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(54) **CIGARETTE**

(57) A cigarette comprising: a tobacco rod; a filter comprising a plurality of filter plugs spaced apart from each other, a plug wrapping paper wrapped around the filter plugs to form a cavity between the filter plugs, and a flavor capsule contained in the cavity and encapsulating a flavor-containing content liquid in a shell; and a tipping paper wrapped on the tobacco rod and the filter

to connect the tobacco rod and the filter, wherein the plug wrapping paper has impermeability to the content liquid, and the opacity of laminated paper formed of the plug wrapping paper and the tipping paper is (i) 70% or less before breakage of the flavor capsule and (ii) is decreased by 5% or more after breakage of the flavor capsule.

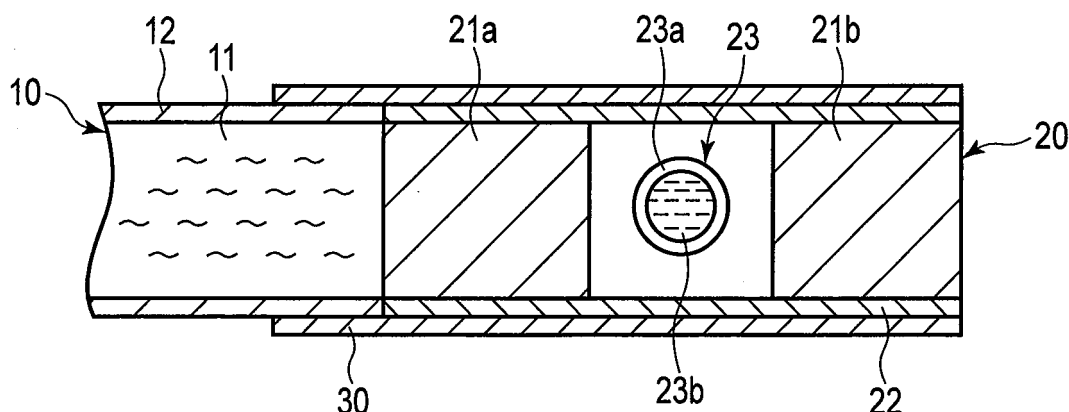


FIG. 1A

Description

Technical Field

5 **[0001]** The present invention relates to a cigarette comprising a cigarette filter including a flavor capsule.

Background Art

10 **[0002]** Conventionally, a flavor capsule is incorporated in a cigarette filter, and the flavor capsule is crushed to enjoy the flavor of the content liquid in smoking or to mask the odor of the cigarette butt after extinguishment (Patent Documents 1 and 2). Details of the flavor capsule are described in, for example, Patent Document 3.

[0003] A tipping paper or a plug wrapping paper plays a role in concealing the joint between the filter and the tobacco rod or concealing the color of tar adhered to the filter material from a smoker. Accordingly, an opaque paper is generally used. In the case of a charcoal filter, an opaque tipping paper or plug wrapping paper also plays a role in concealing the color of activated carbon, in addition to the above role.

[0004] On the other hand, a transparent tipping paper and a transparent plug wrapping paper are used to visualize the inside of a filter (Patent Documents 4 to 6).

20 **[0005]** Patent Document 4 discloses that transparent materials are used as a tipping paper and a plug wrapping paper in order to visualize the inside of a filter and that an opaque coating is applied to a part of the tipping paper to impart a concealing function. Patent Document 4 exemplifies polypropylene, polyvinyl chloride, a cellulose acetate film, polyethylene terephthalate, polyethylene oxide, polyethylene, cellophane, Natureflex (registered trademark), and polyacetic acid as the transparent materials. Further, Patent Document 4 discloses that the tipping paper and the plug wrapping paper may be colored to be semi-transparent for the purpose of providing an esthetic effect to the filter as long as the inside of the filter can be visualized.

25 **[0006]** Patent Document 5 discloses that transparent film materials are used as a tipping paper or a filter wrapping paper in order to visually recognize flavor particles in the filter, and exemplifies polypropylene, polyvinyl chloride, and a cellulose acetate film as transparent film materials.

[0007] Patent Document 6 discloses that transparent materials are used as a tipping paper or a plug wrapping paper in order to visualize extraction effects of a harmful substance.

Prior Art Document

Patent Documents

35 **[0008]**

Patent Document 1: Jpn. Pat. Appln. KOKAI Publication No. 7-250665

Patent Document 2: Jpn. PCT National Publication No. 2007-520204

Patent Document 3: Jpn. PCT National Publication No. 2008-546400

40 Patent Document 4: WO 2009/106374

Patent Document 5: Jpn. Utility Model Application Publication No. 5-45198

Patent Document 6: WO 2004/068975

Summary of Invention

Problem to be solved by the Invention

45 **[0009]** The present inventors have focused on the problems that when a cigarette including a flavor capsule in a filter portion is wrapped with an opaque plug wrapping paper or an opaque tipping paper, it is hard for a smoker to find the position of the flavor capsule in crushing the capsule and it is impossible for a smoker to observe that the capsule content liquid is spread in the filter after crushing the capsule.

50 **[0010]** In the case where a transparent tipping paper and a transparent plug wrapping paper are used to visualize a flavor capsule in a filter, the above concealing function (i.e., a function to conceal the joint between the filter and the tobacco rod or conceal the color of tar adhered to the filter material) is impaired. Further, in the case where the transparent tipping paper and the transparent plug wrapping paper are used to visualize the flavor capsule, the amount of the capsule content liquid is extremely small and thus it is difficult to visually recognize that it is sufficiently spread in the cavity, though it is possible to recognize the breakage of the capsule.

55 **[0011]** Therefore, an object of the present invention is to provide a cigarette comprising a tipping paper and a plug

wrapping paper, wherein

- (a) the tipping paper and the plug wrapping paper retain the above concealing function,
- (b) the position of the flavor capsule can be visually recognized through the tipping paper and the plug wrapping paper by a smoker in crushing the flavor capsule in the filter, and
- (c) a smoker can visually recognize through the tipping paper and the plug wrapping paper that the capsule content liquid is spread in the filter after crushing the capsule.

