm.

[0040] The two or more sheets of filtering material may have a thickness of from 50 μm to 100 μm , for example 60 μm to 90 μm , for example, 70 μm to 90 μm , for example 80 μm to 90 μm , for example 82 μm to 88 μm , for example 83 μm to 87 μm , for example 84 μm to 86 μm , for example 85 μm .

[0041] The filtering material may comprise a paper or non-woven material. The non-woven material may be an air laid non-woven material, such as McAirLaid material, a melt-spun non-woven material, and/or a melt-blown non-woven material.

[0042] The paper may have a basis weight of from 25 g/m^2 to 65 g/m^2 , for example 30 to 60 g/m^2 , for example 30 to 50 g/m^2 , for example 30 to 40 g/m^2 , for example 32 to 38 g/m^2 , for example 33 to 37 g/m^2 , for example 36 g/m^2 .

[0043] The two or more sheets of filtering material may be embossed.

[0044] The outer circumference of the filter element may be between 14 and 26 mm, for example between 16 and 26 mm.

[0045] The length of the filter element may be between 4.0 mm and 50 mm, for example between 5mm and 32mm. The filter element may be for use as part of a tobacco smoke filter or filter for a non-tobacco smokable material, for example marijuana. The filter element of the present invention may be incorporated into a multi-seg-

ment filter as a single segment. This would allow for an increase in the number of features that could be incorporated into the filter. For example, a filter element according to any statement set out above may be joined with a further filter element.

[0046] The filter element of the present invention may be incorporated into a smoking article, such as a cigarette, cigarillo, cigar and the like. The filter element of the present invention may be incorporated into a tobacco heating product or an e-cigarette. The filter element may also be used alone or as part of a filter which is assembled by a user to form a smoking article, for example a roll-your-own smoking article.

[0047] In a further aspect of the present invention, there is provided a filter, for example a tobacco smoke filter, comprising a filter element according to any statement set out above. The filter, for example a tobacco smoke filter, may further comprise one or more further filter element(s). Such a filter which comprises more than one filter element may be referred to as a multi segment filter.

[0048] The filter may comprise an outer wrapper, for example plugwrap, which surrounds the filter element or one or more filter elements. The wrapper may be paper, for example an air permeable paper. The wrapper may have a basis weight from 20 to 100 grams per square metre, for example from 20 to 50 grams per square metre. The wrapper may be coated. The further filter element may be wrapped by an outer wrapper, for example a plugwrap, which surrounds the further filter element. The filter element as defined according to any statement set out above and a further filter element may together be wrapped by an outer wrapper, such as a plug wrap. The outer wrapper may function to join the filter elements and secure them in place.

[0049] In a further aspect of the present invention there is provided a smoking article comprising a filter or filter element as described above. The smoking article may include a filter as set out above that is joined to a wrapped rod of smoking material such as tobacco smoking material. The smoking article may further comprise a tipping wrapper, for example a tipping paper. The tipping wrapper joins the wrapped rod of smoking material to the filter by engaging around the adjacent ends of the filter and the wrapped rod of smoking material. The tipping wrapper may be configured to leave some of the outer surface of the filter or filter wrapper exposed. Alternatively, the filter may be joined to the wrapped rod of smoking material by a full tipping wrapper which engages around the full filter or mouthpiece length and the adjacent end of the rod of smoking material.

[0050] The filter element, filter or smoking article according to the invention may be unventilated, or may be ventilated by methods well known in the art, e.g. by use of a pre-perforated or air-permeable filter wrapper (plugwrap) or tipping wrapper (tipping paper), and/or laser perforation of the filter wrapper and/or tipping wrapper. The mouthpiece, filter, filter element or smoking article ac-

ording to the invention may be ventilated by laser perforation of the longitudinally extending core of filtering material (as well as wrapper(s) (plugwrap) and tipping wrapper (tipping paper) if present). A ventilating full tipping wrapper (tipping paper) may likewise be inherently air-permeable or may be provided with ventilation holes, and for ventilated products where both filter wrapper (plugwrap) and tipping wrapper (tipping paper) are present, ventilation through the tipping wrapper (tipping paper) will usually be in register with that through the filter wrapper (plug wrap). Ventilation holes through a filter wrapper (plugwrap), or through a tipping wrapper (tipping paper), or through both simultaneously, may be made by laser perforation during mouthpiece, filter or filter element production.

[0051] In a further aspect of the present invention there is provided a multiple rod comprising a plurality of filter elements according to the invention arranged end-to-end in a mirror image relationship.

[0052] In a further aspect of the present invention, there is provided an apparatus for making a filter element comprising: a separator for separating two or more longitudinally advancing sheets of filtering material; a gathering chamber configured to gather the separated longitudinally advancing sheets of filtering material and form a rod of partially gathered filtering material; wherein the separator is coupled to the gathering chamber, such that the separator and the gathering chamber are configured to form a longitudinally extending recess in the rod of partially gathered filtering material; and an inserter configured to insert one or more additive release vessels into the longitudinally extending recess.

[0053] Preferably the gathering chamber is a hollow section configured to gather or condense filtering material to form a longitudinally extending rod of filtering material.

[0054] Preferably, the separator and gathering chamber are coupled such that the two or more sheets of longitudinally advancing filtering material are separated before entering the gathering chamber, and the separator prevents complete gathering of the two or more sheets of longitudinally advancing filtering material to thereby form a longitudinally extending recess in the partially gathered filtering material.

[0055] The gathering chamber may comprise an inlet for receiving the separated sheets of filtering material and an outlet for the gathered or partially gathered filtering material to exit. Preferably, the gathering chamber is tapered longitudinally away from the inlet, such that the inlet has a larger internal diameter than the outlet. The gathering chamber acts to gather (for example condense) the two or more sheets of filtering material into a partially gathered rod of filtering material having a longitudinally extending recess.

[0056] Preferably, the separator may be longitudinally tapered. The separator may have a first end having a first diameter, and a second end having a second diameter, wherein the second diameter is smaller than the

first diameter. The separator may extend into and along at least part of the length of the gathering chamber. The first end of the separator may protrude from the gathering chamber and the second end of the separator may be positioned inside the gathering chamber. The separator may be tapered in the same direction as the gathering chamber.

[0057] The separator may be substantially conical or frustoconical. The tapered shape of the separator is configured to separate the two or more sheets of filtering material while also facilitating the partial gathering of the sheets of filtering material. The gathering chamber may be tapered in the same direction as the separator so thereby partially gathering the two or more sheets of filtering material. The applicant has found that even at the point at which the separator is narrowest, the two or more sheets of filtering material remain separated, and after the sheets of filtering material advance beyond the separator, a recess remains in the partially gathered rod, and the recess can receive the or each additive release vessels.

