



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.09.2020 Bulletin 2020/37

(51) Int Cl.:
A24D 3/04 (2006.01) A24D 3/06 (2006.01)

(21) Application number: **20172337.6**

(22) Date of filing: **30.05.2012**

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

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(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
12877676.2 / 2 856 890

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Remarks:
This application was filed on 30-04-2020 as a divisional application to the application mentioned under INID code 62.

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(54) **CIGARETTE**

(57) A cigarette comprises a tobacco rod (1) and a filter (2) including a filter plug (24a, 24b) connected to one end of the tobacco rod (1) and a capsule (26) in which contents (264) is held inside a film (262). The capsule (26) is embedded in the filter plug (24a, 24b), the tobacco rod (1) is a cylindrical shape, the filter (2) is a cylindrical

shape having a diameter A of the filter plug (24a, 24b) perpendicular to the longitudinal direction of the cigarette, wherein the capsule (26) is circular in a cross sectional shape perpendicular to the longitudinal direction of the cigarette with a diameter B, and a capsule ratio is defined as B/A, and a value of B/A is $0.55 \leq B/A \leq 0.75$.

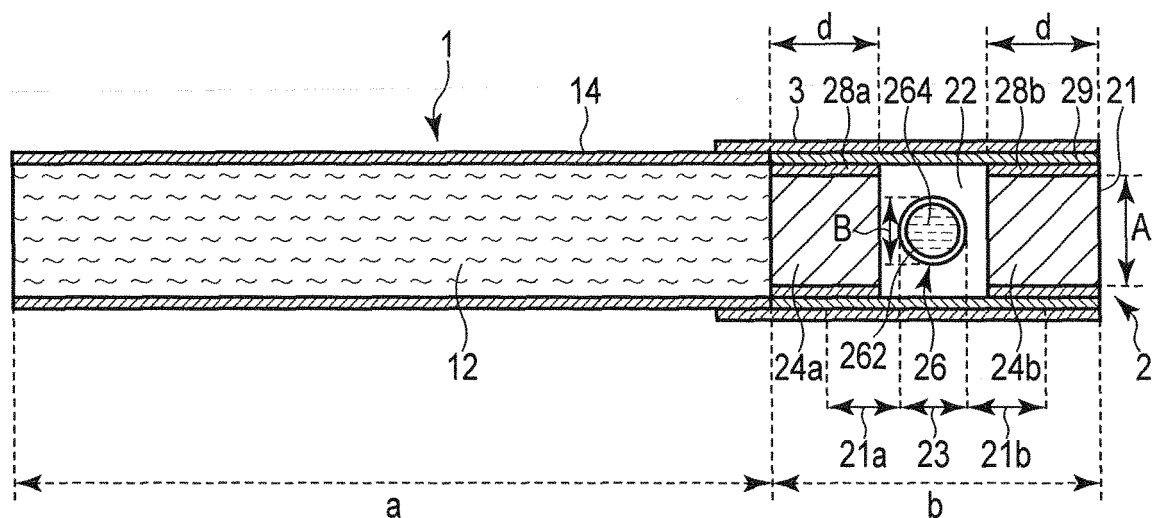


FIG. 1

Description

Technical Field

5 **[0001]** This invention relates to a technology of a cigarette having a capsule in a portion of a filter.

Background Art

10 **[0002]** Cigarettes in each of which a capsule holding a liquid including a flavor is set in a cigarette filter and each of which can enjoy a fragrance of the flavor by destroying the capsule when a smoker starts to smoke are known (Patent Literature 1).

[0003] The capsule is arranged inside a filter for filtering mainstream smoke arranged at one end of a cigarette and the capsule arranged inside the filter is destroyed by the filter being pressurized with user's fingers.

15 Prior Art

Patent Literature

20 **[0004]** Patent Literature 1: Japanese Patent Application KOKAI Publication No. 2003-304856

Summary of Invention

25 **[0005]** However, there are some users who feel it difficult to break the capsule when they attempt to destroy the capsule and it is desired to provide a cigarette in which the capsule can more easily be broken in comparison to the conventional one.

[0006] The present invention is derived from the above circumstances and an object thereof is to provide a cigarette in which the user can feel it easier to break the capsule in comparison to the conventional one.

30 **[0007]** According to the present invention, a cigarette comprising a tobacco rod and a filter including a filter plug connected to one end of the tobacco rod and a capsule in which contents is held inside a film, wherein the filter plug has a property that a repulsive force increases in accordance with a first increasing rate with an increase of an indentation rate when the indentation rate is equal to or less than a specific value as the filter plug is pressed from outside and the repulsive force increases in accordance with a second increasing rate larger than the first increasing rate with the increase of the indentation rate when the indentation rate becomes larger than the specific value, and wherein the capsule is destroyed when the indentation rate of the filter plug is equal to or less than the specific value, is provided

35 **[0008]** There is a case that the specific value of the filter plug is 0.5, and the filter plug may be formed from cellulose acetate fibers.

40 **[0009]** The filter plug may be configured to include a rod side plug and a holder side plug, these plugs being spaced apart from each other via a hollow portion, and to arrange the capsule in the hollow portion. Further, the tobacco rod may be a cylindrical shape, the filter may be a cylindrical shape, the capsule may be circular in a cross sectional shape when it is viewed from an end surface side of the filter, and, in a case that a diameter of the filter plug is A and a diameter of a circle in the cross sectional shape of the capsule when it is viewed from the end surface side of the filter is B, a value of B/A may be $0.55 \leq B/A \leq 0.80$, preferably $0.55 \leq B/A \leq 0.75$, and more preferably $0.55 \leq B/A \leq 0.70$.

[0010] The capsule may be in contact with a peripheral member existing in a radial direction of the hollow portion.

45 **[0011]** The capsule may be embedded in the filter plug. The tobacco rod may be a cylindrical shape, the filter may be a cylindrical shape, the capsule may be circular in a cross sectional shape when it is viewed from an end surface of the filter, and, in a case that a diameter of the filter plug is A and a diameter of a circle in the cross sectional shape of the capsule when it is viewed from the end surface side of the filter is B, a value of B/A may be $0.55 \leq B/A \leq 0.75$, and preferably $0.55 \leq B/A \leq 0.70$.

50 **[0012]** A chip paper may be wound around a periphery of a connecting portion at which the tobacco rod and the filter are connected, and the present invention may be preferably applied to cases in which an outer circumferential length of the chip paper is 25 mm or less, 23 mm or less, 17 mm or less, and 15 mm or less.

[0013] And, it is preferable that a filament denier of the filter plug is 5.0 to 14.0 g/9000 m to form a filter having a relatively low repulsive force while maintaining a total denier.

55 **[0014]** According to the present invention, a cigarette in which the user can feel it easier to break the capsule in comparison to the conventional one is provided.

Brief Description of Drawings

[0015]

- 5 FIG. 1 is a figure for explaining a cigarette of a first embodiment according to the present invention.
 FIG. 2 is a figure showing shapes of capsules that can be used for the present invention.
 FIG. 3 is a figure for explaining an indentation rate.
 FIG. 4 is a figure for explaining a diameter of the capsule.
 FIG. 5 is a figure for explaining a capsule deformation rate.
 10 FIG. 6 is a figure for explaining a measuring system to measure a relationship between the indentation rate and a repulsive force.
 FIG. 7 is a graph showing the relationship between the indentation rate and the repulsive force measured by the measuring system in FIG. 6.
 FIG. 8 is a figure for explaining a measuring system to measure a movement of the capsule in a cavity filter.
 15 FIG. 9A is a diagram showing the movement of the capsule measured by the measuring system in FIG. 8.
 FIG. 9B is a diagram showing the movement of the capsule measured by the measuring system in FIG. 8.
 FIG. 9C is a diagram showing the movement of the capsule measured by the measuring system in FIG. 8.
 FIG. 9D is a diagram showing the movement of the capsule measured by the measuring system in FIG. 8.
 FIG. 10 is a figure for explaining a cigarette of a second embodiment according to the present invention.
 20 FIG. 11 is a figure for explaining a cigarette of a third embodiment according to the present invention.