Means for solving the Problem

[0012] In a cigarette including a flavor capsule, it has been intended not to form a stain of the capsule content liquid released by breakage of the capsule on the plug wrapping paper or the tipping paper. Accordingly, for example, in the case where a lipophilic solvent is used as the capsule content liquid, an oilproof paper is preferably used as the plug wrapping paper. On the contrary, the present inventors have attached the capsule content liquid to a semi-transparent plug wrapping paper so as to intentionally form a highly transparent stain on the plug wrapping paper and completed the present invention.

[0013] Specifically, according to the present invention, there is provided a cigarette comprising:

- a tobacco rod comprising a tobacco filler and a cigarette paper wrapped around the tobacco filler,
- a filter comprising a plurality of filter plugs spaced apart from each other, a plug wrapping paper wrapped around the filter plugs to form a cavity between the filter plugs, and a flavor capsule contained in the cavity and encapsulating a flavor-containing content liquid in a shell, and
- a tipping paper wrapped on the tobacco rod and the filter to connect the tobacco rod and the filter,
- wherein the plug wrapping paper has impermeability to the content liquid, and
- the opacity of laminated paper formed of the plug wrapping paper and the tipping paper is (i) 70% or less before breakage of the flavor capsule and (ii) is decreased by 5% or more when the content liquid released by breakage of the flavor capsule is adhered to the plug wrapping paper.

Effects of the Invention

[0014] According to the cigarette of the present invention,

- (a) the tipping paper and the plug wrapping paper retain the concealing function,
- (b) the position of the flavor capsule can be visually recognized through the tipping paper and the plug wrapping paper by a smoker in crushing the flavor capsule in the filter, and
- (c) a stain of the capsule content liquid is formed on the plug wrapping paper after crushing the capsule, and thus a smoker can visually recognize that the capsule content liquid is spread in the filter.

Brief Description of Drawings

[0015]

FIG. 1A is a cross-sectional view showing a part of a cigarette of the present invention before crushing the flavor capsule.

FIG. 1B is a cross-sectional view showing a part of the cigarette of the present invention after crushing the flavor capsule.

FIG. 2 is an explanatory view showing a filter of the Example of the present invention.

FIG. 3 is an explanatory view showing a cigarette of the Example of the present invention.

Mode for Carrying Out the Invention

[0016] Hereinafter, the present invention will be described with reference to the drawings. However, the following description aims to describe the present invention in detail and does not intend to limit the present invention.

[0017] FIGS. 1A and 1B are cross-sectional views showing a part of cigarettes of the present invention. FIG. 1A shows the cigarette before crushing a flavor capsule 23, and FIG. 1B shows the cigarette after crushing the flavor capsule 23.

[0018] The cigarettes shown in FIGS. 1A and 1B comprise a tobacco rod 10 and a filter 20 where the flavor capsule 23 is contained in a cavity defined by two filter plugs 21a and 21b and a plug wrapping paper 22. The tobacco rod 10 and the filter 20 are connected by the tipping paper 30. The cigarettes shown in FIGS. 1A and 1B have a cylindrical

shape as a whole, similarly to a usual filter-tipped cigarette.

[0019] The tobacco rod 10 is formed of a tobacco filler 11 and a cigarette paper 12 wrapped around the tobacco filler, similarly to a usual cigarette, and has, for example, a diameter of 5 to 10 mm and a length of 40 to 80 mm.

[0020] The filter 20 includes the filter plugs 21a and 21b spaced apart from each other via a cavity, the plug wrapping paper 22 wrapped around the filter plugs 21a and 21b to form a cavity between the filter plugs, and the flavor capsule 23 contained in the cavity between the filter plugs and encapsulating a flavor-containing content liquid in a shell. The filter 20 has almost the same diameter as that of the tobacco rod 10 and may have, for example, a length of 15 to 40 mm, similarly to a usual filter.

[0021] In the cigarettes of FIGS. 1A and 1B, the two filter plugs 21a and 21b are arranged via a cavity. N filter plugs (N is an integer more than or equal to 2) may be arranged via (N-1) cavities. For example, N is from 2 to 4, preferably from 2 to 3, more preferably 2.

[0022] The filter plugs 21a and 21b may be formed of a fibrous filter material such as a cellulose acetate fiber, similarly to a usual filter-tipped cigarette. The filter plugs may be formed of only the fibrous filter material or may be formed of the fibrous filter material and a material paper wrapped around the fibrous filter material. The filter plug 21a at the side of cut tobacco and the filter plug 21b at the side of a mouthpiece may have the same material and structure or may have different materials and structures.

[0023] The plug wrapping paper 22 is wrapped around the two filter plugs 21. As a result, it forms a cavity together with the two filter plugs 21a and 21b. The plug wrapping paper 22 is semi-transparent and has an opacity level such that the flavor capsule 23 located in the cavity can be visually recognized. That is, the plug wrapping paper 22 has an opacity level such that the position of the flavor capsule can be visually recognized by a smoker in crushing the flavor capsule in the filter. Thus, the plug wrapping paper 22 has a concealing function to keep an internal structure of the filter concealed. Further, when the capsule content liquid released by breakage of the flavor capsule is adhered to the plug wrapping paper 22, the opacity of the plug wrapping paper 22 is decreased and the visually recognizable level of the flavor capsule is increased. That is, the transparency of the plug wrapping paper 22 is increased in a position where the capsule content liquid is adhered. The outline of the broken flavor capsule can be clearly observed. The expression "visually recognizable level is increased" means that the outline of the broken flavor capsule can be clearly observed. Specifically, it means that the evaluation score is increased according to the evaluation criteria described in Table 1 below. As a result, the smoker can visually recognize that the capsule content liquid is spread in the cavity.

[0024] Thus, in the present invention, the capsule content liquid is adhered to a semi-transparent plug wrapping paper so as to form a highly transparent stain on the plug wrapping paper. The spread stain enables the capsule content liquid spread in the cavity to be visually recognized. As a result, the smoker can enjoy the flavor after visually recognizing that the capsule content liquid is sufficiently spread in the cavity.