[0058] The applicant has found that the configuration of the separator and the gathering chamber maintains alignment of the two or more sheets of filtering material. For example, vertical alignment of the two or more sheets of filtering material is maintained. Herein vertical alignment means alignment in the plane perpendicular to the plane in which the sheets of filtering material longitudinally advance and perpendicular to the plane that is transverse to plane in which the sheets of filtering material longitudinally advance. The applicant has found that maintaining the alignment of the two or more sheets of filtering material whilst the filtering material is gathered leads to a core of filtering material having improved homogeneity and also assists with capsule placement. The applicant has found that the separator keeps the folds of the sheet material apart such that the capsule can be placed into the centre of the partially gathered filtering material, so leading to improved capsule positioning.

[0059] The gathering chamber may comprise an aperture, for example a longitudinally extending aperture, for receiving the inserter. This configuration enables the inserter to insert one or more additive release vessels into the recess formed in the partially gathered rod of filtering material. The gathering chamber may be tapered from or after the aperture to facilitate further gathering of the partially gathered rod of filtering material around the additive release vessel to close the recess and thereby form a continuous rod comprising a longitudinally extending core of filtering material and one or more additive release vessels.

[0060] The separator may extend into and along at least part of the length of the gathering chamber, but the separator does not extend as far as the longitudinally extending aperture. This configuration allows for the one or more additive release vessels to be inserted into the recess.

[0061] In an embodiment, the apparatus may comprise

a preliminary chamber comprising: an inlet and an outlet; wherein the preliminary chamber is tapered longitudinally away from the inlet. The inlet may have a larger internal diameter than the outlet.

5 **[0062]** The separator may be longitudinally tapered and extends into and along at least part of the length of the preliminary chamber. The first end of the separator may protrude from the preliminary chamber and the second end of the separator may be positioned inside the preliminary chamber. The separator may be tapered in the same direction as the preliminary chamber. The separator being tapered in the same direction as the preliminary chamber means that the separator is able to be positioned partially inside of the preliminary chamber.

10 **[0063]** The applicant has found that the preliminary chamber helps to partially gather the filtering material before it enters the gathering chamber.

15 **[0064]** In this embodiment, the gathering chamber comprises an inlet joined to the outlet of the preliminary chamber, and the gathering chamber comprises an aperture for receiving the inserter. The gathering chamber may taper longitudinally from the end of the aperture to thereby gather the two or more sheets of filtering material around the additive release vessel to close the recess and thereby form a continuous rod comprising a longitudinally extending core of filtering material and one or more additive release vessels.

20 **[0065]** The apparatus may comprise a cutter configured to cut a single sheet of filtering material into two or more longitudinally extending sheets of filtering material. The cutter may be configured to cut the single sheet of filtering material into two, three, four or more longitudinally extending sheets of filtering material.

25 **[0066]** The inserter may comprise a rotating drum or wheel configured to insert the or each additive release vessel into the longitudinally extending recess.

30 **[0067]** The apparatus may comprise a rod cutter configured to cut a rod comprising a longitudinally extending core of filtering material and one or more additive release vessels to form a filter element.

35 **[0068]** The apparatus may comprise an embosser. The embosser may comprise a rotating drum (for example an embossing roller) comprising projections (e.g. spikes) extending away from the surface of the drum (for example the surface of the embossing roller). The embosser may emboss the two or more sheets of filtering material. The applicant has found that embossing the two or more sheets leads to a filter element having a desired pressure drop and a compact or dense end visual appearance.

40 **[0069]** The apparatus may comprise a wrapping element for wrapping the advancing rod before it is cut.

45 **[0070]** The apparatus may comprise an additive applicator for applying an additive to the two or more sheets of filtering material. The additive may be a taste modifying agent and/or a flavourant. The flavourant may, for example, be menthol, spearmint, peppermint, nutmeg, cinnamon, clove, lemon, chocolate, peach, strawberry, vanilla

or the like.

[0071] In a further aspect of the invention, there is provided an apparatus for separating and gathering two or more sheets of filtering material, the apparatus comprising: a gathering chamber comprising an inlet and an outlet, wherein the inlet has a larger diameter than the outlet such that the gathering chamber is longitudinally tapered; a separator extending at least part of the way into the gathering chamber and protruding from the inlet of the gathering chamber; wherein the separator and the gathering chamber are configured to separate and partially gather two or more sheets of filtering material to thereby form a partially gathered longitudinally extending rod of filtering material comprising a longitudinally extending recess.

[0072] The gathering chamber may comprise an inlet for receiving the separated sheets of filtering material and an outlet for the partially gathered filtering material to exit. The gathering chamber acts to gather (for example condense) the two or more sheets of filtering material into a partially gathered rod of filtering material having a longitudinally extending recess.

[0073] The separator may be tapered in the same direction as the gathering chamber.

[0074] The separator may be substantially conical or frustoconical. The tapered shape of the separator separates the two or more sheets of filtering material while also facilitating the partial gathering of the sheets of filtering material. The gathering chamber may be tapered in the same direction as the separator so thereby partially gathering the two or more sheets of filtering material. The applicant has found that even at the point at which the separator is narrowest, the two or more sheets of filtering material remain separated, and after the sheets of filtering material advance beyond the separator, a recess remains in the partially gathered rod, and the recess can receive the or each additive release vessel.

[0075] The applicant has found that the configuration of the separator and the gathering chamber maintains alignment of the two or more sheets of filtering material. For example, vertical alignment of the two or more sheets of filtering material is maintained. Herein vertical alignment means alignment in the plane perpendicular to the plane in which the sheets of filtering material longitudinally advance and perpendicular to the plane that is transverse to the plane in which the sheets of filtering material longitudinally advance. The applicant has found that maintaining the alignment of the two or more sheets of filtering material whilst the filtering material is gathered leads to a core of filtering material having improved homogeneity and also assists with capsule placement. The applicant has found that the separator keeps the folds of the sheet material apart such that the capsule can be placed into the centre of the partially gathered filtering material, so leading to improved capsule positioning.

[0076] The gathering chamber may comprise an aperture, for example a longitudinally extending aperture, for receiving an inserter for inserting one or more additive

release vessels. This configuration enables the inserter to insert one or more additive release vessels into the recess formed in the partially gathered rod of filtering material. The gathering chamber may be tapered from or after the aperture to facilitate further gathering of the partially gathered rod of filtering material around the additive release vessel to close the recess and thereby form a continuous rod comprising a longitudinally extending core of filtering material and one or more additive release vessels.