Description of Embodiments

- [0016]** In the followings, embodiments of the present invention will be described, but the present invention is not limited to concrete forms of such embodiments of the present invention and is defined by recitations of claims and equivalents thereof.

<First Embodiment>

- 30 **[0017]** FIG. 1 shows a cigarette including a capsule filter as a first embodiment of the present invention. The cigarette is formed by connecting a cylindrical tobacco rod 1 in which a wrapping paper 14 is wound around a tobacco filler 12 and a cylindrical filter 2 with a chip paper 3 wound around a peripheral surface of a connecting portion at which the tobacco rod 1 and the filter 2 are connected.
- [0018]** The filter 2 is constructed by a rod side plug 24a (arranged on a tobacco rod side) and a cigarette holder side plug 24b (arranged on a cigarette holder side) arranged to space apart from each other via a hollow portion 22 in a longitudinal direction of the cigarette, a capsule 26 in the hollow portion 22, rolling papers 28a, 28b wound around the rod side plug 24a and the cigarette holder side plug 24b respectively as an example of an outer-wrapping paper, and a molding paper 29 arranged around the rolling papers 28a, 28b while leaving the hollow portion 22 as an example of the outer-wrapping paper. (In this specification, the filter having a structure in which the hollow portion is formed between plural filter plugs is called as a "cavity filter".)
- 40 **[0019]** As the filter plug, for example, a filter plug formed by a following manner can be used. With this manner, cellulose acetate fibers of a filament denier 1.0 to 14.0 g/9000 m (preferably 5.0 to 14.0 g/9000 m and more preferably 5.0 to 6.0 g/9000 m) extending in a direction substantially parallel to the longitudinal direction of the cigarette are bound, for example, triacetin as a plasticizer is added with a plasticizer adding amount of 2 to 10% (preferably 3 to 6%) to fibers in weight percentage, a total denier is set at 17,000 to 44,000 g/9000 m (preferably 17,000 to 35,000 g/9000 m), a pressure drop is set at 100 to 700 mmH₂O/120 mm (preferably 260 to 680 mmH₂O/120 mm), etc. Alternatively, as the filter plug, papers each of which is made mainly of plant pulp having a basis weight of 15 to 60 g/m², a thickness of 20 to 150 μm, and a width of 14 to 27 mm and which are bound may also be used. Activated carbon may also be included in the filter plug.
- 50 **[0020]** As the chip paper 3, a paper made mainly of plant pulp having a basis weight of 20 to 60 g/m² and a thickness of 20 to 60 μm can be used. As each of the rolling paper 28a, 28b and the molding paper 29, a paper made mainly of plant pulp having a basis weight of 20 to 100 g/m², a thickness 20 to 150 μm, and an air permeability of 0 to 30,000 CORESTA unit (C.U.) can be used.
- [0021]** The cigarette can be structured, for example by setting a length of the tobacco rod ("a" in FIG. 1) at 53 to 67 mm, a length of the filter ("b" in FIG. 1) at 17 to 31 mm, an outer circumferential length of the chip paper at 14 to 26.1 mm, a length of each of the rod side plug and the cigarette holder side plug ("d" in FIG. 1) at 5 mm or more, and a size of the capsule in the longitudinal direction of the cigarette at 1 to 8 mm.
- 55 **[0022]** In this embodiment, the capsule 26 is destroyed before an indentation rate of the rod side plug 24a and cigarette

holder side plug 24b from an outer side in a radial direction of the filter plug in a peripheral filter 21 reaches 0.5.

<Peripheral filter>

5 **[0023]** The peripheral filter is defined, as indicated by each of 21a, 21b in FIG. 1, by a portion of the filter to which a pressure is applied when an user applies a pressure to destroy the capsule by its fingers and, in many cases, depending on a size of an user's finger, a length from a rod side end of the surrounding filter 21a to a cigarette holder end of the surrounding filter 21b is about 10 to 20 mm.

10 **[0024]** When the user applies the pressure by its fingers to destroy the capsule, the pressure is not applied to only a part of a filter located in the same position as that where the capsule exists (hereinafter, that part of the filter is denoted as a "capsule location") in the longitudinal direction of the cigarette, but to the capsule location 23 and parts of the filter 21 (surrounding filters) exist in surroundings of the capsule location 23 in the longitudinal direction of the cigarette.

<Indentation rate>

15 **[0025]** The indentation rate is defined by $(C-D)/C$, where, as shown in FIG. 3, "C" is a distance between spots "e" on a filter plug 242a before external pressures are applied thereto and "D" is a distance between spots "e" on a filter plug 242b after the external pressures are applied thereto.

20 <Capsule ratio>

[0026] A ratio (hereinafter, denoted as a "capsule ratio") B/A of "a diameter B of a circle in a cross sectional shape of the capsule 26 when it is viewed from a filter end surface side 21 of the capsule" to "a diameter A of the filter plug 24" may be set to $0.55 \leq B/A \leq 0.80$, preferably $0.55 \leq B/A \leq 0.75$, and more preferably $0.55 \leq B/A \leq 0.70$ and a capsule deformation rate is 1/7 to 2/3.

<Diameter>

30 **[0027]** In a case that a value of a diameter changes (B, B', B'') depending on a position of a cross section because, as shown in FIG. 4, the capsule 26 is a sphere and the like, the diameter having the largest value is defined as the diameter B.

<Capsule deformation rate>

35 **[0028]** A capsule deformation rate is defined by $(E-F)/E$, where a distance between spots "f", "f" of a capsule 266a before the spots of the capsule are not subject to an external pressure is E and a distance between spots "f", "f" of a capsule 266b in a state that the spots of the capsule are subject to the external pressure and the capsule is immediately before it is destroyed is F, as shown in FIG.5.

40 <Capsule>

[0029] The capsule 26 has a structure in which a liquid for contents 264 including a flavor, as an example of contents, is held by a film 262. As the capsule, for example, a capsule having a circular cross section or elliptical cross section when it is viewed from the filter end surface side 21 may be used, and a sphere shaped capsule or a cylindrical shaped capsule, as shown in FIG. 2, may be used.

45 **[0030]** A film forming material includes, for example, starch and a gelling agent. As the gelling agent, for example, gellan gum is used. The film forming material may further include a gelling assistant. As the gelling assistant, for example, calcium chloride is used. In this invention, the film forming material may further include a capsule plasticizer. As the capsule plasticizer, glycerin and/or sorbitol is used. The film forming material may further include a coloring agent.

50 **[0031]** The capsule deformation rate can be adjusted by changing a composition or thickness of the film forming material.

[0032] As the flavor included in the liquid for contents in the capsule, for example, menthol, plant essential oil or the like can be used. As a solvent for the flavor included in the liquid for contents, for example, medium chain triglyceride fatty acid (MCT) can be used. The liquid for contents may further includes other additives such as a pigment, emulsifying agent, thickener and so on.

55 **[0033]** In addition, the capsule may hold granulated solid as its contents.

<Capsule forming method>

[0034] As a forming method for a flavor capsule, it is preferable to use a dropping method by which the flavor capsule having a seamless film can be formed. In this method, a double nozzle is used, and the liquid for contents is discharged from an inner nozzle while a liquid film material is discharged from an outer nozzle, so that the film liquid can seamlessly hold the liquid for contents.

[0035] Inventors of this invention examined why an user feels it difficult to break the capsule when he or her destroys the capsule arranged inside the cavity filter 2 like in the present embodiment by applying a pressure to the filter with its fingers.

[0036] The inventors measured a pressure detected when, as shown in FIG. 6, a filter plug 242 placed on a stage 61 is pressed from above by a rheometer 62 arranged on an outer side of the filter plug in a radial direction thereof, and measurement results as shown in FIG. 7 are obtained. No. 1 to No. 4 in FIG. 7 correspond to sample Nos. shown in Table 1 and Table 2 shown in later. FIG. 7 is a graph in which a vertical axis represents a repulsive force per a unit cross section of the filter plug and a horizontal axis represents an indentation rate, and it is clear from the graph that the repulsive force increases with an increase of the indentation rate. In this graph, the repulsive force per a unit cross section is a value obtained by dividing the repulsive force by a cross section (mm²) and the cross section means a circular cross section which is orthogonal to a longitudinal direction of the cylindrical filter.