[0025] In order to produce the above effects, the plug wrapping paper 22 specifically satisfies the following three requirements in the present invention.

- (1) The plug wrapping paper has impermeability to the capsule content liquid.
- (2) The laminated paper formed of the plug wrapping paper and the tipping paper has an opacity of 70% or less.
- (3) When the capsule content liquid released by breakage of the flavor capsule is adhered to the laminated paper formed of the plug wrapping paper and the tipping paper, the laminated paper has an opacity of 5% or more lower than that before breakage of the capsule.

[0026] In the present invention, the tipping paper is preferably transparent. In the case where the tipping paper is transparent, the opacity is generally from 0.5 to 3%. For example, NatureFlex 23 μ (Innovia Films) or NatureFlex 42 μ (Innovia Films) can be used as a base film for the tipping paper. Thus, in the case where the tipping paper is transparent, the tipping paper does not substantially affect the opacity of the laminated paper. Therefore, in the case where the tipping paper is transparent, the requirement (2) is represented by the expression "the plug wrapping paper has an opacity of 70% or less", and the requirement (3) is represented by the expression "when the capsule content liquid released by breakage of the flavor capsule is adhered to the plug wrapping paper, the plug wrapping paper has an opacity of 5% or more lower than that before breakage of the capsule".

[0027] The term "opacity" used herein means a value measured in accordance with JIS P8138A (1976).

[0028] Specifically, it can be determined whether the plug wrapping paper satisfies the requirement (1) as follows. That is,

the plug wrapping paper and a test paper are laminated to form a laminated paper, and the opacity of the laminated paper is measured from the side of the test paper;

the capsule content liquid is dropped to the laminated paper from the side of the plug wrapping paper, and the opacity of the laminated paper is measured from the side of the test paper;

the opacity after dropping the capsule content liquid is subtracted from the opacity before dropping the capsule content liquid to obtain the difference in the opacity; and

in the case where the difference is 10% or less, the plug wrapping paper is evaluated as having impermeability to the capsule content liquid, and in the case where the difference exceeds 10%, the plug wrapping paper is evaluated as not having impermeability to the capsule content liquid (see Example 2 below). Therefore, the expression "having impermeability" used herein encompasses not only the case of having complete impermeability, but also the case of having

impermeability and very slight permeability (see Table 3 below). Here, the opacity is also measured in accordance with JIS P8138A (1976). The "test paper" used herein is an opaque paper having a function as a filter paper which can absorb a liquid when the liquid permeates the plug wrapping paper. For example, a paper having an opacity of 80 or more and a thickness of 33 to 53 μm can be used. Examples thereof include 37 White Stencil Paper (Nippon Paper Papyrus Co., Ltd.).

[0029] Specifically, it can be determined whether the laminated paper formed of the plug wrapping paper and the tipping paper satisfies the requirement (2) as follows. That is, the plug wrapping paper and the tipping paper are laminated to form a laminated paper, and the opacity of the laminated paper is measured from the side of the tipping paper (see Example 3 below). Here, the opacity is also measured in accordance with JIS P8138A (1976). In the present invention, the opacity thus measured (i.e., the opacity before adhesion of the capsule content liquid) is 70% or less, preferably from 5 to 70%, more preferably from 10 to 40%, still more preferably from 15 to 40%. When the opacity exceeds 70%, it is difficult to visually recognize the flavor capsule through the plug wrapping paper and the tipping paper.

[0030] Specifically, it can be determined whether the laminated paper formed of the plug wrapping paper and the tipping paper satisfies the requirement (3) as follows. That is, the plug wrapping paper and the tipping paper are laminated to form a laminated paper, and the opacity of the laminated paper is measured from the side of the tipping paper;

the capsule content liquid is dropped to the laminated paper from the side of the plug wrapping paper, and the opacity of the laminated paper is measured from the side of the tipping paper; and

the opacity after dropping the capsule content liquid is subtracted from the opacity before dropping the capsule content liquid to obtain the difference in the opacity (see Example 3 below). Here, the opacity is also measured in accordance with JIS P8138A (1976). In the present invention, the difference in the opacity thus obtained is 5% or more, preferably from 5 to 30%, more preferably from 10 to 30%. In the case where the difference in opacity is less than 5%, it is difficult to recognize that the capsule content liquid released by breakage of the capsule is spread in the cavity of the filter because a decrease in the opacity of the laminated paper is not sufficient.

[0031] As for the requirements (2) and (3), the opacity of a laminated paper formed by laminating a plug wrapping paper and a tipping paper may be measured before producing a cigarette. Alternatively, after producing a cigarette, a laminated paper formed of a plug wrapping paper and a tipping paper is cut out from the cavity of the cigarette, and the laminated paper may be measured. In the latter case, an adhesive is contained in the laminated paper, but an influence of the adhesive on the opacity can be disregarded because a transparent adhesive (e.g., an emulsion-based adhesive) is generally used to bond the plug wrapping paper to the tipping paper.

[0032] More specifically, a paper having an opacity of 5 to 40%, a smoothness of 500 to 2500 sec, and an ash content of 0 to 5% can be used as the plug wrapping paper 22. Preferably, a paper having an opacity of 20 to 40%, a smoothness of 500 to 2500 sec, and an ash content of 0 to 5% can be used as the plug wrapping paper 22. More specifically, a glassine paper and a parchment paper which satisfy the above conditions can be used as the plug wrapping paper 22. Preferably, the glassine paper which satisfies the above conditions can be used as the plug wrapping paper 22. When the opacity exceeds 30%, this is not preferable from the viewpoint of visual recognition of the flavor capsule. When the smoothness is less than 500 sec, this is not preferable from the viewpoint of impermeability to the capsule content liquid. When the ash content exceeds 5%, this is not preferable from the viewpoint of an increase in opacity. The thickness of the plug wrapping paper 22 may be, for example, from 40 to 80 μm .