[0077] The separator may extend into and along at least part of the length of the gathering chamber, but the separator does not extend as far as the longitudinally extending aperture. This configuration allows for the one or more additive release vessels to be inserted into the recess.

[0078] In an embodiment, the apparatus may comprise a preliminary chamber comprising: an inlet and an outlet; wherein the preliminary chamber is tapered longitudinally away from the inlet. The inlet may have a larger internal diameter than the outlet.

[0079] The separator may be longitudinally tapered and extends into and along at least part of the length of the preliminary chamber. The first end of the separator may protrude from the preliminary chamber and the second end of the separator may be positioned inside the preliminary chamber. The separator may be tapered in the same direction as the preliminary chamber. The separator being tapered in the same direction as the preliminary chamber means that the separator is able to be positioned partially inside of the preliminary chamber.

[0080] The applicant has found that the preliminary chamber helps to partially gather the filtering material before it enters the gathering chamber.

[0081] In this embodiment, the gathering chamber comprises an inlet joined to the outlet of the preliminary chamber, and the gathering chamber comprises an aperture for receiving the inserter. The gathering chamber may taper longitudinally from or after the end of the aperture to thereby gather the two or more sheets of filtering material around the additive release vessel to close the recess and thereby form a continuous rod comprising a longitudinally extending core of filtering material and one or more additive release vessels.

[0082] The apparatus for separating and gathering two or more sheets of filtering material may be included as part of an apparatus for making a filter element.

[0083] The gathering chamber may also be referred to as a gathering shoe. The preliminary chamber may also be referred to as a supporting shoe.

[0084] Preferred embodiments of the invention will now be described by reference to the accompanying drawings in which:

Figure 1 is a schematic overview of the method of the present invention;

Figure 2 is a perspective view of part of the apparatus

according to the present invention;

Figure 3 is a side view of part of the apparatus according to the present invention in use;

Figure 4 is a rear view of part of the apparatus according to the present invention in use;

Figure 5 is a side view of the separator according to the present invention;

Figure 6 is a perspective view of a filter element according to the present invention

Figure 7 is a sectional view of a filter element according to the present invention.

Figure 8 is a perspective view of an apparatus for separating and gathering two or more sheets of filtering material.

[0085] Figure 1 shows a schematic overview of the process of the present invention.

[0086] Filtering material 104 is unwound from a reel 102 and advanced in a longitudinal direction L. The filtering material is a pre-cut sheet of paper filtering material comprising two individual sheets of paper filtering material wound onto the same reel 102. Each sheet has a width of 110mm, a thickness of 85 μm and a basis weight of 36 g/m². The two sheets 104 advance together longitudinally in parallel. The longitudinal edge of one sheet abuts the longitudinal edge of the other sheet. It will be appreciated that more than two sheets of filtering material could be used, for example 3 or 4 or more sheets of longitudinally advancing filtering material. It will be appreciated that the two or more sheets of filtering material may be formed as part of the method of the invention. For example, a single sheet of filtering material could be advanced longitudinally and cut longitudinally into multiple sheets. It will be appreciated that a non-woven sheet material could also be used.

[0087] The advancing sheets of filtering material 104 are embossed by an embosser 106. The embosser 106 comprises a rotating roller comprising spikes which protrude from the outer surface of the roller. The advancing sheets of filtering material are drawn between the roller and a flat surface or between the roller and a second smooth roller (as shown in figure 1) and the embossing roller embosses the sheets of filtering material. The applicant has found that embossing the sheets of filtering material leads to a desired pressure drop and leads to a dense or compact visual end appearance.

[0088] The embossed sheets of filtering material are then advanced and flattened by a wire 108. The flattened sheets of filtering material are then separated by a separator in the form of a separator cone 110. The separated sheets of filtering material pass into a preliminary chamber 116, and the sheets remain separated as the two

sheets are gathered together such that a recess is formed in the partially gathered rod of filtering material. The partially gathered rod of filtering material then passes into the gathering chamber 122 and one or more capsules are inserted into the recess in the partially gathered rod of filtering material by means of a capsule inserter 130 comprising a rotating wheel. The rod is then further gathered and condensed by the gathering chamber 122 to thereby close the recess and form a rod comprising a longitudinally extending core of filtering material and one or more additive release vessel within the core of filtering material.

[0089] The rod is advanced in the longitudinal direction and is wrapped with an outer wrapper, such as a plug wrap to form a wrapped rod. The rod is wrapped with an outer wrapper using techniques known in the art. Finally the wrapped rod is cut by a rod cutter 140 to form a filter element comprising a longitudinally extending core of filtering material comprising one or more additive release vessels located within the core of filtering material. The rod cutter is a standard rod cutter known in the art.

[0090] The gathering and capsule insertion steps and apparatus will now be described in more detail with reference to figures 2 to 4 and 8.

[0091] The flattened tow 104 is advanced and before it enters the preliminary chamber 116 the two sheets are separated by the cone 110. The cone 110 comprises a first end 112 and a second end 114. The first end has a wider diameter than the second end such that the cone tapers longitudinally from the first end to the second end. The cone is formed from a metal.

[0092] As shown in figures 3 and 4, the cone 110 separates the two sheets of filtering material as these enter the preliminary chamber 116.

[0093] The preliminary chamber 116 comprises an inlet 118 and an outlet 120. The inlet 118 has a larger diameter than the outlet 120 such that the preliminary chamber 116 tapers longitudinally from the inlet 118 to the outlet 120. The cone 110 is positioned partially within the preliminary chamber 116 such that part of the cone 110 protrudes out of and away from the inlet 118 of the preliminary chamber 116. The preliminary chamber 116 is formed from a metal.

[0094] The cone 110 is fixed within the preliminary chamber 116 by a mechanical support. Before the sheets of filtering material are drawn into the preliminary chamber 116, the sheets are separated by the cone 110. As the sheets of filtering material are drawn into the preliminary chamber 116, the sheets remain separated by the cone 110, but as the filtering material advances longitudinally, the gap between the sheets reduces as the diameter of the cone 110 reduces. At the same time, the filtering material is partially gathered by the inner surfaces of the preliminary chamber 116. As the diameter of the preliminary chamber 116 decreases, the filtering material is gathered and condensed to form a partially gathered rod of filtering material. The cone 110 prevents complete gathering of the filtering material and leads to the

formation of a recess in the partially gathered rod off filtering material. The applicant has found that the cone 110 keeps the folds of the sheet material apart such that the capsule can be placed into the centre of the partially gathered filtering material, so leading to improved capsule positioning.

