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(54) **CIGARETTE**

(57) A cigarette comprises 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. 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. The capsule is destroyed when the indentation rate of the filter plug is equal to or less than the specific value.

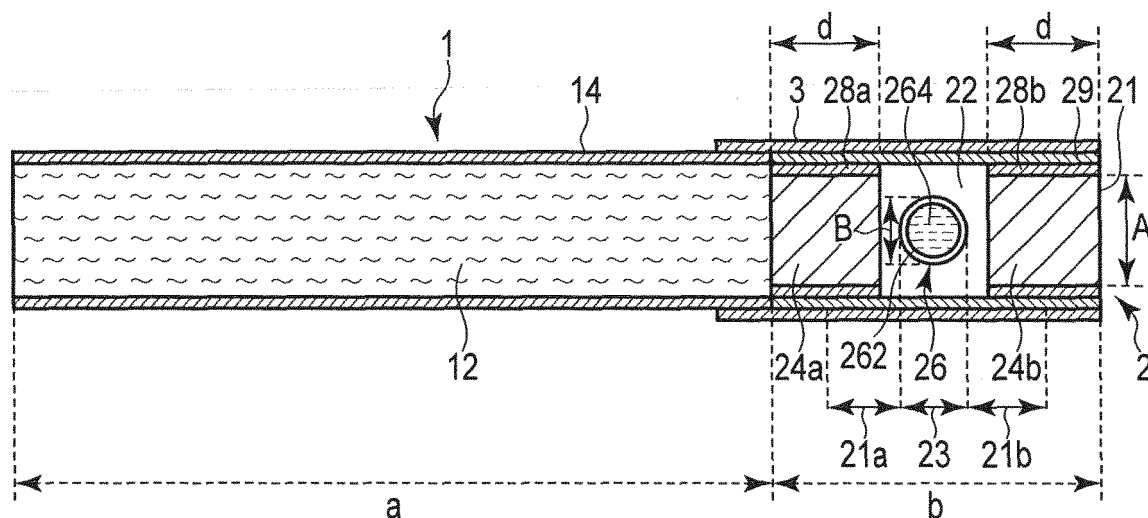


FIG. 1

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 (Japanese Patent Application KOKAI Publication No. 2003-304856).

[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. Examples of such cigarettes are disclosed in EP 2 213 185 A1, WO 2006/082529 A2, EP 2 120 616 A2 and JP 2011 512122 A, for instance.

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Summary of Invention

[0004] 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.

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[0005] 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.

[0006] The present invention provides a cigarette with the features of claim 1. Preferred embodiments are described in the further claims.

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[0007] 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 $0.55 \leq B/A \leq 0.70$.

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[0008] The capsule may be in contact with a peripheral member existing in a radial direction of the hollow portion.

[0009] 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 $0.55 \leq B/A \leq 0.70$.

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[0010] 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.

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[0011] 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.

[0012] 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.

45 Brief Description of Drawings

[0013]

FIG. 1 is a figure for explaining a cigarette of a first embodiment according to the present invention.

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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.

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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.

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.
 FIG. 11 is a figure for explaining a cigarette of a third embodiment according to the present invention.

Description of Embodiments

[0014] 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>

[0015] 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.

[0016] 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".)

[0017] 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.

[0018] 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 pmm, and an air permeability of 0 to 30,000 CORESTA unit (C.U.) can be used.

[0019] 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.

[0020] 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>

[0021] 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.

[0022] 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>

[0023] 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.

<Capsule ratio>

[0024] 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>

[0025] 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>

[0026] 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.

<Capsule>

[0027] 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.

[0028] 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.

[0029] The capsule deformation rate can be adjusted by changing a composition or thickness of the film forming material.

[0030] 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.

[0031] In addition, the capsule may hold granulated solid as its contents.

<Capsule forming method>

[0032] 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.

[0033] 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.

[0034] 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 (mm^2) and the cross section means a circular cross section which is orthogonal to a longitudinal direction of the cylindrical filter.

[0035] 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.

[0036] 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.

[0037] 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 ($\text{mmH}_2\text{O}/120\text{mm}$)	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	Outer circumferential length of filter plug (mm)	Basis Weight (g/m^2)	Thickness (μm)	Pressure Drop ($\text{mmH}_2\text{O}/120\text{mm}$)	Width of paper (mm)
4	paper	24.4	35	60	300	220

[0038] 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 $50 \text{ g}/\text{m}^2$ and whose thickness is $52 \mu\text{m}$ around a filter plug, a length of the filter plug is 27 mm, and the filter plug includes no capsule.