[0037] That is, since the user normally puts a pressure on the peripheral filter in addition to the capsule when the user destroys the capsule, the filter plug generates the repulsive force as the measurement result when the capsule is destroyed. As a result of this, a value of the repulsive force increases with an increase of the indentation rate to destroy the capsule.

[0038] Further, it should be noted that the repulsive force linearly increases (a first increasing rate) with the increase of the indentation rate while the indentation rate is equal to or less than a specific value (0.5 in this measurement), but the repulsive force increases like a quadratic curve (a second increasing rate larger than the first increasing rate) with the increase of the indentation rate when the indentation rate is larger than the specific value. That is, when the indentation rate becomes larger than the specific value, the repulsive force largely increases rapidly and a trend to increase the repulsive force changes while pressing the filter plug. And, it is considered as a reason why the user feels it difficult to break the capsule.

[0039] The rheometer used for the measurement in FIG. 6 is a Sun RHEOMETER CR3000EX (manufactured by Sun Scientific Co., Ltd.), and conditions for forming filter plugs are as shown in Tables 1 and 2. Each of the samples other than the sample of No. 4 uses cellulose acetate fibers as a material and triacetin is used as the plasticizer.

[Table 1]

Sample No.	Filter type	Outer circumferential length of filter plug (mm)	Fiber denier (g/9000m)	Total Denier (g/9000m)	Pressure Drop (mmH ₂ O/120mm)	Plasticizer addition amount to fibers in weight percentage (%)
1	cavity	24.4	5.0	35000	300	3.0
2	cavity	16.8	6.0	17000	671	6.0
3	embedded	24.4	5.0	35000	260	3.0

[Table 2]

Sample No.	Filter type	Outercircumferential length of filter plug (mm)	Basis Weight (g/m ²)	Thickness (μm)	Pressure Drop (mmH ₂ O/120mm)	Width of paper (mm)
4	paper	24.4	35	60	300	220

[0040] An indentation width (a diameter of a circular indentation surface) of the rheometer is 15.0 mm, a cavity width in the longitudinal direction of the cavity filter is 6.0 mm, and, when the cavity filter is indented, a center position of the rheometer in its width direction is set to a center position of the cavity in its width direction. Each sample is formed by winding a molding paper whose basis weight is 50 g/m² and whose thickness is 52 μm around a filter plug, a length of the filter plug is 27 mm, and the filter plug includes no capsule.

[0041] In the cigarette having the capsule filter according to the present embodiment, the capsule can be destroyed

when the indentation rate of the filter is equal to or less than the specific value (0.5) and therefore, the user can feel it easier to break the capsule than in the conventional one.

[0042] FIGS. 9A to 9D show pressure distributions detected by a pressure-sensitive electrically conductive elastomer sensor 81 when, as shown in FIG. 8, a cavity filter 82 placed on the sensor 81 is indented from above by the rheometer 62. And, a capsule is arranged at a center of a hollow portion of the cavity filter. A Y direction shown by a vertical axis and an X direction shown by a horizontal axis in each of FIGS. 9A to 9D correspond to a Y direction and an X direction shown in FIG. 8. A pressure increases in an order of 1, 2, The rheometer used for the measurement in each of FIGS. 9A to 9D is the same as that described above and an Inastomer (manufactured by Inaba Rubber Co., Ltd.) is used as the sensor 81.

[0043] FIGS. 9A to 9D show in this order pressure distributions in time sequence from a start of an indentation. In FIGS. 9A and 9B, a pressure does not reach at the capsule and a pressure (a repulsive force) is generated only by the filter plug. FIG. 9C shows that the pressure reaches at the capsule and the capsule also generates a pressure (a repulsive force). FIG. 9D shows that the pressure (the repulsive force) generated by the capsule in FIG. 9C is almost disappeared after the capsule is destroyed.

[0044] In FIG. 9C, it is found that a location at which a high pressure (repulsive force) is detected is shifted from the center position of the hollow portion of the cavity filter toward a minus Y direction. As a result of this, it is found that the capsule moves in the hollow portion in a process that the capsule arranged in the hollow portion being destroyed by pressing the capsule via the filter plugs. This movement of the capsule can also be considered as one reason why the user feels it difficult to break the capsule in the conventional cigarette.

[0045] When the present invention is used for a cavity filter like the present embodiment, a range of the movement of the capsule in the hollow portion becomes smaller with setting a value of the capsule ratio to $0.55 \leq B/A \leq 0.8$, so that the user can feel it easier to destroy the capsule.

[0046] When the capsule and the molding paper 29 (a peripheral member in the present embodiment) come into contact with each other in a process in which the capsule 26 arranged in the hollow portion 22 is pressed to be destroyed, the movement of the capsule 26 is limited due to a frictional force between the capsule 26 and the molding paper 29. Thus, the user can feel it easier to break the capsule. If the molding paper 29 is not used, a member which exists on the outer side of the hollow portion in the radial direction thereof, for example the chip paper, is the peripheral member.

[0047] When the cavity filter is used, in view of a manufacturing stability, the value of the capsule ratio is preferably $0.55 \leq B/A \leq 0.75$ and more preferably $0.55 \leq B/A \leq 0.70$.

[0048] When the diameter of the filter becomes smaller, an amount of the flavor in the capsule tends to be insufficient because a volume of the capsule becomes smaller and further a velocity of an air flow caused by a suction of a smoker becomes faster.

[0049] Such a problem is also reduced by using a cigarette having a capsule filter in which the value of the capsule ratio is set to $0.55 \leq B/A \leq 0.8$ because the volume of the capsule with respect to the diameter of the filter increases in comparison with the conventional cigarette.

[0050] When a finger presses a thing, if a degree of depression caused by pressing is large on a location at which the thing is pressed by the finger, peoples feel that it is "hard", and have an impression that it is "difficult to break". Thus, in a case that a cigarette has a filter of a small diameter and a size of the capsule is also small, a force tends to concentrate on one point of the finger. Therefore, peoples strongly feel that it is more difficult to break the small capsule even though a load which is constant as a whole is applied to the small capsule. Even in such a cigarette that has a small diameter so that the people likely feel that it is difficult to break a capsule, a concentration of force on a finger can be mitigated by using a cigarette having a capsule filter whose capsule ratio is $0.55 \leq B/A \leq 0.8$ and a feeling that it is difficult to break the capsule can be reduced.

[0051] As a result of this, the present invention can be applied more suitably with a decreasing in an outer circumferential length of the chip paper such as 25 mm or less, 23 mm or less, 17 mm or less and 15 mm or less.

<Second Embodiment>

[0052] FIG. 10 shows a cigarette having a capsule filter as a second embodiment of the present invention.

[0053] A filter portion of this cigarette is different from that of the first embodiment. And, since the other portions of this cigarette are the same as those of the cigarette of the first embodiment, the other portions of this cigarette are denoted by the same reference characters as those denote the other portions of the cigarette of the first embodiment and detailed descriptions thereof are omitted.

[0054] A filter 4 of the second embodiment is structured by a filter plug 44, a web paper 46 wound around the filter plug 44 as an example of an outer-wrapping paper, and a capsule 48 embedded in the filter plug 44. (a filter of a structure in which a capsule is embedded inside the filter is called as an "embedded filter" in this specification.)

[0055] The capsule, the filter plug, the chip paper, and the web paper similar to those described in the first embodiment can be used, and also each dimension of the cigarette described in the first embodiment can be used as that of the

cigarette of the present embodiment.

[0056] Since a forming method of the capsule of this embodiment is the same as that of the capsule of the first embodiment, descriptions of the forming method of the capsule of this embodiment are omitted herein.

[0057] Also in the present embodiment, the capsule 48 is destroyed before an indentation rate of the filter plug 44 when peripheral filters 41a, 41b are pressed from an outer side in a radial direction of the filter plug reaches at 0.5.