[0095] The partially gathered rod of filtering material is drawn into the gathering chamber in the form of gathering shoe 122. Gathering shoe 122 comprises an inlet 124 and an outlet (not shown). The inlet of the gathering shoe has a larger diameter than the outlet of the gathering shoe. The cross sectional diameter of the gathering shoe initially remains constant in a first section 126. In a second section 127 of the gathering shoe, the cross sectional diameter decreases such that the second section 127 is longitudinally tapered. A third section 128 has a constant cross sectional diameter. It will be appreciated that the gathering shoe may not include a third section 128. Positioned in a top surface of the gathering shoe is a longitudinally extending aperture which extends partially along the first section 126 and second section 127 of the gathering shoe. The aperture is configured to receive the capsule inserter wheel 130.

[0096] The capsule inserter wheel 130 is fed by a hopper (not shown).

[0097] The capsule inserter wheel is one known in the art. The capsule inserter wheel utilises a vacuum and air jet system to collect and insert the capsules into the longitudinally extending recess. In such a system, a first wheel (not shown) comprises a plurality of grooves spaced equidistantly around its cylindrical surface. A hopper, which contains the capsules, releases the capsules and the capsules are collected by the grooves in the first wheel. A vacuum pump applies suction to the grooves such that each groove collects a single capsule.

[0098] A second smaller wheel 130 is positioned beneath the first wheel. The second wheel 130 comprises a plurality of grooves spaced equidistantly around its cylindrical surface. The capsules collected by the first wheel are transferred to the second wheel 130. At the bottom of the travel path of a given groove on the first wheel, the suction applied to that groove stops, and the capsule is transferred by gravity to a corresponding groove on the second wheel. The capsules are retained in the grooves of the second wheel 130 by suction applied by a vacuum pump. The bottom part of the second wheel 130 is positioned within the aperture of the gathering shoe 122. At the bottom of the travel path of a given groove, the suction applied to that particular groove is stopped and is replaced by a jet of air directed at the capsule to thereby release the capsule into the longitudinally extending recess.

[0099] Alternative capsule inserter wheels could also be used and an alternative capsule inserter wheel configuration will now be described. The capsule inserter wheel has radially extending cylindrical recesses spaced equidistantly around its cylindrical surface. The base of each recess is formed by the free end of a plunger or

piston. Each piston is resiliently biased by a spring radially towards the centre of the wheel, but is movable radially outwards against this spring bias to sweep through the recess and so positively eject its contents. Sequential operation of the pistons or plungers as the wheel rotates clockwise is effected by means of stationary cam surface which engages with the radially inner end of the pistons or plungers over a portion of their travel path.

[0100] As the inserter wheel rotates, each recess is filled with an individual frangible capsule from a hopper as the recesses pass around the top of their travel path. The pistons or plungers are operated by a cam surface to empty the capsules from the inserter wheel recesses, into the longitudinally extending recess of the advancing rod of partially gathered filtering material, at the bottom of the travel path of the recesses.

[0101] The aperture in the gathering shoe 122 enables the capsule inserter wheel to extend into the gathering shoe 122 and thereby insert one or more capsule into the recess within the rod of partially gathered filtering material. The rotational speed of the capsule inserter 130 and the longitudinal speed of the advancing rod of partially gathered filtering material is constant so the capsules are inserted into the rod of partially gathered filtering material at regular intervals and so are positioned at regular intervals within the core of filtering material. The presence of a recess in the partially gathered rod of filtering material aids the placement of the one or more capsules and improves the capsule positioning within the finished filter element.

[0102] Following capsule insertion, the partially gathered rod continues to advance longitudinally and is further gathered by the walls of the gathering shoe. As the internal diameter of the gathering shoe decreases, the partially gathered rod is further gathered and condensed such that the recess is closed and a longitudinally advancing rod comprising a longitudinally extending core of filtering material and one or more capsules is provided.

[0103] Further processing steps are carried out on the rod as described above with reference to figure 1.

[0104] Figure 8 shows an apparatus for separating and gathering two or more sheets of filtering material. The apparatus includes the same structure and components as described above with reference to figures 2 to 4, but the apparatus does not include a capsule inserter.

[0105] Figure 5 shows a side view of the cone 110. As shown in figure 5, the cone has a first end 112 which has a larger diameter than the second end 114. A first section of the cone extending from the first end 112 of the cone has a constant diameter. A second section of the cone extends from the first section and has a diameter that decreases from the first end of the second section to the second end of the second section, such that the second section is tapered. A final third section extends from the second end of the second section and includes a narrower and constant diameter.

[0106] Figure 6 is a perspective view of a filter element according to the invention.

[0107] The filter element 200 shown in figure 6 comprises a longitudinally extending core of filtering material 202 formed from two sheets of paper filtering material having a basis weight of 36 g/m², a thickness of 85 μm and each sheet having a width of 110mm. The core 202 comprises a capsule 204 positioned centrally within the core. The capsule is a frangible capsule containing 2.5g of menthol in an oil carrier. The capsule has a diameter 3.35mm. The filter element 200 also includes a paper plug wrap 206 which surrounds the core and is secured by a lapped and stuck seam as is known in the art. The filter element has a circumference of 24mm and a length of 27mm.

[0108] Figure 7 shows a perspective sectional view of the filter element 200 shown in figure 6. Figure 7 illustrates the structure of the capsule 204 which includes a capsule shell 208 comprising gelatine, and a liquid menthol flavourant solution 210 within the capsule shell. It will be appreciated that other flavourants may be contained in the capsule 204.

[0109] The filter element shown in figures 6 and 7 may be made according to the method described above with reference to figures 1 to 4.

[0110] The filter element 200 shown in figures 6 and 7 may be joined to a wrapped tobacco rod (not shown) to form a filtered smoking article, such as a filtered cigarette. The filter element 200 may be joined to the wrapped tobacco rod by ring tipping paper, in which the tipping paper engages around only the adjacent ends of the filter element and wrapped tobacco rod to thereby leave some of the plug wrap 206 exposed. Alternatively, the filter may be joined by a full tipping overwrap which engages around the entire length of the filter element and the adjacent end of the wrapped tobacco rod.

[0111] There are disclosed herein methods, apparatuses, filter elements, filters and smoking articles according to the following numbered paragraphs.