[0039] 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.

[0040] 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.

[0041] 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.

[0042] 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.

[0043] 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.

[0044] 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.

[0045] 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 $0.55 \leq B/A \leq 0.70$.

[0046] 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.

[0047] 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.

[0048] 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.

[0049] 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>

[0050] FIG. 10 shows a cigarette having a capsule filter as a second embodiment of the present invention.

[0051] 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.

[0052] 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.)

[0053] 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.

[0054] 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.

[0055] 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.

[0056] 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 $2/3$.

[0057] 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.

[0058] 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.

[0059] 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.

[0060] 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.

[0061] 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.

[0062] 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.

[0063] 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>

[0064] 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.

[0065] 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.

[0066] 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.

[0067] 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.

[0068] 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.

[0069] 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.

[0070] The following numbered paragraphs describe further embodiments of the invention.

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 1, wherein the indentation rate, in particular the specific value thereof, is 0.5.

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

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

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

8. The cigarette according to 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 1 to 3,
wherein the capsule is embedded in the filter plug.

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

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

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

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

16. The cigarette according to any one of 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.

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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.

5 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.

10 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
15 equal to or less than 0.5.

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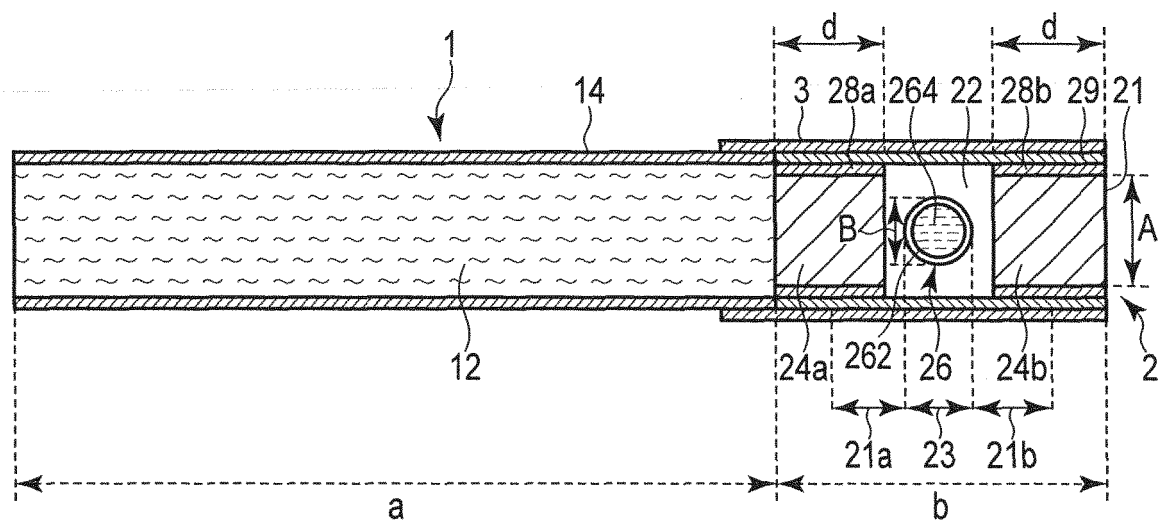