[0058] A value of a capsule ratio B/A may be set to $0.55 \leq B/A \leq 0.75$, preferably to $0.55 \leq B/A \leq 0.70$, and a capsule deformation rate is equal to or less than $2/3$.

[0059] Since the capsule exists in the filter also in the cigarette with the filter according to the second embodiment, a pressure is applied on the peripheral filters 41a, 41b when a user destroys the capsule. Therefore, the filters generate repulsive forces when the capsule is destroyed, and a value of the repulsive force increases with an increase of the indentation rate to destroy the capsule.

[0060] However, since the capsule can be destroyed in the cigarette having the capsule filter according to the present embodiment when the indentation rate of the filter is equal to or less than a specific value (0.5), the user can feel it easier to break the capsule than in the conventional one.

[0061] A cigarette having a conventional embedded filter tends to give a strong feeling that it is difficult to break the capsule because a filter exists in a capsule location 43. Therefore, an application of the present invention is particularly effective.

[0062] Generally, in a cigarette having an embedded filter, a capsule is arranged inside fibers when the fibers are gathered in a process of creating a filter plug by gathering cellulose acetate fibers or the like in a rod shape.

[0063] Therefore, when the value of the capsule ratio is set to $0.55 \leq B/A \leq 0.75$ in the cigarette with the filter of the second embodiment formed as described above, the filter plug in a capsule position is pressed harder than the conventional one so that a pressure generated by user's fingers is more easily transferred to the capsule and the user can feel it easier to break the capsule.

[0064] When considering a relationship between an ease in a break of the capsule and a pressure drop which is felt by a smoker while the user smokes, it is preferable that the value of the capsule ratio is set to $0.55 \leq B/A \leq 0.70$ so that the pressure drop can be kept at a proper level (if the pressure drop is too high, it is difficult to smoke, and, if the pressure drop is too low, it is difficult to feel smoking) while the ease in the break of the capsule is maintained.

[0065] Also in the present embodiment, as described above, the present invention can be applied more suitably with a decreasing in an outer circumferential length of the chip paper such as 25 mm or less, 23 mm or less, 17 mm or less and 15 mm or less.

<Measure against exudation>

[0066] FIG. 11 shows a cigarette as a third embodiment of the present invention. This embodiment uses a cavity filter similar to that in the first embodiment, and the same parts of the third embodiment as those of the first embodiment are denoted by the same reference characters as those used to denote the same parts of the first embodiment and the descriptions thereof are omitted. The present embodiment is different from the first embodiment in that a rolling paper is not used and an exudation preventing molding paper 52 for preventing an exudation of a liquid for contents in the capsule is used as a molding paper.

[0067] As an example of the exudation preventing molding paper 52, a water-resistant paper having a water resistance, an oil-resistant paper having an oil resistance, a water and oil resistant paper having a water resistance and oil resistance, or a paper on an inside of which a wax having a water resistance and/or an oil resistance and the like is coated may be used. In some cases, such molding paper has almost no air permeability.

[0068] Further, a gap filling layer 56 is formed between the exudation preventing molding paper 52 and each of filter plugs 54a, 54b to fill the gap between the exudation preventing molding paper 52 and each of the filter plugs 54a, 54b. As the gap filling layer, an adhesive such as a paste or a hot melt adhesive may be used. When the paper on the inside of which a wax having a water resistance and/or an oil resistance and the like is coated is used, the wax can perform as the gap filling layer.

[0069] When a value of the capsule ratio is set to $0.55 \leq B/A$, a relatively large amount of liquid for contents can be held in the capsule. In this case, by constructing the cavity filter as the present embodiment, a possibility that the liquid for contents exudes out through the cavity filter when the liquid for contents flew out from the capsule in the hollow portion can be reduced.

[0070] Naturally, an embedded filter can also be structured by using a gap filling layer and a rolling paper that prevents an exudation of a liquid for contents of a capsule like the above described exudation preventing molding paper. This invention is also useful when an user destroys a capsule by using anything other than fingers.

[0071] If it is not specifically mentioned, each element and each condition setting in each embodiment of the present invention described above can individually and independently be combined with each other.

Further embodiments:

[0072]

1. A cigarette comprising:

a tobacco rod; and

a filter including a filter plug connected to one end of the tobacco rod and a capsule in which contents is held inside a film, wherein

the filter plug has a property that a repulsive force increases in accordance with a first increasing rate with an increase of an indentation rate when the indentation rate is equal to or less than a specific value as the filter plug is pressed from outside and the repulsive force increases in accordance with a second increasing rate larger than the first increasing rate with the increase of the indentation rate when the indentation rate becomes larger than the specific value, and

the capsule is destroyed when the indentation rate of the filter plug is equal to or less than the specific value.

2. The cigarette according to embodiment 1, wherein the specific value of the indentation rate is 0.5.

3. The cigarette according to embodiment 1 or 2, wherein the filter plug is formed from cellulose acetate fibers.

4. The cigarette according to any one of embodiments 1 to 3, wherein the filter plug includes a rod side plug and a holder side plug, these plugs being spaced apart from each other via a hollow portion, and the capsule is arranged in the hollow portion.

5. The cigarette according to embodiment 4, wherein

the tobacco rod is a cylindrical shape,

the filter is a cylindrical shape,

the capsule is circular in a cross sectional shape when it is viewed from an end surface side of the filter,

and, in a case that a diameter of the filter plug is A and a diameter of a circle in the cross sectional shape of the capsule when it is viewed from the end surface side of the filter is B, a value of B/A is $0.55 \leq B/A \leq 0.80$.

6. The cigarette according to embodiment 5, wherein the value of B/A is $0.55 \leq B/A \leq 0.75$.

7. The cigarette according to embodiment 6, wherein the value of B/A is $0.55 \leq B/A \leq 0.70$.

8. The cigarette according to embodiment 5, wherein the capsule is in contact with a peripheral member existing in a radial direction of the hollow portion.

9. The cigarette according to any one of embodiments 1 to 3, wherein the capsule is embedded in the filter plug.

10. The cigarette according to embodiment 9, wherein

the tobacco rod is a cylindrical shape,

the filter is a cylindrical shape,

the capsule is circular in a cross sectional shape when it is viewed from an end surface of the filter,

and, in a case that a diameter of the filter plug is A and a diameter of a circle in the cross sectional shape of the capsule when it is viewed from the end surface side of the filter is B, a value of B/A is $0.55 \leq B/A \leq 0.75$.

11. The cigarette according to embodiment 10, wherein the value of B/A is $0.55 \leq B/A \leq 0.70$.

12. The cigarette according to embodiment 3, wherein a chip paper is wound around a periphery of a connecting portion at which the tobacco rod and the filter are connected, and an outer circumferential length of the chip paper is 25 mm or less.

13. The cigarette according to embodiment 12, wherein the outer circumferential length of the chip paper is 23 mm or less.

14. The cigarette according to embodiment 13, wherein the outer circumferential length of the chip paper is 17 mm

or less.

15. The cigarette according to embodiment 14, wherein the outer circumferential length of the chip paper is 15 mm or less.

16. The cigarette according to any one of embodiments 3 to 15, wherein a filament denier of the filter plug is 5.0 to 14.0 g/9000 m.

Claims

1. A cigarette comprising:

a tobacco rod (1); and
a filter (4) including

a filter plug (44) connected to one end of the tobacco rod (1), and
a capsule (48) in which contents (264) is held inside a film (262),

characterized in that:

the capsule (48) is embedded in the filter plug (44),
the tobacco rod (1) is a cylindrical shape,
the filter (2) is a cylindrical shape with a diameter A of the filter plug (44) perpendicular to the longitudinal
direction of the cigarette,
the capsule (48) is circular in a cross sectional shape perpendicular to the longitudinal direction of the
cigarette with a diameter B,
a capsule ratio is defined as B/A, and
a value of B/A is $0.55 \leq B/A \leq 0.75$.

2. The cigarette according to claim 1, comprising a chip paper (3) which is wound around a periphery of a connecting portion at which the tobacco rod (1) and the filter (4) are connected, wherein an outer circumferential length of the chip paper (3) is ≤ 25 mm.