1. A method for making a filter element comprising the steps of:

advancing two or more sheets of filtering material in a longitudinal direction;

separating the two or more sheets of longitudinally advancing filtering material;

gathering the separated sheets of longitudinally advancing filtering material to form a partially gathered rod of filtering material having a longitudinally extending recess;

inserting an additive release vessel into the longitudinally extending recess;

gathering the filtering material around the additive release vessel to close the recess and thereby form a rod comprising a longitudinally extend-

ing core of filtering material and one or more additive release vessels; and

cutting the continuous rod to form a filter element comprising a longitudinally extending core of filtering material and one or more additive release vessels.

2. The method according to paragraph 1, wherein the two or more sheets of longitudinally advancing filtering material are separated by a separator.

3. The method according to paragraph 2, wherein the gathering of the separated two or more sheets of longitudinally advancing filtering material comprises drawing the separated two or more sheets of longitudinally advancing filtering material into a gathering chamber.

4. The method according to paragraph 3, wherein the separator is coupled to the gathering chamber such that the two or more sheets of longitudinally advancing filtering material are separated before entering the gathering chamber, and the separator prevents complete gathering of the two or more sheets of longitudinally advancing filtering material to thereby form a longitudinally extending recess in the partially gathered filtering material.

5. The method according to paragraph 3 or 4, wherein the gathering chamber comprises an inlet for receiving the separated sheets of filtering material and an outlet for the partially gathered filtering material to exit; and wherein the gathering chamber is tapered longitudinally away from the inlet.

6. The method according to any one of paragraphs 3 to 5, wherein the separator is longitudinally tapered and/or extends into and along at least part of the length of the gathering chamber.

7. The method according to any one of paragraphs 4 to 6, wherein the separator is tapered in the same direction as the gathering chamber.

8. The method according to any one of paragraphs 4 to 7, wherein the separated two or more longitudinally advancing sheets of filtering material are drawn into a preliminary chamber before entering the gathering chamber.

9. The method according to paragraph 8, wherein the preliminary chamber comprises an inlet and an outlet; wherein the outlet of the preliminary chamber is joined to the inlet of the gathering chamber; and wherein the separator extends into and along at least part of the length of the preliminary chamber.

10. The method according to paragraph 8 or 9, wherein the preliminary chamber is tapered longitudinally away from the preliminary chamber inlet.

11. The method according to any one of paragraphs 1 to 10, wherein the additive release vessel is inserted into the longitudinally extending recess by an additive release vessel inserter. 5

12. The method according to paragraph 11, wherein the additive release vessel inserter comprises a rotating drum or wheel. 10

13. The method according to any one of paragraphs 1 to 12, wherein the two or more sheets of filtering material are embossed. 15

14. The method according to any one of paragraphs 1 to 13, wherein the filtering material comprises a non-woven material. 20

15. The method according to any one of paragraphs 1 to 14, wherein the filtering material comprises paper. 25

16. The method according to any one of paragraphs 1 to 15, wherein the two or more sheets of longitudinally advancing filtering material comprise 2, 3 or 4 sheets of longitudinally advancing filtering material. 30

17. A filter element obtained by the method of any one of paragraphs 1 to 16.

18. A filter element comprising a longitudinally extending core of filtering material and an additive release vessel enclosed within the longitudinally extending core of filtering material; wherein the longitudinally extending core of filtering material is formed from two or more sheets of filtering material. 35 40

19. The filter element according to paragraph 18, wherein the filtering material comprises paper or a non-woven material. 45

20. The filter element according to paragraph 17 or 18, wherein the additive release vessel is a capsule.

21. The filter comprising a filter element according to any one of paragraphs 17 to 20. 50

22. The smoking article comprising a filter element according to any one of paragraphs 17 to 20 or a filter according to paragraph 21. 55

23. An apparatus for making a filter element comprising:

a separator for separating two or more longitudinally advancing sheets of filtering material;

a gathering chamber configured to gather the separated longitudinally advancing sheets of filtering material and form a rod of partially gathered filtering material;

wherein the separator is coupled to the gathering chamber such that the separator and the gathering chamber are configured to form a longitudinally extending recess in the rod of partially gathered filtering material; and

an inserter configured to insert one or more additive release vessels into the longitudinally extending recess.

24. The apparatus according to paragraph 23, wherein the gathering chamber comprises an inlet for receiving the separated sheets of filtering material and an outlet for the partially gathered filtering material to exit; and wherein the gathering chamber tapers longitudinally away from the inlet.

25. The apparatus according to paragraph 23 or 24, wherein the separator is longitudinally tapered and extends into and along at least part of the length of the gathering chamber.

26. The apparatus according to paragraph 23 to 25, wherein the separator is tapered in the same direction as the gathering chamber.

27. The apparatus according to any one of paragraphs 23 to 26 comprising: a preliminary chamber comprising: an inlet and an outlet; wherein the outlet of the preliminary chamber is joined to the inlet of the gathering chamber; and wherein the separator extends into and along part of the length of the preliminary chamber.

28. The apparatus according to paragraph 27, wherein the preliminary chamber tapers longitudinally away from the inlet.

29. The apparatus according to any one of paragraphs 23 to 28, wherein the gathering chamber comprises a longitudinally extending aperture for receiving the inserter.

30. The apparatus according to any one of paragraphs 23 to 29, wherein the gathering chamber is configured to gather the filtering material around the additive release vessel to close the recess and thereby form a continuous rod comprising a longitudinally extending core of filtering material and one or more additive release vessels.

31. The apparatus according to any one of paragraphs 23 to 30, comprising a rod cutter configured to cut a rod comprising a longitudinally extending core of filtering material and one or more additive release vessels to form a filter element.

32. The apparatus according to any one of paragraphs 23 to 31, wherein the inserter comprises a rotating drum or wheel configured to insert the or each additive release vessel into the longitudinally extending recess.

33. An apparatus for separating and gathering two or more sheets of filtering material, the apparatus comprising:

a gathering chamber comprising an inlet and an outlet, wherein the inlet has a larger diameter than the outlet such that the gathering chamber is longitudinally tapered;

a separator extending at least part of the way into the gathering chamber and protruding from the inlet of the gathering chamber;

wherein the separator and the gathering chamber are configured to separate and partially gather two or more sheets of filtering material to thereby form a partially gathered longitudinally extending rod of filtering material comprising a longitudinally extending recess.

Claims

1. A method for making a filter element comprising the steps of:

advancing two or more sheets of filtering material in a longitudinal direction;
separating the two or more sheets of longitudinally advancing filtering material;
gathering the separated sheets of longitudinally advancing filtering material to form a partially gathered rod of filtering material having a longitudinally extending recess;
inserting an additive release vessel into the longitudinally extending recess;
gathering the filtering material around the additive release vessel to close the recess and thereby form a rod comprising a longitudinally extending core of filtering material and one or more additive release vessels.