[0033] The plug wrapping paper 22 may be treated such that a specific shaped region having water repellency or oil repellency is provided on the inner surface (i.e., the surface at the side of the cavity) so as to allow the specific shape to be silhouetted when the content liquid released by breakage of the flavor capsule is adhered to the plug wrapping paper. The region having water repellency can be formed by coating with paraffin, silicon or the like. The region having oil repellency can be formed by coating with wax, paraffin, carboxymethylcellulose, latex or the like. These substances can be applied to the plug wrapping paper by using a printing technique. The specific shape may be an arbitrary shape including a symbol; a figure such as a circle, a triangle, a square or a star; or a character such as an alphabet letter.

[0034] In the cigarette of FIGS. 1A and 1B, the flavor capsule 23 is contained in a cavity between filter plugs. A flavor capsule or a plurality of flavor capsules (e.g., 2 to 10 capsules) may be contained in a cavity.

[0035] The flavor capsule is formed of a shell 23a and a content liquid 23b containing a flavor. As the shell 23a, for example, starch, dextrin, polysaccharides, agar, gellan gum, gelatin, various natural gelling agents or glycerin can be used. Further, the shell 23a may contain a flavor and a colorant. The flavor capsule is preferably colored to be recognized by the smoker in crushing the flavor capsule even if it is wrapped with the plug wrapping paper having an opacity. A colorant such as Blue No. 1 is preferably contained in the shell 23a. As the flavor contained in the content liquid 23b, for example, menthol, plant essential oils or the like can be used. As a solvent of the content liquid 23b, a solvent suitable for the flavor can be used. For example, medium chain fatty acid triglyceride (MCT) (specifically, glyceryl tricapr-

ylate/caprates), propylene glycol, water, and ethanol can be used. The content liquid may contain other additives such as other solvents, dyes, emulsifiers, and thickeners.

[0036] The production method of the flavor capsule is not particularly limited. If a dropping method is used, a flavor capsule having a seamless shell can be produced. In this method, a content liquid and a liquid shell material are discharged at the same time from an inner nozzle and an outer nozzle respectively, using a double nozzle, and thereby the content liquid can be seamlessly encapsulated in the shell liquid. The diameter of the flavor capsule can be set to, for example, 1.5 to 7.0 mm.

[0037] When the cigarette of the present invention is produced, the flavor to be contained in the cigarette is first determined. According to the type of flavor, a solvent suitable for dissolving the flavor is selected. Then, a plug wrapping paper that satisfies the above requirements (1) to (3) with respect to the solvent can be selected. For example, in the case where menthol is contained in the cigarette, medium-chain fatty acid triglyceride is selected as the solvent. A paper that satisfies the above requirements (1) to (3) with respect to this solvent, for example, 40.0 Super Thick White Glassine (Nippon Paper Papyrus Co., Ltd.; glassine paper), 25.8 Thin White Glassine (Nippon Paper Papyrus Co., Ltd.; glassine paper), Dleep W34.9 (Oji Specialty Paper Co., Ltd.; parchment paper) or JT Highly Transparent Glassine 40 (Nippon Paper Papyrus Co., Ltd.; glassine paper) can be selected (see Tables 4 and 6).

[0038] In the cigarette of FIGS. 1A and 1B, the tipping paper 30 preferably has impermeability to the content liquid. Further, the tipping paper is preferably transparent. As such a tipping paper, a transparent cellophane can be used.

[0039] The tipping paper 30 is bonded with an adhesive to cover the whole of the plug wrapping paper 22 and a part of the cigarette paper 12. The adhesive is preferably transparent and colorless so as not to affect the level of visual recognition of the flavor capsule. For example, an emulsion-based adhesive can be used. The tipping paper 30 may have, for example, a length (width) of 20 to 50 mm in the longitudinal direction of the tobacco rod, and a thickness of 10 to 100 μm . The tipping paper has a number of small apertures for air permeation (ventilation apertures) in a line or multiple lines along the circumferential direction of the cigarette, or irregularly, as with a usual filter-tipped cigarette. The tipping paper 30 may be subjected to coating, for example, white printing in the regions other than the cavity.

Examples

Example 1: Visibility of capsule

[0040] In this example, it was evaluated whether a flavor capsule could be visually recognized before and after crushing the flavor capsule of the cigarette of the present invention.

1. Materials

[0041] As plug wrapping papers of filters A to F, papers with the following trade names were used. Manufacturers and paper types are described in parentheses.

Filter A:

40.0 Super Thick White Glassine (Nippon Paper Papyrus Co., Ltd.; glassine paper)
Opacity: 30 to 35%, smoothness: 800 to 1000 sec, ash content: 0 to 5%

Filter B:

25.8 Thin White Glassine (Nippon Paper Papyrus Co., Ltd.; glassine paper)
Opacity: 20 to 25%, smoothness: 1000 to 1200 sec, ash content: 0 to 5%

Filter C:

50NFB (oilproof paper) (Nippon Paper Papyrus Co., Ltd.; oilproof paper)
Opacity: 75 to 80%, smoothness: 30 to 130 sec, ash content: 1 to 2%

Filter D:

Graphane 35gsm (Oji Specialty Paper Co., Ltd.; glassine paper)
Opacity: 5 to 15%, smoothness: 1500 to 2000 sec, ash content: 0 to 5%

Filter E:

P-10000C (highly permeable non-woven fabric) (Nippon Paper Papyrus Co., Ltd.; highly permeable non-woven fabric)

Opacity: 40 to 50%, smoothness: 8 to 10 sec, ash content: 0 to 3%

Filter F:

NatureFlex 42 μ (transparent film) (Innovia Films; transparent cellophane)

Opacity: 1.0 to 2.0%, smoothness: 3500 to 4000 sec

Filter G:

JT Highly Transparent Glassine 40 (Nippon Paper Papyrus Co., Ltd.; glassine paper)

Opacity: 15 to 25%, smoothness: 1500 sec or more, ash content: 0 to 5%

2. Production of filter

[0042] The filter shown in FIG. 2 was produced using the above plug wrapping papers. The filter is formed of the filter plug 21a at the side of cut tobacco (left side), the filter plug 21b at the side of a mouthpiece (right side), the plug wrapping paper 22, and the flavor capsule 23.