3. The cigarette according to claim 2, wherein the outer circumferential length of the chip paper (3) is ≤ 23 mm.

4. The cigarette according to claim 3, wherein the outer circumferential length of the chip paper (3) is ≤ 17 mm.

5. The cigarette according to claim 4, wherein the outer circumferential length of the chip paper (3) is ≤ 15 mm.

6. The cigarette according to any one of claims 1-5, wherein a filament denier of the filter plug (44) is 5.0 g/9000 m to 14.0 g/9000 m.

7. The cigarette according to any one of claims 1-6, wherein
the capsule (48) embedded inside the filter plug (44) is destroyed, in use, by applying a pressure on two spots (e) on the filter plug (44) by the fingers of the user,
an indentation rate of the filter plug (44) is defined as (C-D)/C, wherein C is a distance between spots (e) on the filter plug (44) before said pressure is applied thereto and D is a distance between spots (e') on the filter plug (44) after said pressure is applied thereto,
the capsule (48) is configured to be destroyed when the indentation rate of the filter plug (44) is equal to or less than 0.5.

8. A cigarette comprising:

a tobacco rod (1); and
a filter (2) including

a filter plug (24a, 24b, 54a, 54b) connected to one end of the tobacco rod (1), and
a capsule (26) in which contents (264) is held inside a film (262),

characterized in that:

the filter plug (24a, 24b, 54a, 54b) includes a rod side plug (24a, 54a) and a holder side plug (24b, 54b), these plugs (24a, 24b, 54a, 54b) being spaced apart from each other via a hollow portion (22), and the capsule (26) is arranged in the hollow portion (22).

the tobacco rod (1) is a cylindrical shape,

the filter (2) is a cylindrical shape with a diameter A of the filter plug (24a, 24b, 54a, 54b) perpendicular to the longitudinal direction of the cigarette,

the capsule (26) is circular in a cross sectional shape perpendicular to the longitudinal direction of the cigarette with a diameter B,

a capsule ratio is defined as B/A , and

a value of B/A is $0.55 \leq B/A \leq 0.80$.

9. The cigarette according to claim 8, comprising a chip paper (3) which is wound around a periphery of a connecting portion at which the tobacco rod (1) and the filter (2) are connected, wherein an outer circumferential length of the chip paper (3) is ≤ 25 mm.

10. The cigarette according to claim 9, wherein the outer circumferential length of the chip paper (3) is ≤ 23 mm.

11. The cigarette according to claim 10, wherein the outer circumferential length of the chip paper (3) is ≤ 17 mm.

12. The cigarette according to claim 11, wherein the outer circumferential length of the chip paper (3) is ≤ 15 mm.

13. The cigarette according to any one of claims 8-12, wherein a filament denier of the filter plug (24a, 24b, 54a, 54b) is 5.0 g/9000 m to 14.0 g/9000 m.

14. The cigarette according to any one of claims 8-13, wherein

the capsule (26) arranged in the hollow portion (22) is destroyed, in use, by applying a pressure on two spots (e) on the filter plug (24a, 24b, 54a, 54b) by the fingers of the user,

an indentation rate of the filter plug (24a, 24b, 54a, 54b) is defined as $(C-D)/C$, wherein C is a distance between spots (e) on the filter plug (24a, 24b, 54a, 54b) before said pressure is applied thereto and D is a distance between spots (e') on the filter plug (24a, 24b, 54a, 54b) after said pressure is applied thereto,

the capsule (26) is configured to be destroyed when the indentation rate of the filter plug (24a, 24b, 54a, 54b) is equal to or less than 0.5.