FIG. 1

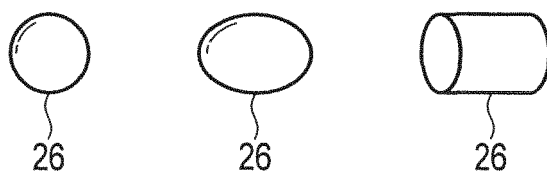


FIG. 2

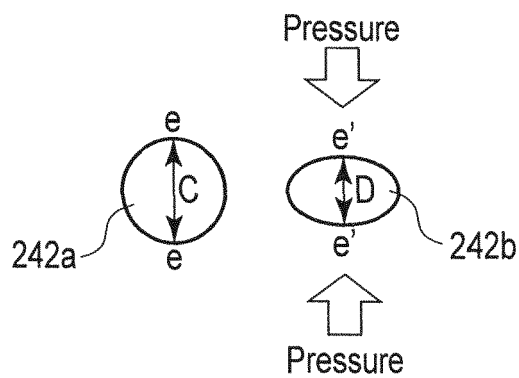


FIG. 3

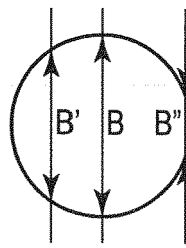


FIG. 4

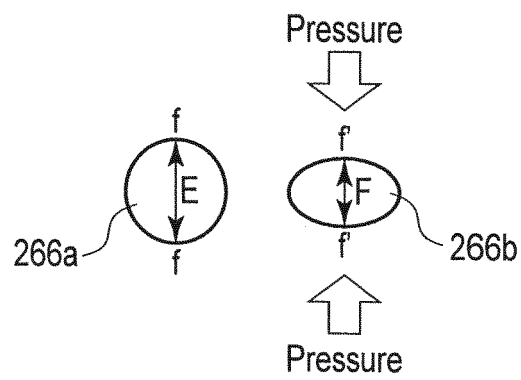


FIG. 5