[0043] The "filter plug 21a at the side of cut tobacco" is formed of a filter material (Non-Wrap-Acetate (ATK2010-02)) (not including a material paper). A length L1 of the plug is 11 mm and the circumference is 24.1 mm. The "filter plug 21b at the side of a mouthpiece" is formed of a filter material (Acetate tow (2.8Y35000)) and a material paper (P10000C). A length L2 of the plug is 10 mm and the circumference is 24.1 mm. A cavity defined by the two filter plugs and a plug wrapping paper has a length (S) of 6 mm. The flavor capsule 23 is formed of the content liquid 23b containing medium-chain fatty acid triglyceride (glyceryl tricaprylate/caprate) and a flavor (menthol and a plant essential oil), and the shell 23a mainly containing polysaccharide (starch). The flavor capsule has a diameter D of 4.5 mm. The flavor capsule was prepared by mixing starch (20% by weight) of a shell material with the content liquid (80% by weight) and subjecting the resulting mixture to the dropping method. The total length (Lf) of the produced filter is 27 mm.

[0044] As shown in FIG. 2, the plug wrapping paper 22 was wrapped around two filter plugs and the flavor capsule using an FLR cigarette making machine (ND-5RC, Sanjo Machine Works, Ltd.).

3. Production of cigarette

[0045] The cigarette shown in FIG. 3 was produced using the filter produced as described above. The cigarette is formed of the "tobacco rod 10", the "filter 20", and the "tipping paper 30".

[0046] As the "tobacco rod", a tobacco rod of Mild Seven (Japan Tobacco Inc. brand) was used. The tobacco rod has a length (Lr) of 57 mm and a circumferential size of 24.8 mm. The "filter" is as shown in FIG. 2 and the total length (Lf) thereof is 27 mm. As for the "tipping paper", NatureFlex 23 μ (Innovia Films) was used as a base film, it was white-printed in the width of 10 mm from each end by TANNPAPIER GmbH, and then subjected to process into a tipping paper. The tipping paper has a length (Lt) of 32 mm, and its white-printed areas have lengths (Lt1 and Lt2) of 10 mm.

[0047] An EVA-based emulsion was used as an adhesive for tipping. Cigarettes A and B were produced using the filters A and B respectively, by means of a cigarette making machine (ProtosM5, Hauni Maschinenbau AG). Further, cigarettes C to G were manually produced using the filters C to G respectively.

4. Evaluation results

[0048] The visibility (level of visual recognition) of a flavor capsule was visually evaluated. The evaluation was performed under a standard light source at a temperature of 23°C and a humidity of 50%.

(1) Two each of the cigarettes A to G were prepared.

(2) In one of the two cigarettes, the capsule was crushed using needle-nose pliers.

(3) After crushing the capsule, the cigarette was placed on a desk and left alone for 5 minutes.

(4) After being left alone, the cigarette was placed on a commercially available copy paper and the visibility of the capsule was visually evaluated and scored.

The scoring was performed based on the following table.

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[Table 1]

Score	Evaluation criteria
5	Color: The color of the capsule shell is the same as the original color Outline: The outline of the capsule shell can be clearly seen Size: The size looks the same as the original size of the capsule
4	Color: The color of the capsule shell is lighter than the original color Outline: The outline of the capsule shell can be clearly seen Size: The size looks the same as the original size of the capsule
3	Color: The color of the capsule shell is lighter than the original color Outline: The outline of the capsule shell is blurred Size: The size looks smaller by 1 to 20% than the original size of the capsule
2	Color: The color of the capsule shell is lighter than the original color Outline: The outline of the capsule shell is not clear Size: The size looks smaller by 30% or more than the original size of the capsule
1	The capsule cannot be visually recognized

(5) Before crushing the capsule, the cigarette was evaluated in the same manner. A difference between this evaluation score and the evaluation score obtained in (4) was calculated as "a change in visibility".

(6) The evaluation was performed by five evaluators. The visual evaluation results are shown below. The following table shows the visual evaluation results along with the opacity measurement results. As the opacity measurement results, the results obtained in the following Example 3 (Table 6) were transcribed.

[Table 2]

Cigarette	Score before crushing	Score after crushing	Change in visibility	Opacity before crushing	Opacity after crushing
Cigarette A (Glassine 40)	2	4	+2	31.2%	11.0%
Cigarette B (Glassine 25.8)	3	4	+1	20.9%	8.8%
Cigarette C (50NFB)	1	2	+1	74.5%	61.8%
Cigarette D (Graphane)	3	4	+1	14.3%	11.9%
Cigarette E (P10000C)	2	3	+1	42.2%	18.2%
Cigarette F (NatureFlex 42 μ)	5	5	0	2.5%	2.2%
Cigarette G (Highly Transparent Glassine 40)	3	4	+1	16.2%	10.8%

[0049] In the cigarette C, the capsule cannot be visually recognized before crushing it. The 50NFB (oilproof paper) is not suitable as the plug wrapping paper. In the cigarette F, the capsule can be recognized clearly and visually before and after crushing it. The NatureFlex 42 μ does not have a concealing function, and thus it is not suitable as the plug wrapping paper. On the other hand, in the cigarettes A, B, D, E, and G, the capsule can be visually recognized before crushing it (evaluation scores 2 to 3). When the capsule was crushed, the capsule content liquid was adhered to the plug wrapping paper, and thus the capsule could be recognized more clearly and visually.

Example 2: Liquid impermeability of plug wrapping paper

[0050] In this example, the liquid impermeability of various plug wrapping papers was evaluated.

1. Materials

[0051] The following papers were used as plug wrapping paper. Trade names, manufacturers, and paper types are described in parentheses in this order.