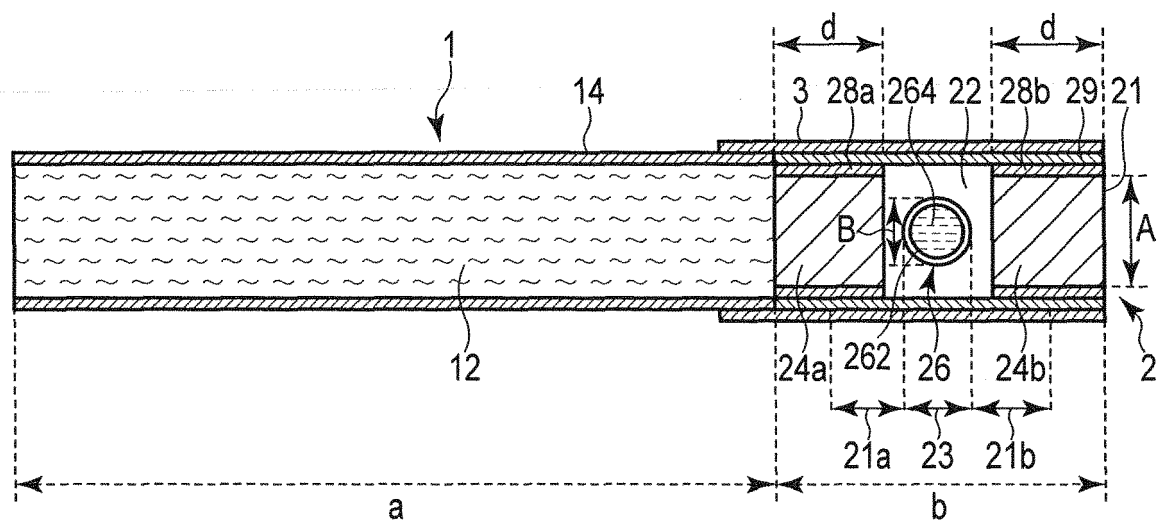


FIG. 1

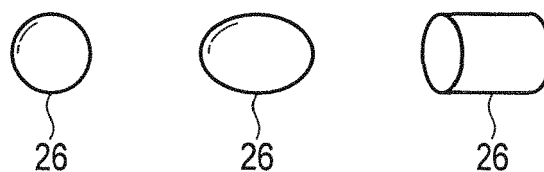


FIG. 2

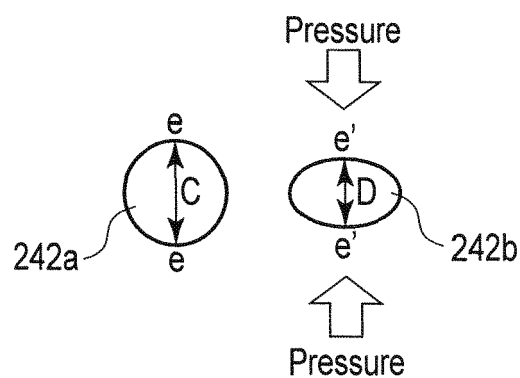


FIG. 3

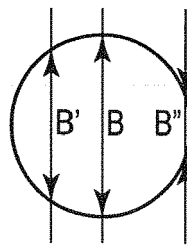


FIG. 4

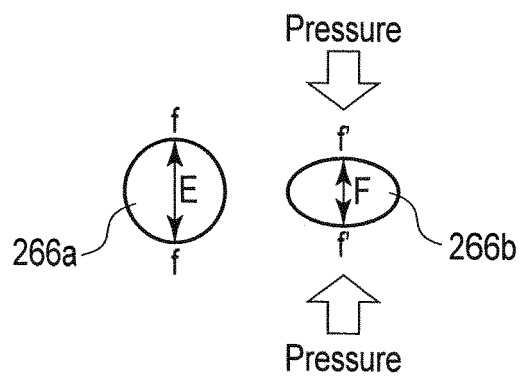


FIG. 5

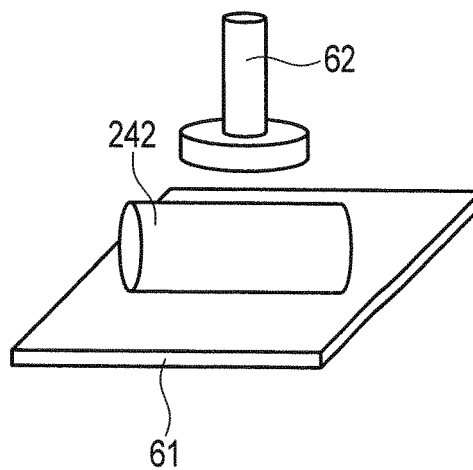


FIG. 6

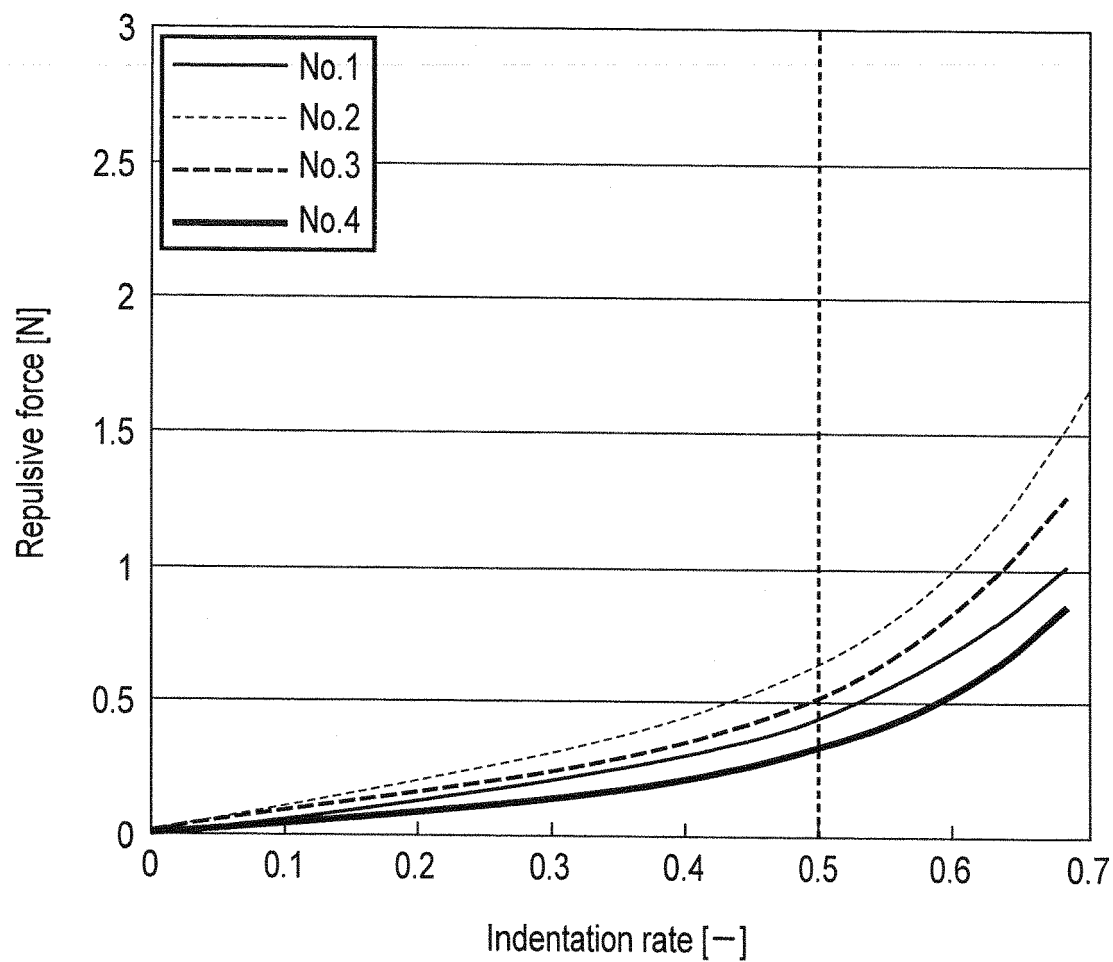


FIG. 7

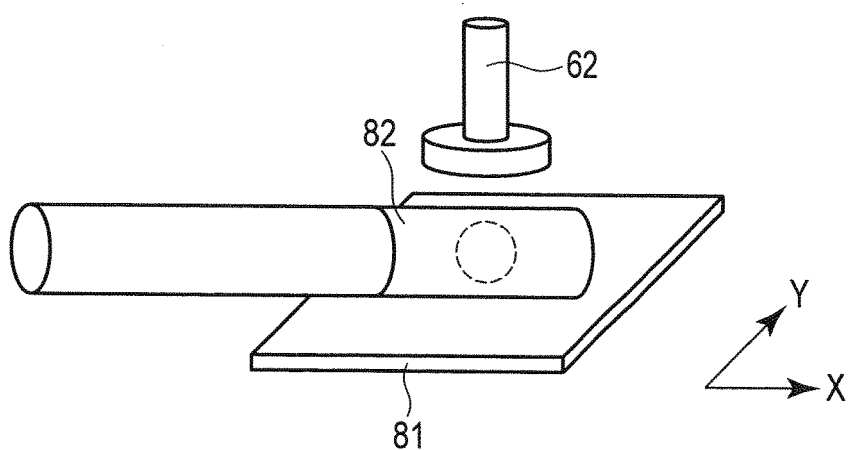


FIG. 8

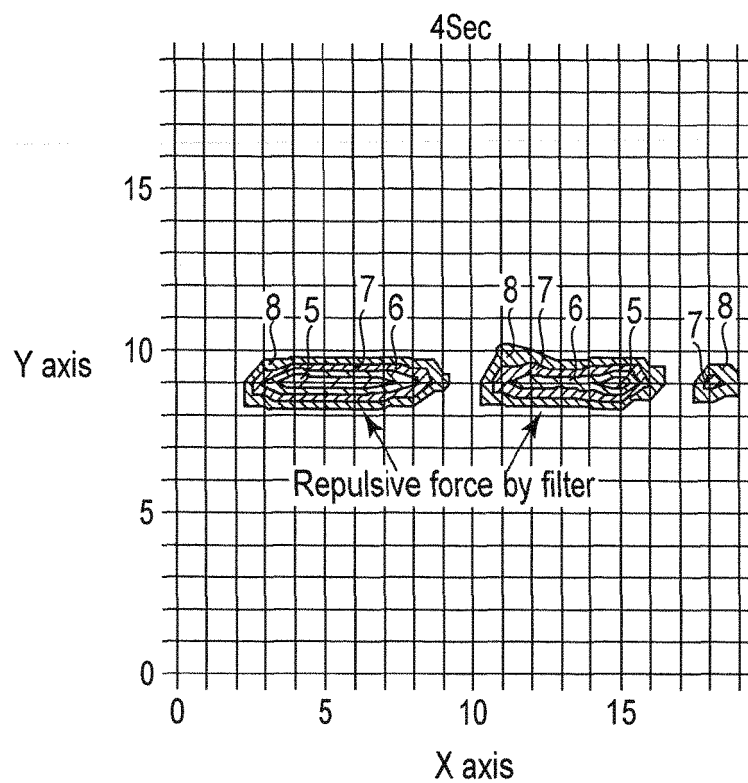


FIG. 9A

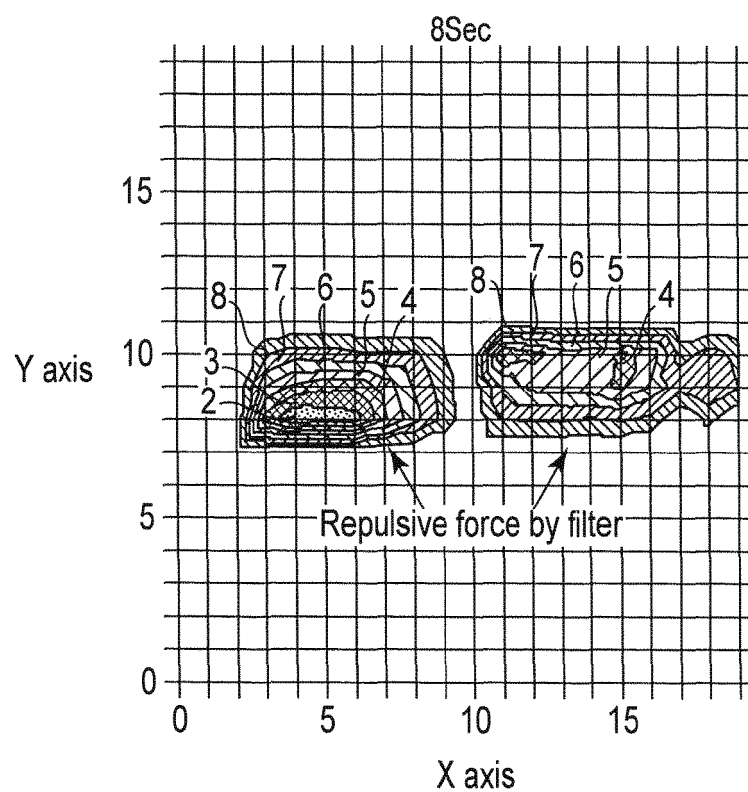


FIG. 9B

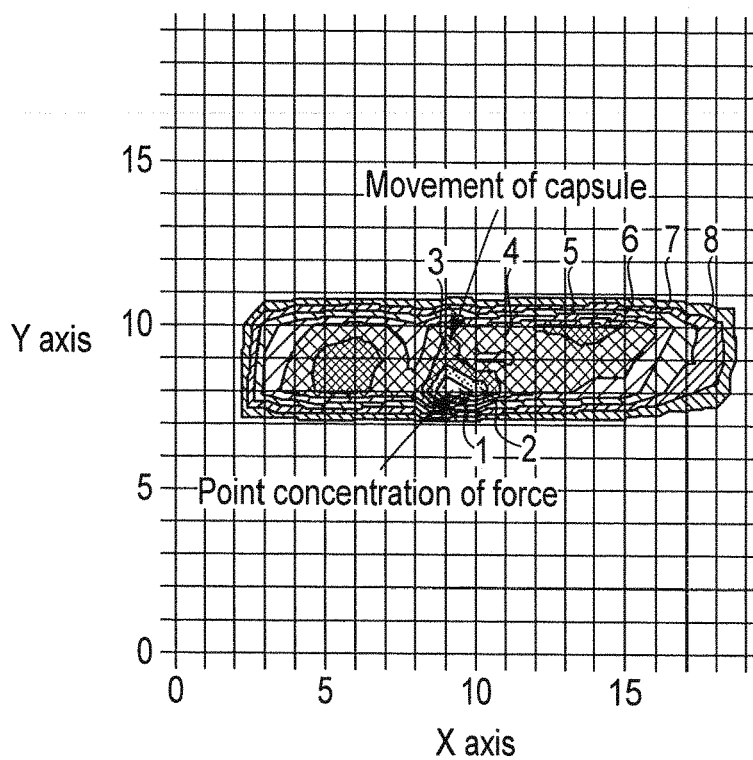


FIG. 9C

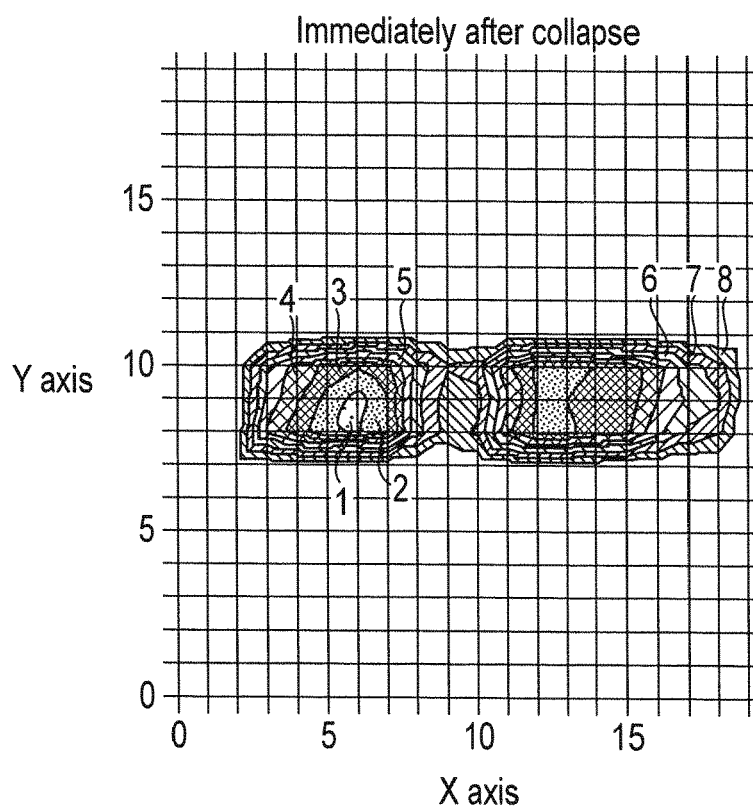


FIG. 9D

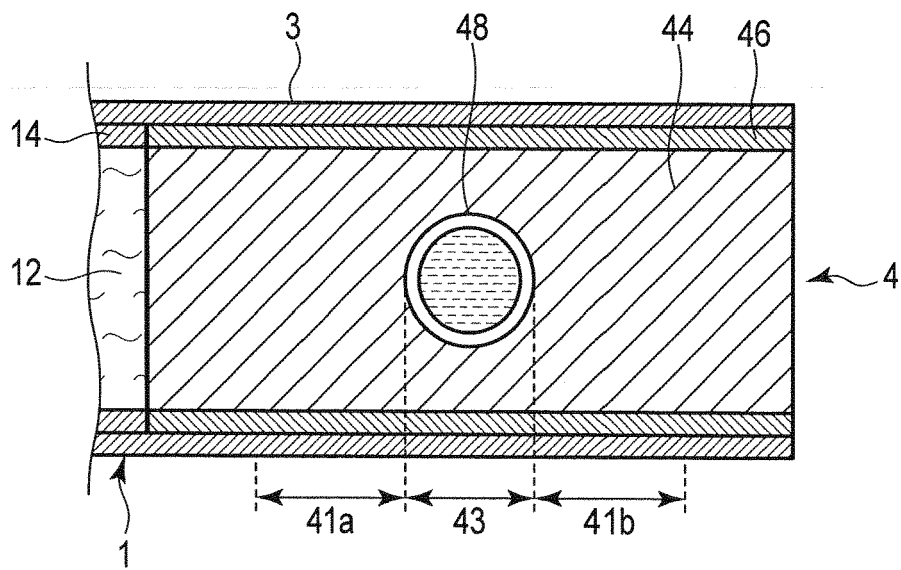


FIG. 10

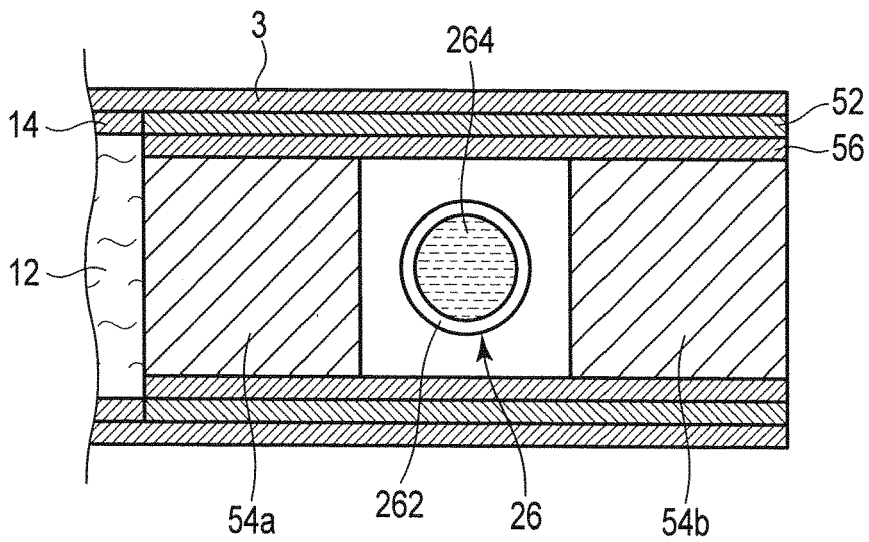


FIG. 11



EUROPEAN SEARCH REPORT

Application Number
EP 20 17 2337

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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)
A	EP 2 213 185 A1 (REYNOLDS TOBACCO CO R [US]) 4 August 2010 (2010-08-04) * column 18, paragraph [0063] - column 19, paragraph [0064]; figure 10 *	1-14	INV. A24D3/04 A24D3/06
A	WO 2006/082529 A2 (PHILIP MORRIS PROD [CH]) 10 August 2006 (2006-08-10) * page 17, line 8 - page 18, line 18; figures 1-9 *	1-14	
A	EP 2 120 616 A2 (PHILIP MORRIS PROD [CH]) 25 November 2009 (2009-11-25) * column 1, paragraph [0003]-[0004]; figures 1,2,4 * * column 5, line 45 - column 6, line 11 *	1-14	
A	JP 2011 512122 A (R.J. REYNOLDS TOBACCO CO. [US]) 21 April 2011 (2011-04-21) * figures 1,2 *	1-14	
A	JP 2008 546400 A (V. MANE FILS [FR]) 25 December 2008 (2008-12-25) * the whole document *	1-14	TECHNICAL FIELDS SEARCHED (IPC) A24D
A	EP 0 649 607 A2 (BRITISH AMERICAN TOBACCO CO [GB]) 26 April 1995 (1995-04-26) * abstract; claims 1,2; figures 1,1a,5 *	1-14	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 June 2020	Examiner Fernandez, Eva
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	

EPO FORM 1503 03.82 (P04C01)

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

EP 20 17 2337

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-06-2020

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 2213185	A1	04-08-2010	AT	387862 T	15-03-2008
			AT	456309 T	15-02-2010
			AT	472947 T	15-07-2010
			AT	476879 T	15-08-2010
			AT	532424 T	15-11-2011
			DE 602004012296	T2	05-03-2009
			EP	1670327 A2	21-06-2006
			EP	1905318 A1	02-04-2008