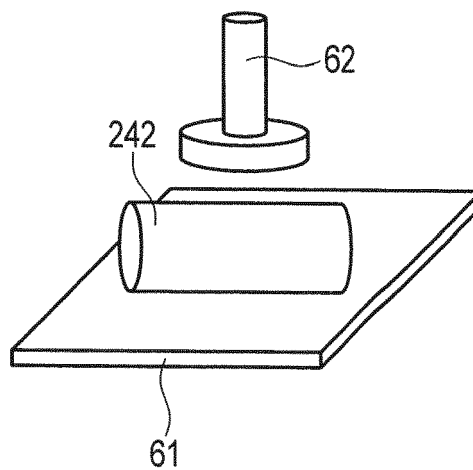


FIG. 6

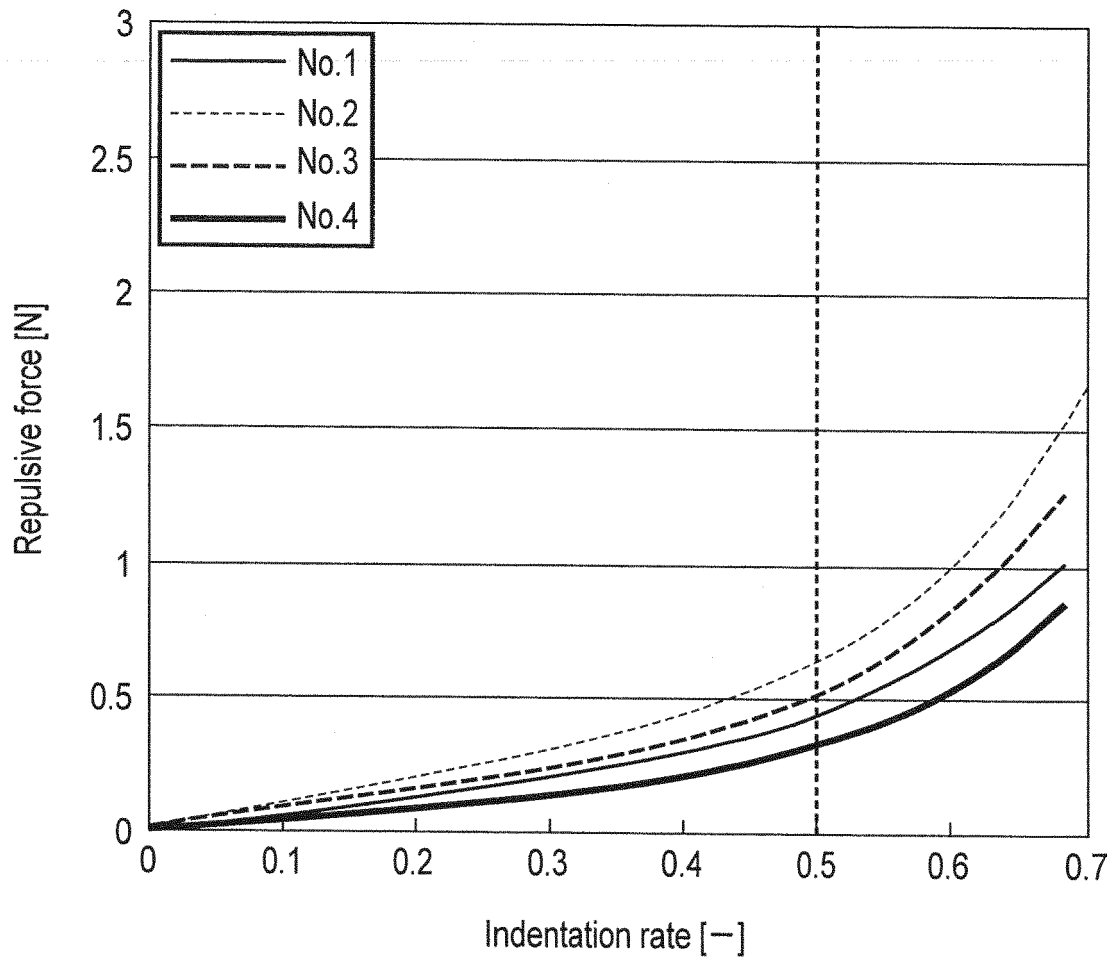


FIG. 7

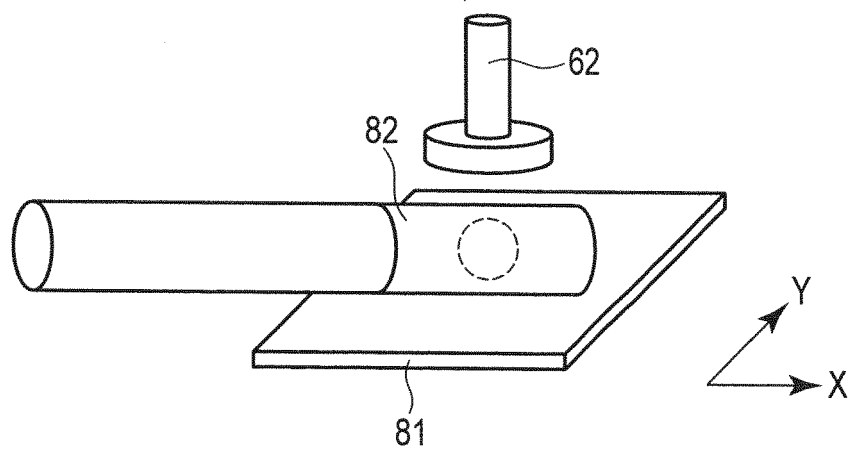


FIG. 8

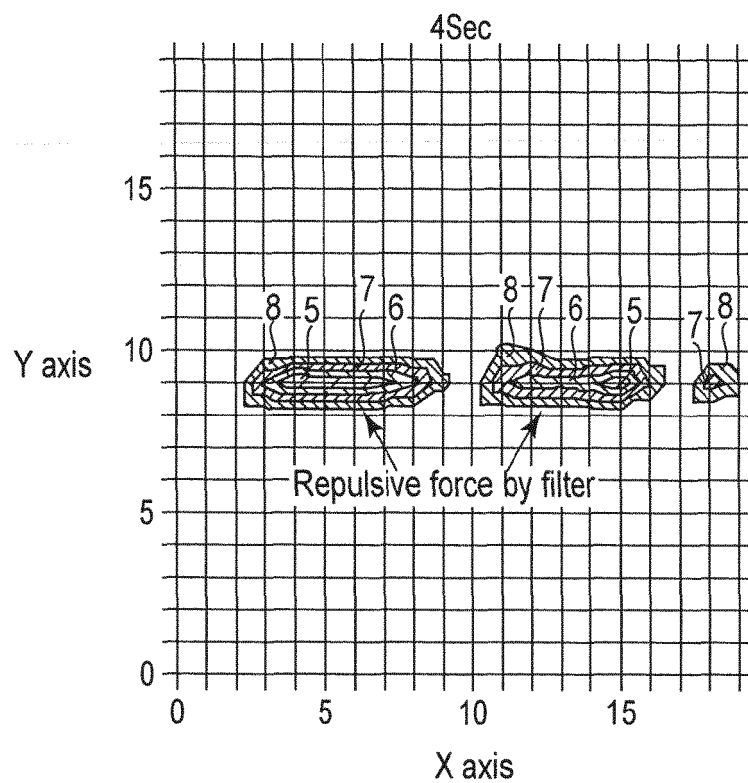


FIG. 9A

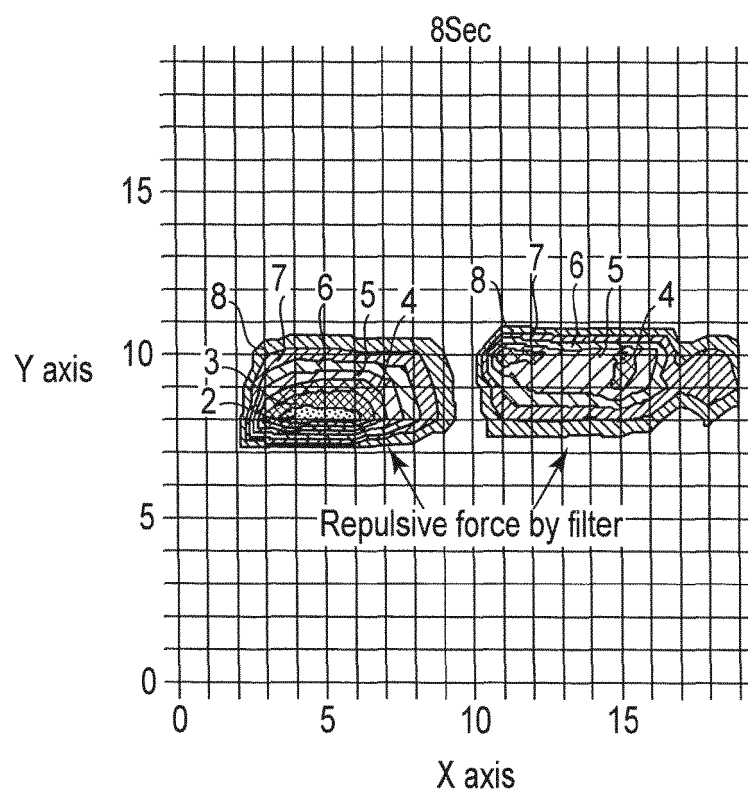