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(1) Plain paper 24 (Plain paper 24.0 gsm; Nippon Paper Papyrus Co., Ltd.; plain paper)

Opacity: 65 to 75%, smoothness: 80 to 140 sec, ash content: 8 to 12%

(2) N250 (N250; Nippon Paper Papyrus Co., Ltd.; plain paper)

Opacity: 40 to 50%, smoothness: 100 to 140 sec, ash content: 5% or less

(3) NPWS (NPWS-OLL; Nippon Paper Papyrus Co., Ltd.; plain paper)

Opacity: 45 to 55%, smoothness: 150 to 190 sec, ash content: 5% or less

(4) P10000C (P-10000C; Nippon Paper Papyrus Co., Ltd.; highly permeable non-woven fabric)

Opacity: 40 to 50%, smoothness: 8 to 10 sec, ash content: 0 to 3%

(5) P20000C (P-20000C; Nippon Paper Papyrus Co., Ltd.; highly permeable non-woven fabric)

Opacity: 35 to 45%, smoothness: 1 to 4 sec, ash content: 0 to 3%

(6) NatureFlex 23 μ (NatureFlex 23 μ ; Innovia Films; transparent cellophane)

Opacity: 1.0 to 2.0%, smoothness: 3500 to 4000 sec

(7) 50NFB (50NFB; Nippon Paper Papyrus Co., Ltd.; oilproof paper)

Opacity: 75 to 80%, smoothness: 30 to 130 sec, ash content: 1 to 2%

(8) Dreep W34.9 (Dreep W34.9; Oji Specialty Paper Co., Ltd.; parchment paper)

Opacity: 30 to 50%, smoothness: 3000 sec or more, ash content: 0 to 5%

(9) Graphane (graphane 35gsm; Oji Specialty Paper Co., Ltd.; glassine paper)

Opacity: 5 to 15%, smoothness: 1500 to 2000 sec, ash content: 0 to 5%

(10) Glassine 25.8 (25.8 Thin White Glassine; Nippon Paper Papyrus Co., Ltd.; glassine paper)

Opacity: 20 to 25%, smoothness: 1000 to 1200 sec, ash content: 0 to 5%

(11) Glassine 40 (40.0 Super Thick White Glassine; Nippon Paper Papyrus Co., Ltd.; glassine paper)

Opacity: 30 to 35%, smoothness: 800 to 1000 sec, ash content: 0 to 5%

(12) Highly Transparent Glassine 40 (JT Highly Transparent Glassine 40; Nippon Paper Papyrus Co., Ltd.; glassine paper)

Opacity: 15 to 25%, smoothness: 1500 sec or more, ash content: 0 to 5%

2. Evaluation method

[0052] As liquids to be added, medium-chain fatty acid triglyceride (MCT) (glyceryl tricaprilate/caprinate), propylene glycol (PG), and water were used.

[0053] The evaluation was performed under a standard light source at a temperature of 23°C and a humidity of 50%.

(1) Before dropping liquid

[0054] A plug wrapping paper was laminated with a tipping paper (37 White Stencil Paper; Nippon Paper Papyrus Co., Ltd.) (test paper). The opacity (%) of the laminated paper thus obtained was measured from the side of the tipping paper by the Hunter method (JIS P 8138A).

(2) After dropping liquid

[0055] 70 μ l of the liquid was dropped onto the side of the plug wrapping paper of the laminated paper. Two minutes after dropping the liquid, the liquid remaining on the surface of the plug wrapping paper was wiped off. Thereafter, the opacity (%) was measured from the side of the tipping paper by the Hunter method (JIS P 8138A).

[0056] A difference between the opacity (%) after dropping the liquid and the opacity (%) before dropping the liquid was calculated as the "variation amount of opacity". The impermeability was evaluated based on the "variation amount of opacity" as described in the following table.

[Table 3]

Variation amount of opacity	Appearance	Evaluation
-1 to 5 %	Permeation into the tipping paper is not observed	◎
5 to 10 %	Very slight permeation is observed	○
10 to 20 %	Partial permeation is observed	△
more than 20 %	Overall permeation is observed	×

[0057] In the case where the liquid is water, the opacity value cannot be measured because it is dried over time, and

thus the impermeability was instantly evaluated by its appearance in accordance with the evaluation criteria of Table 3.

3. Evaluation results

[0058] The "variation amount of opacity" and "evaluation of impermeability" for various plug wrapping papers are shown below.

[Table 4]

Wrapping paper	Opacity before dropping	Variation amount of Opacity (evaluation of impermeability)		
		MCT	PG	Water
None	80.6	36.3 (×)	38.4 (×)	(○)
Plain Paper 24	88.7	37.7 (×)	33.8 (×)	(×)
N250	86.1	35.1 (×)	34.5 (×)	(×)
NPWS	88.9	39.3 (×)	37.8 (×)	(×)
P10000C	85.0	33.3 (×)	32.0 (×)	(×)
P20000C	84.7	34.0 (×)	31.6 (×)	(×)
NatureFlex 23 μ	82.2	0.5 (○)	0.5 (○)	(○)
50NFB	90.9	3.3 (○)	2.6 (○)	(○)
Dreep W34.9	84.5	0.2 (○)	-0.3 (○)	(○)
Graphane	83.1	0.9 (○)	0.1 (○)	(○)
Glassine 25.8	83.0	5.3 (Δ)	3.9 (○)	(×)
Glassine 40	84.5	3.1 (○)	1.7 (○)	(Δ)
Highly Transparent Glassine 40	83.3	0.4 (○)	0.2 (○)	(○)

[0059] Since the Plain paper 24, N250, NPWS, P10000C, and P20000C have permeability to any type of liquid, these papers are not suitable as the plug wrapping paper. The NatureFlex 23 μ , 50NFB, Dreep W34.9, Graphane, and Highly Transparent Glassine 40 had impermeability to any type of liquid. The Glassine 25.8 had slight permeability to medium-chain fatty acid triglyceride, but there is no problem to use it as the plug wrapping paper. In the case of Glassine 25.8, water cannot be used as a solvent of the flavor capsule because it had permeability to water. The Glassine 40 had impermeability to the liquids other than water.

Example 3: Changes in opacity of plug wrapping paper

1. Evaluation method

[0060] In this example, the plug wrapping paper used in Example 2 was laminated with the transparent tipping paper NatureFlex 23 μ . Then, changes in opacity due to adhesion of a liquid to the laminated paper were evaluated. The same liquid as that used in Example 2 was dropped onto the laminated paper and the evaluation was performed in the same manner as Example 2.