			EP	1908361 A1	09-04-2008
			EP	1908362 A1	09-04-2008
			EP	2213185 A1	04-08-2010
			ES	2299876 T3	01-06-2008
			ES	2340084 T3	28-05-2010
			ES	2376717 T3	16-03-2012
			JP	4795959 B2	19-10-2011
			JP	5031513 B2	19-09-2012
			JP	5068137 B2	07-11-2012
			JP	5068138 B2	07-11-2012
			JP	2007507230 A	29-03-2007
			JP	2008043345 A	28-02-2008
			JP	2008043346 A	28-02-2008
			JP	2008043347 A	28-02-2008
			WO	2005032287 A2	14-04-2005

WO 2006082529	A2	10-08-2006	AU	2006211051 A1	10-08-2006
			AU	2011201814 A1	19-05-2011
			AU	2012200056 A1	02-02-2012
			AU	2015202875 A1	18-06-2015
			AU	2017203804 A1	22-06-2017
			BR	PI0606129 A2	02-06-2009
			CN	101115408 A	30-01-2008
			CN	102100401 A	22-06-2011
			CN	103271438 A	04-09-2013
			DK	1850685 T3	10-06-2013
			EA	200701666 A1	28-02-2008
			EP	1850685 A2	07-11-2007
			EP	2578094 A2	10-04-2013
			EP	2578095 A2	10-04-2013
			ES	2422430 T3	11-09-2013
			ES	2684488 T3	03-10-2018
			ES	2729382 T3	04-11-2019
			HK	1110481 A1	18-10-2013
			JP	5134970 B2	30-01-2013
			JP	5604387 B2	08-10-2014
			JP	2008528053 A	31-07-2008
			JP	2011250801 A	15-12-2011

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

EP 20 17 2337

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-06-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		JP 2013055951 A	28-03-2013
		JP 2016146852 A	18-08-2016
		KR 20070100422 A	10-10-2007
		KR 20130029457 A	22-03-2013
		KR 20140090269 A	16-07-2014
		LT 2578095 T	10-08-2018
		PL 1850685 T3	30-09-2013
		PL 2578094 T3	31-10-2019
		PL 2578095 T3	31-12-2018
		PT 1850685 E	04-06-2013
		PT 2578094 T	10-09-2019
		RS 52785 B	31-10-2013
		SI 1850685 T1	28-06-2013
		TR 201908116 T4	21-06-2019
		UA 90128 C2	12-04-2010
		US 2006174901 A1	10-08-2006
		US 2009277465 A1	12-11-2009
		US 2020146343 A1	14-05-2020
		WO 2006082529 A2	10-08-2006
		ZA 200705848 B	30-07-2008

EP 2120616 A2	25-11-2009	AT 515953 T	15-07-2011
		AU 2007343080 A1	17-07-2008
		BR PI0720983 A2	18-03-2014
		CN 101553140 A	07-10-2009
		CO 6210782 A2	20-10-2010
		DK 2120616 T3	05-09-2011
		EA 200970658 A1	26-02-2010
		EP 2120616 A2	25-11-2009
		ES 2366754 T3	25-10-2011
		JP 5348648 B2	20-11-2013
		JP 2010514437 A	06-05-2010
		KR 20090102790 A	30-09-2009
		MY 145922 A	15-05-2012
		NZ 576771 A	29-06-2012
		PL 2120616 T3	30-12-2011
		PT 2120616 E	01-09-2011
		RS 51953 B	29-02-2012