2. The method according to claim 1, wherein the two or more sheets of longitudinally advancing filtering material are separated by a separator; and/or wherein the gathering of the separated two or more sheets of longitudinally advancing filtering material compris-

es drawing the separated two or more sheets of longitudinally advancing filtering material into a gathering chamber.

3. The method according to claim 2, wherein the separator is coupled to the gathering chamber such that the two or more sheets of longitudinally advancing filtering material are separated before entering the gathering chamber, and the separator prevents complete gathering of the two or more sheets of longitudinally advancing filtering material to thereby form a longitudinally extending recess in the partially gathered filtering material.

4. The method according to claim 2 or 3, wherein the gathering chamber comprises an inlet for receiving the separated sheets of filtering material and an outlet for the partially gathered filtering material to exit, and wherein the gathering chamber is tapered longitudinally away from the inlet; and/or wherein the separator is longitudinally tapered and/or extends into and along at least part of the length of the gathering chamber; and/or wherein the separator is tapered in the same direction as the gathering chamber.

5. The method according to claim 3 or 4, wherein the separated two or more longitudinally advancing sheets of filtering material are drawn into a preliminary chamber before entering the gathering chamber; for example wherein the preliminary chamber comprises an inlet and an outlet, wherein the outlet of the preliminary chamber is joined to the inlet of the gathering chamber, and wherein the separator extends into and along at least part of the length of the preliminary chamber.

6. The method according to any preceding claim, wherein the additive release vessel is inserted into the longitudinally extending recess by an additive release vessel inserter; for example wherein the additive release vessel inserter comprises a rotating drum or wheel.

7. The method according to any preceding claim, wherein the two or more sheets of filtering material are embossed; and/or wherein the filtering material comprises a non-woven material; and/or wherein the filtering material comprises paper; and/or wherein the two or more sheets of longitudinally advancing filtering material comprise 2, 3 or 4 sheets of longitudinally advancing filtering material.

8. The method according to any preceding claim, comprising a step of cutting the rod to form a filter element comprising a longitudinally extending core of filtering material and one or more additive release vessels.

9. A filter element comprising a longitudinally extending

core of filtering material and an additive release vessel enclosed within the longitudinally extending core of filtering material; wherein the longitudinally extending core of filtering material is formed from two or more sheets of filtering material.

10. The filter element according to claim 9, wherein the filtering material comprises paper or a non-woven material; and/or wherein the additive release vessel is a capsule.

11. An apparatus for making a filter element comprising:

a separator for separating two or more longitudinally advancing sheets of filtering material; a gathering chamber configured to gather the separated longitudinally advancing sheets of filtering material and form a rod of partially gathered filtering material; wherein the separator is coupled to the gathering chamber such that the separator and the gathering chamber are configured to form a longitudinally extending recess in the rod of partially gathered filtering material; and an inserter configured to insert one or more additive release vessels into the longitudinally extending recess.

12. The apparatus according to claim 13, wherein the gathering chamber comprises an inlet for receiving the separated sheets of filtering material and an outlet for the partially gathered filtering material to exit, and wherein the gathering chamber tapers longitudinally away from the inlet; and/or wherein the separator is longitudinally tapered and extends into and along at least part of the length of the gathering chamber; for example wherein the separator is tapered in the same direction as the gathering chamber.

13. The apparatus according to claim 11 or 12 comprising: a preliminary chamber comprising: an inlet and an outlet; wherein the outlet of the preliminary chamber is joined to the inlet of the gathering chamber; and wherein the separator extends into and along part of the length of the preliminary chamber; for example wherein the preliminary chamber tapers longitudinally away from the inlet.

14. The apparatus according to any one of claims 11 to 13, wherein the gathering chamber comprises a longitudinally extending aperture for receiving the inserter; and/or wherein the gathering chamber is configured to gather the filtering material around the additive release vessel to close the recess and thereby form a continuous rod comprising a longitudinally extending core of filtering material and one or more additive release vessels; and/or wherein the appa-

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ratus comprises a rod cutter configured to cut a rod comprising a longitudinally extending core of filtering material and one or more additive release vessels to form a filter element; and or wherein the inserter comprises a rotating drum or wheel configured to insert the or each additive release vessel into the longitudinally extending recess.

15. An apparatus for separating and gathering two or more sheets of filtering material, the apparatus comprising:

a gathering chamber comprising an inlet and an outlet, wherein the inlet has a larger diameter than the outlet such that the gathering chamber is longitudinally tapered; a separator extending at least part of the way into the gathering chamber and protruding from the inlet of the gathering chamber; wherein the separator and the gathering chamber are configured to separate and partially gather two or more sheets of filtering material to thereby form a partially gathered longitudinally extending rod of filtering material comprising a longitudinally extending recess.