FIG. 9B

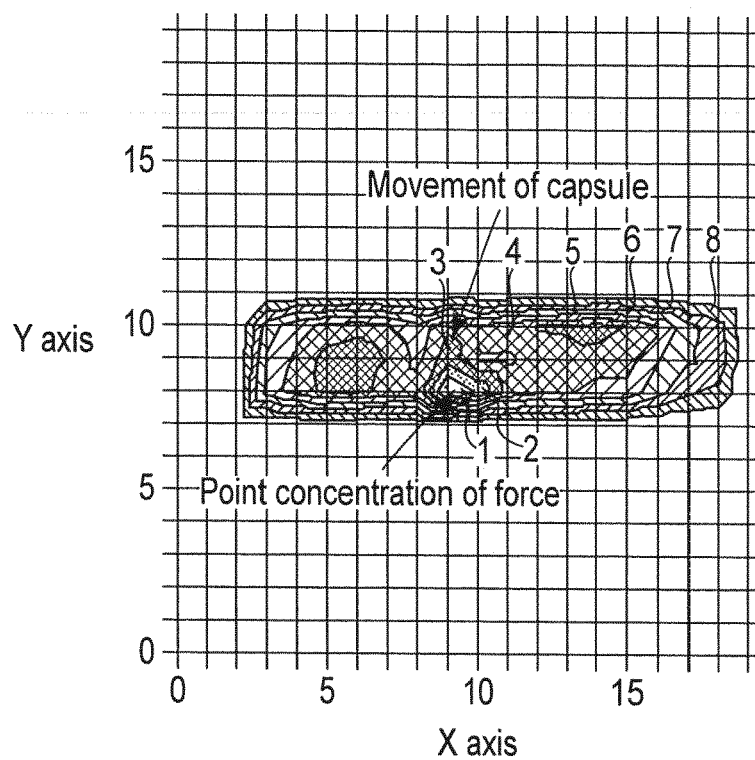


FIG. 9C

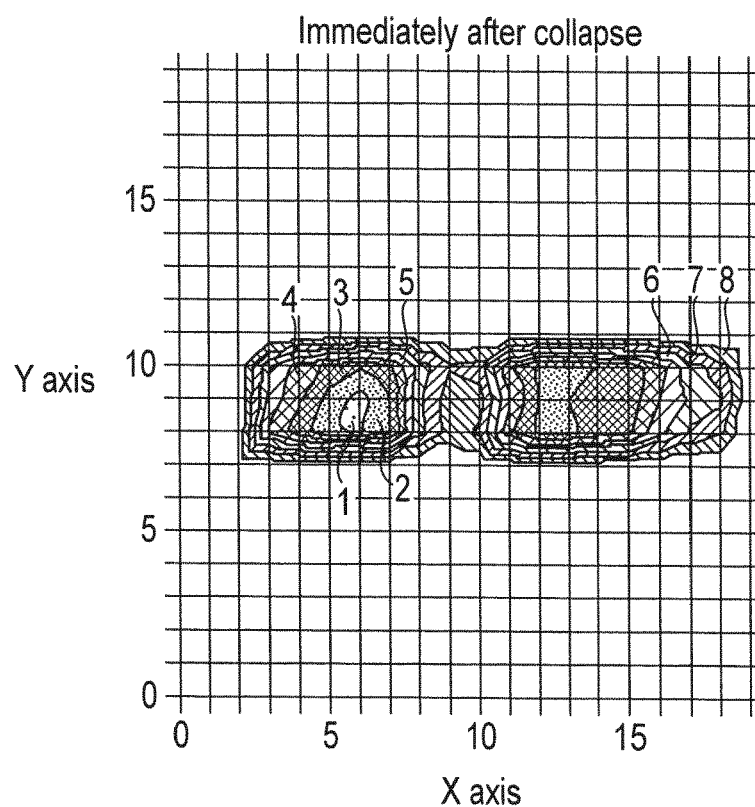


FIG. 9D

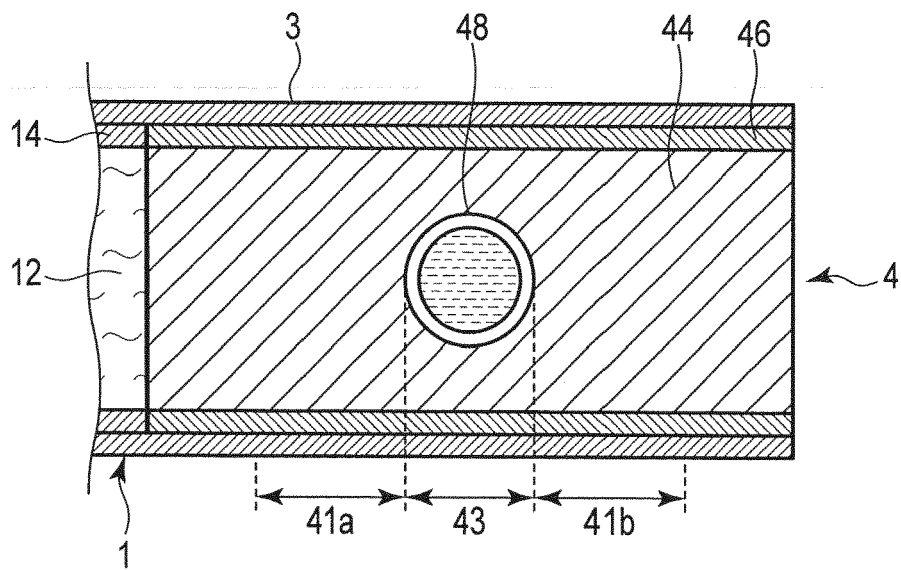


FIG. 10

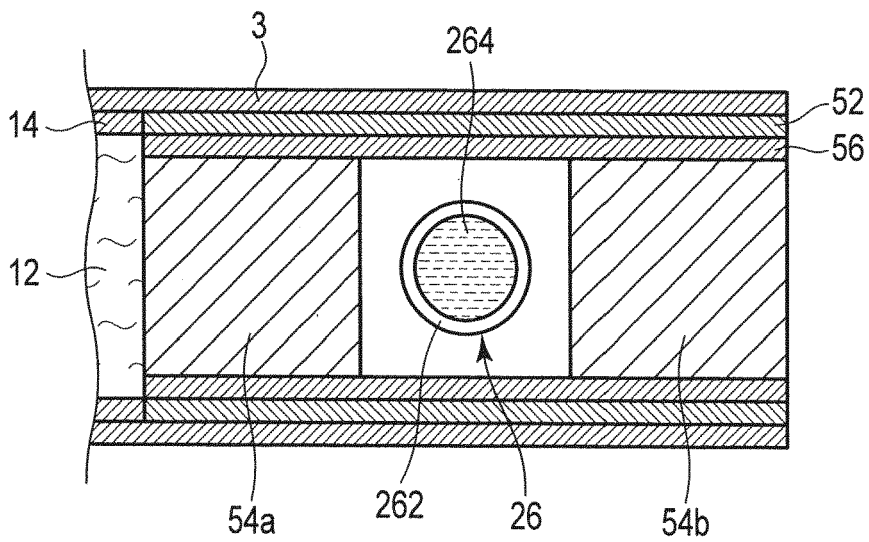


FIG. 11



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Place of search Munich		Date of completion of the search 25 September 2020	Examiner Fernandez, Eva
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