[0061] A difference between the opacity (%) after dropping the liquid and the opacity (%) before dropping the liquid was calculated as the "variation amount of opacity". The "variation amount of opacity" was evaluated along with the "appearance (transparency)" as described in the following table.

[Table 5]

Variation amount of opacity	Appearance	Evaluation
less than -1 %	Wrinkles occur due to oil or water absorption	-
-1 to 5 %	Changes are hardly observed	×
5 to 10 %	Transparency is slightly increased	Δ

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(continued)

Variation amount of opacity	Appearance	Evaluation
10 to 20 %	Transparency is increased	○
more than 20 %	Transparency is significantly increased	◎

[0062] As shown in Table 5, when the variation amount of opacity is 5% or more, an increase in transparency can be visually recognized.

2. Evaluation results

[0063] The "variation amount of opacity" and "evaluation" as for various plug wrapping papers are shown below.

[Table 6]

Wrapping paper	Opacity before dropping	variation amount of opacity (evaluation)		
		MCT	PG	Water
None	1.3	0.3 (×)	0.3 (×)	-5.2 (○)
Plain Paper 24	66.8	45.4 (◎)	41.0 (◎)	33.0 (◎)
N250	44.5	29.9 (◎)	27.0 (◎)	23.0 (◎)
NPWS	47.5	33.2 (◎)	30.5 (◎)	29.7 (◎)
P10000C	42.2	24.0 (◎)	21.4 (◎)	13.7 (○)
P20000C	39.5	18.1 (○)	17.0 (○)	15.6 (○)
NatureFlex 23 μ	2.5	0.3 (×)	-0.6 (×)	-4.5 (-)
50NFB	74.5	12.7 (○)	5.9 (Δ)	-1.0 (×)
Dreep W34.9	37.2	6.6 (Δ)	7.5 (Δ)	10.6 (○)
Graphane	14.3	2.4 (×)	0.2 (×)	-8.5 (-)
Glassine 25.8	20.9	12.1 (○)	10.0 (○)	9.3 (Δ)
Glassine 40	31.2	20.2 (◎)	5.2 (Δ)	7.2 (Δ)
Highly Transparent Glassine 40	16.2	5.4 (Δ)	3.7 (×)	3.0 (×)

[0064] The opacity of Plain paper 24, N250, NPWS, P10000C, and P20000C was largely changed after dropping any type of liquid. However, these papers have permeability to any type of liquid as shown in the result of Example 2, and thus these papers are not suitable as the plug wrapping paper.

[0065] Since the NatureFlex 23 μ does not exhibit a variation amount of opacity of 5% or more, it is not suitable as the plug wrapping paper.

[0066] Since the 50NFB is opaque, the position of the flavor capsule cannot be recognized in the case where the paper is used. Thus, it is not suitable as the plug wrapping paper.

[0067] The Dreep W34.9 had an opacity of 37.2% before dropping and exhibited a variation amount of opacity of 5% or more with respect to any type of liquid after dropping each liquid. Thus, in the case of Dreep W34.9, an increase in transparency could be visually recognized. Further, the Dreep W34.9 had impermeability to any type of liquid (see the result of Example 2). This indicates that the Dreep W34.9 can be used as the plug wrapping paper.

[0068] Since the Graphane does not exhibit a variation amount of opacity of 5% or more, it is not suitable as the plug wrapping paper.

[0069] The Glassine 25.8 had an opacity of 20.9% before dropping and exhibited a variation amount of opacity of 5% or more after dropping medium-chain fatty acid triglyceride (MCT) and propylene glycol (PG). Thus, in the case of Glassine 25.8, an increase in transparency could be visually recognized. Further, the Glassine 25.8 had impermeability to medium-chain fatty acid triglyceride (MCT) and propylene glycol (PG) (see the result of Example 2). This indicates that the Glassine 25.8 can be used as the plug wrapping paper when these liquids are used as the flavor content liquid.

[0070] The Glassine 40 had an opacity of 31.2% before dropping and exhibited a variation amount of opacity of 5%

or more after dropping medium-chain fatty acid triglyceride (MCT), propylene glycol (PG), and water. Thus, in the case of Glassine 40, an increase in transparency could be visually recognized. Further, the Glassine 40 had impermeability to medium-chain fatty acid triglyceride (MCT), propylene glycol (PG), and water (see the result of Example 2). This indicates that the Glassine 40 can be used as the plug wrapping paper when these liquids are used as the flavor content liquid.

[0071] The highly transparent Glassine 40 had an opacity of 16.2% before dropping and exhibited a variation amount of opacity of 5% or more after dropping medium-chain fatty acid triglyceride (MCT). Thus, in the case of the highly transparent Glassine 40, an increase in transparency could be visually recognized. Further, the highly transparent Glassine 40 had impermeability to any type of liquid (see the result of Example 2). This indicates that the highly transparent Glassine 40 can be used as the plug wrapping paper.

List of Reference Signs

[0072]

- 10: Tobacco rod
- 11: Tobacco filler
- 12: Cigarette paper
- 20: Filter
- 21a: Filter plug (side of cut tobacco)
- 21b: Filter plug (side of mouthpiece)
- 22: Plug wrapping paper
- 23: Flavor capsule
- 23a: Shell
- 23b: Content liquid
- 30: Tipping paper

Claims

1. A cigarette comprising:

a tobacco rod comprising a tobacco filler and a cigarette paper wrapped around the tobacco filler, a filter comprising a plurality of filter plugs spaced apart from each other, a plug wrapping paper wrapped around the filter plugs to form a cavity between the filter plugs, and a flavor capsule contained in the cavity and encapsulating a flavor-containing content liquid in a shell, and a tipping paper wrapped on the tobacco rod and the filter to connect the tobacco rod and the filter, wherein the plug wrapping paper has impermeability to the content liquid, and the opacity of laminated paper formed of the plug wrapping paper and the tipping paper is (i) 70% or less before breakage of the flavor capsule and (ii) is decreased by 5% or more when the content liquid released by breakage of the flavor capsule is adhered to the plug wrapping paper.