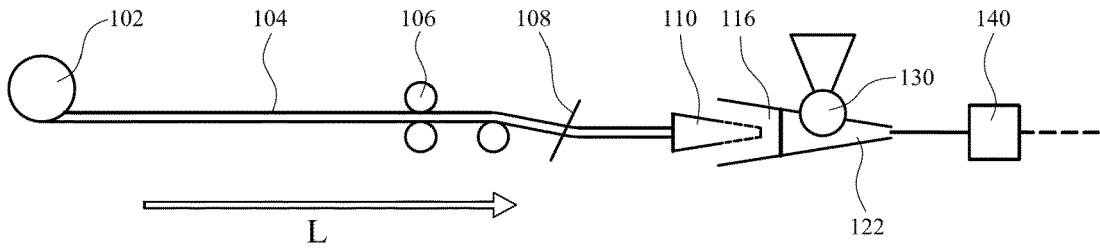


Figure 1

Figure 2

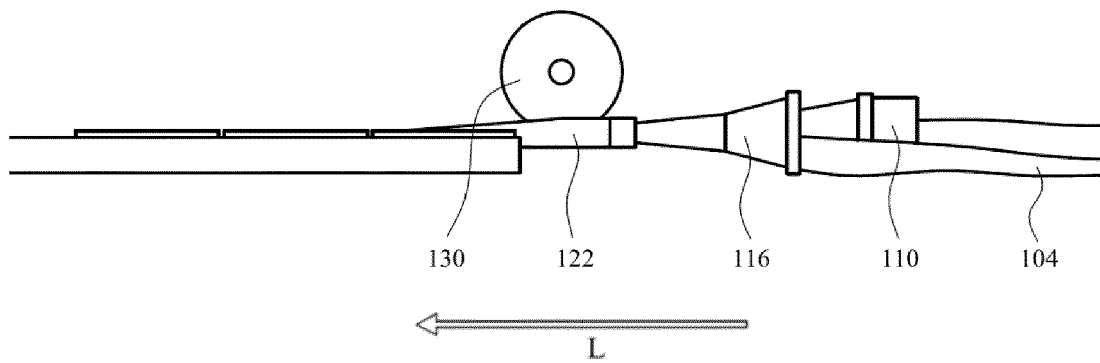
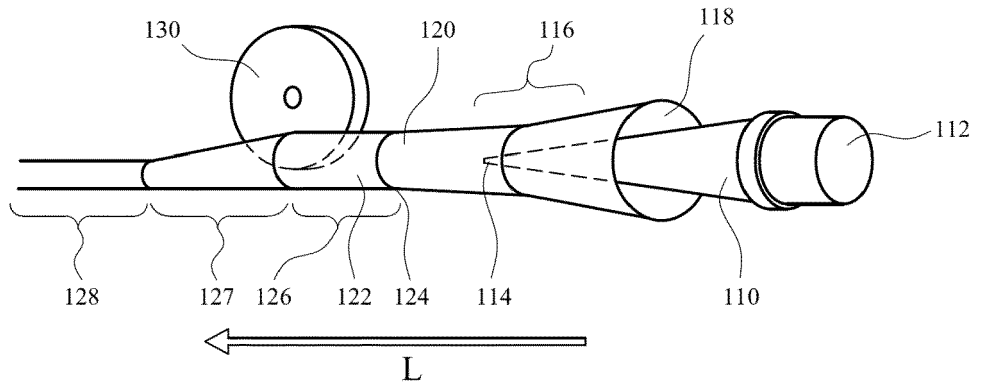