		SI 2120616 T1	30-09-2011
		UA 96976 C2	26-12-2011
		US 2008163877 A1	10-07-2008
		WO 2008084333 A2	17-07-2008

JP 2011512122 A	21-04-2011	CN 101925403 A	22-12-2010
		EP 2234711 A1	06-10-2010
		EP 3299084 A1	28-03-2018

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

EP 20 17 2337

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-06-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		ES 2657636 T3	06-03-2018
		JP 5117579 B2	16-01-2013
		JP 2011512122 A	21-04-2011
		US 2010294290 A1	25-11-2010
		WO 2009094859 A1	06-08-2009

JP 2008546400 A	25-12-2008	AP 2372 A	06-03-2012
		AT 439772 T	15-09-2009
		BR PI0611577 A2	21-09-2010
		CN 101203148 A	18-06-2008
		CY 1109633 T1	13-08-2014
		DK 1906775 T3	07-12-2009
		EG 26683 A	02-06-2014
		ES 2331713 T3	13-01-2010
		HK 1115783 A1	12-03-2010
		JP 5616018 B2	29-10-2014
		JP 5731045 B2	10-06-2015
		JP 6010090 B2	19-10-2016
		JP 2008546400 A	25-12-2008
		JP 2014166188 A	11-09-2014
		JP 2015037425 A	26-02-2015
		KR 20080022127 A	10-03-2008
		KR 20150051244 A	11-05-2015
		KR 20160138325 A	02-12-2016
		KR 20180049222 A	10-05-2018
		NZ 564190 A	28-01-2011
		PT 1906775 E	17-11-2009
		SI 1906775 T1	29-01-2010
		UA 90150 C2	12-04-2010
		US 2009050163 A1	26-02-2009
		US 2014053855 A1	27-02-2014
		US 2016249676 A1	01-09-2016
		WO 2006136197 A1	28-12-2006
		ZA 200711059 B	24-06-2009

EP 0649607 A2	26-04-1995	AT 198261 T	15-01-2001
		AT 235171 T	15-04-2003
		AU 675573 B2	06-02-1997
		BR 9403650 A	30-05-1995
		DE 69426480 T2	19-04-2001
		DE 69432372 T2	23-10-2003
		DK 0649607 T3	29-01-2001
		DK 0920816 T3	22-04-2003
		EP 0649607 A2	26-04-1995
		EP 0920816 A2	09-06-1999
		ES 2152969 T3	16-02-2001

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

EP 20 17 2337

5

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The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-06-2020

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		ES 2193465 T3	01-11-2003
		GR 3035202 T3	30-04-2001
		JP 3744953 B2	15-02-2006
		JP H07250665 A	03-10-1995
		JP 2003304856 A	28-10-2003
		PT 649607 E	30-04-2001
		PT 920816 E	31-07-2003
		US 2003098033 A1	29-05-2003
		US 2004074507 A1	22-04-2004

20

25

30

35

40

45

50

EPO FORM P0459

55

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Patent documents cited in the description

- JP 2003304856 A [0004]