Figure 3

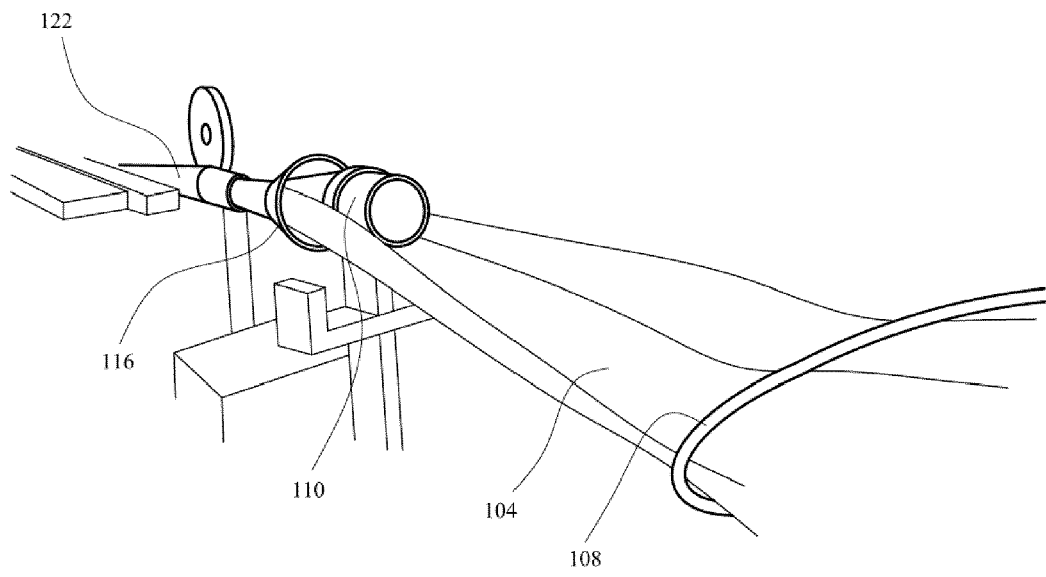


Figure 4

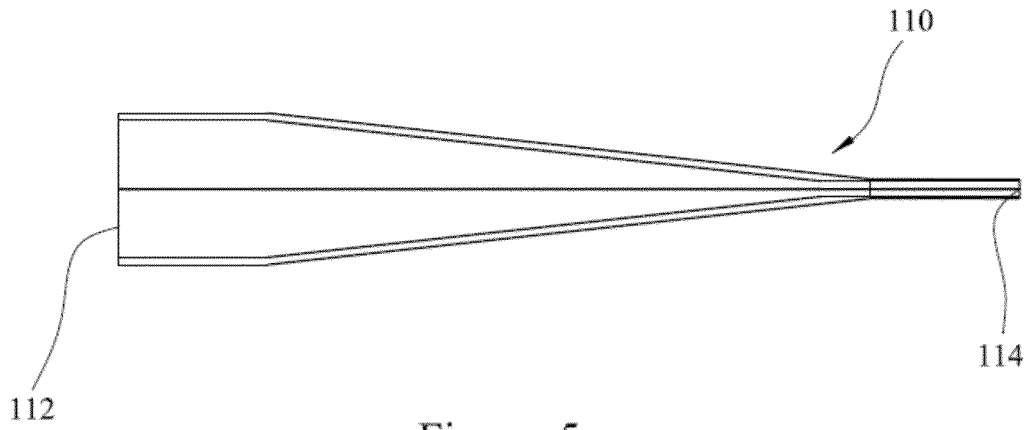


Figure 5

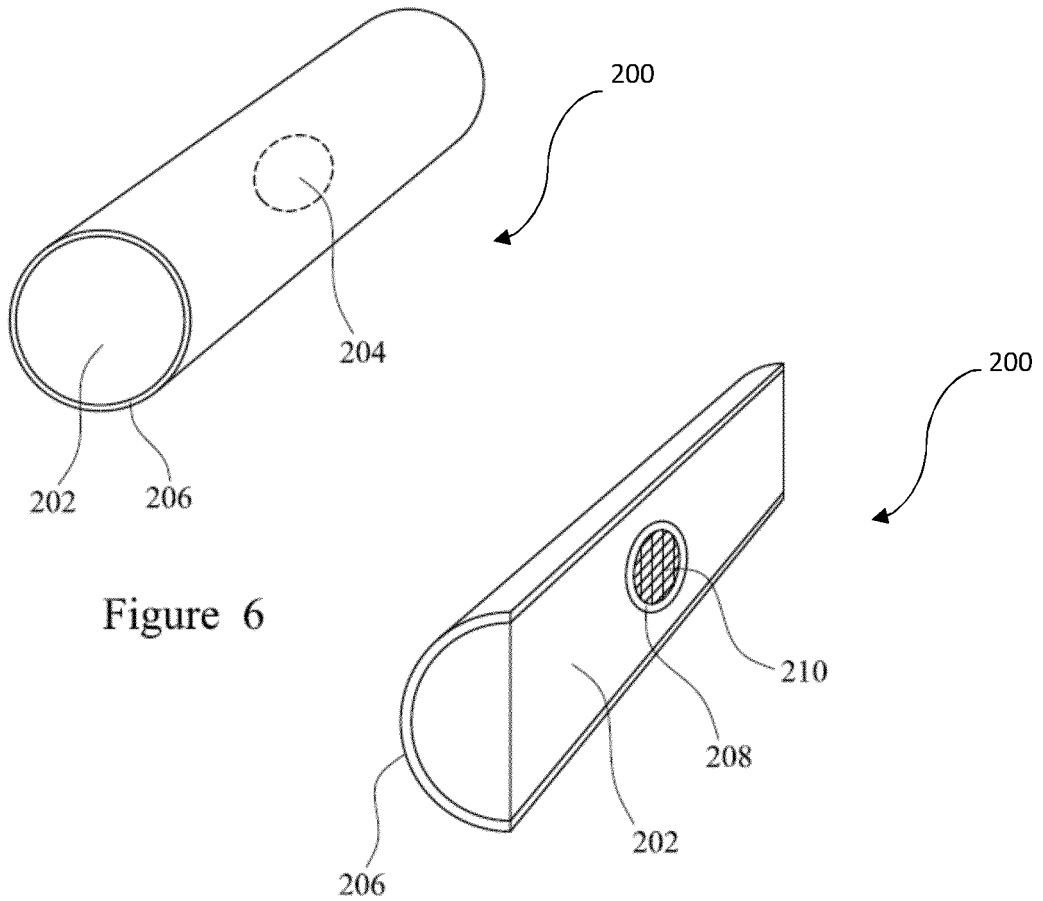


Figure 6

Figure 7

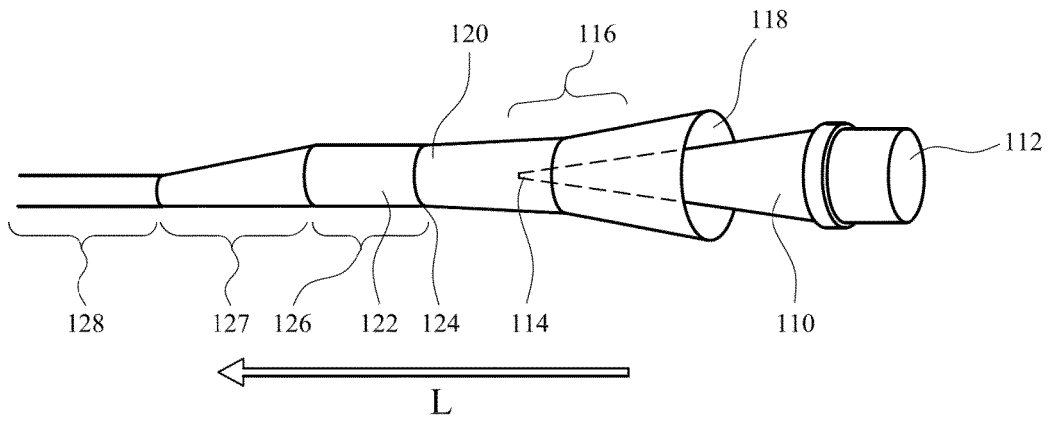


Figure 8



EUROPEAN SEARCH REPORT

Application Number

EP 21 18 1456

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2012/065042 A1 (LE ROUX GERHARD MALAN [ZA]) 15 March 2012 (2012-03-15)	1-3, 6-11, 14	INV. A24D3/02
Y	* paragraph [0038] - paragraph [0087]; figure 18 *	4, 5, 12, 15	A24D3/04
A	* paragraph [0099] * * paragraphs [0001], [0002] *	13	
Y	EP 2 868 215 A2 (HAUNI MASCHINENBAU AG [DE]) 6 May 2015 (2015-05-06)	4, 12, 15	
A	* paragraph [0039] - paragraph [0046]; figure 1 * * paragraph [0047] - paragraph [0054]; figure 2 * * paragraphs [0051], [0052] *	13	
Y	US 2015/018187 A1 (GIANNINI ANTONELLA [IT] ET AL) 15 January 2015 (2015-01-15)	4, 5, 12, 15	
A	* paragraph [0037]; figure 7 *	13	
A	US 2012/080043 A1 (NAENEN RENE [BE] ET AL) 5 April 2012 (2012-04-05)	1-15	TECHNICAL FIELDS SEARCHED (IPC) A24D
	* paragraph [0049] - paragraph [0062]; figure 1 *		
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 28 April 2022	Examiner Schwertfeger, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 21 18 1456

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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28-04-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012065042 A1	15-03-2012	BR PI1009527 A2	15-03-2016
		CN 102421306 A	18-04-2012
		EP 2405775 A1	18-01-2012
		JP 5129889 B2	30-01-2013
		JP 2012519497 A	30-08-2012
		KR 20110131277 A	06-12-2011
		PL 2405775 T3	28-11-2014
		RU 2011140702 A	20-04-2013
		US 2012065042 A1	15-03-2012
		WO 2010103000 A1	16-09-2010
		ZA 200901679 B	26-08-2015
EP 2868215 A2	06-05-2015	CN 104585877 A	06-05-2015
		DE 102013222055 A1	30-04-2015
		EP 2868215 A2	06-05-2015
US 2015018187 A1	15-01-2015	CN 104302196 A	21-01-2015
		DE 202013012384 U1	25-08-2016
		EA 201491461 A1	30-12-2014
		EP 2822409 A1	14-01-2015
		HU E029303 T2	28-03-2017
		JP 6205651 B2	04-10-2017
		JP 2015509374 A	30-03-2015
		KR 20140143144 A	15-12-2014
		PL 2822409 T3	30-11-2016
		US 2015018187 A1	15-01-2015
		WO 2013132434 A1	12-09-2013
US 2012080043 A1	05-04-2012	BR PI1011261 A2	22-03-2016
		CN 102387718 A	21-03-2012
		EP 2416673 A1	15-02-2012
		JP 2012523223 A	04-10-2012
		KR 20120016629 A	24-02-2012
		PL 2416673 T3	30-08-2013
		RU 2011145056 A	20-05-2013
		US 2012080043 A1	05-04-2012
		WO 2010115829 A1	14-10-2010