2. The cigarette according to claim 1, wherein the tipping paper is transparent.

3. The cigarette according to claim 1 or 2, wherein the plug wrapping paper has a difference in opacity of 10% or less between a pre-dropping opacity and a post-dropping opacity, where the difference in opacity is obtained according to the following procedure:

the plug wrapping paper and a test paper are laminated to form a laminated paper, and the opacity of the laminated paper is measured from the side of the test paper; the content liquid is dropped to the laminated paper from the side of the plug wrapping paper, and the opacity of the laminated paper is measured from the side of the test paper; and the difference between the pre-dropping opacity and the post-dropping opacity is calculated.

4. The cigarette according to any one of claims 1 to 3, wherein the opacity of laminated paper formed of the plug wrapping paper and the tipping paper is (i) 40% or less before breakage of the flavor capsule and (ii) is decreased by 10% or more when the content liquid released by breakage of the flavor capsule is adhered to the plug wrapping paper.

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5. The cigarette according to any one of claims 1 to 4, wherein the plug wrapping paper has an opacity of 5 to 40%, a smoothness of 500 to 2500 sec, and an ash content of 0 to 5%.
6. The cigarette according to claim 5, wherein the plug wrapping paper is a glassine paper or a parchment paper.
7. The cigarette according to any one of claims 1 to 6, wherein the plug wrapping paper comprises a region having water repellency or oil repellency on the inner surface.

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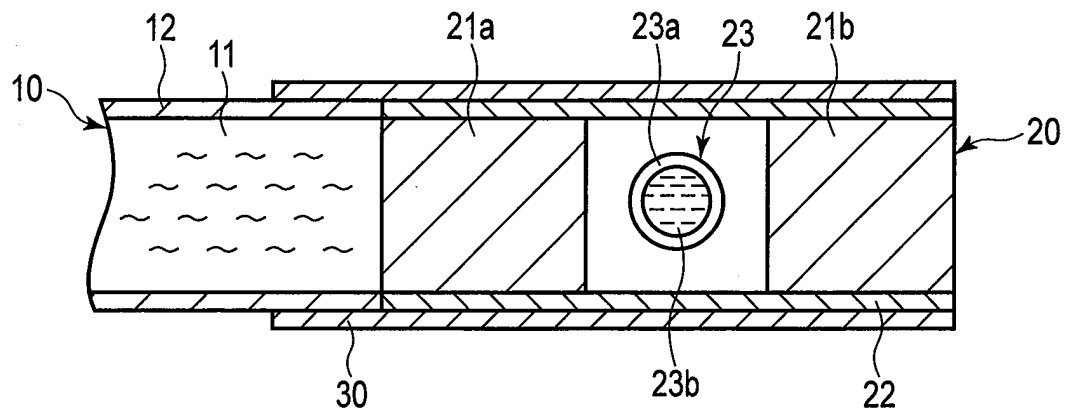


FIG. 1A

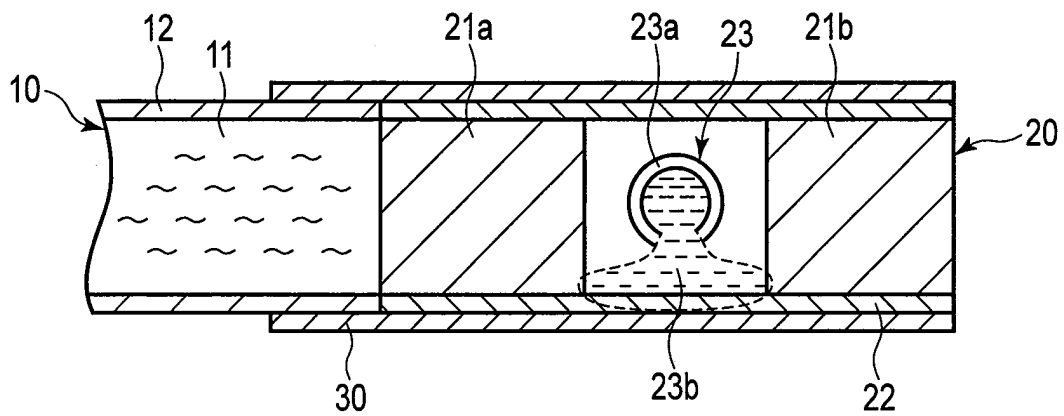


FIG. 1B

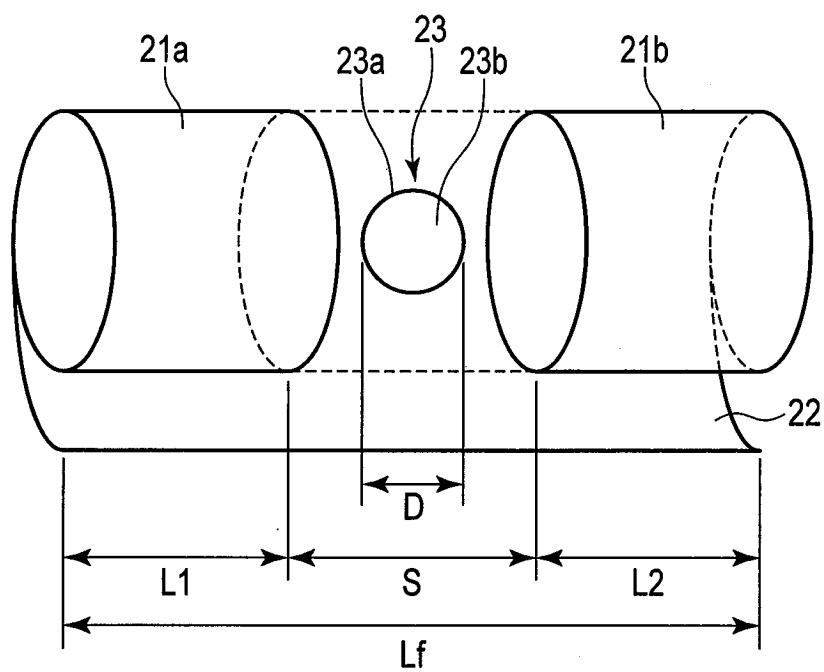


FIG. 2

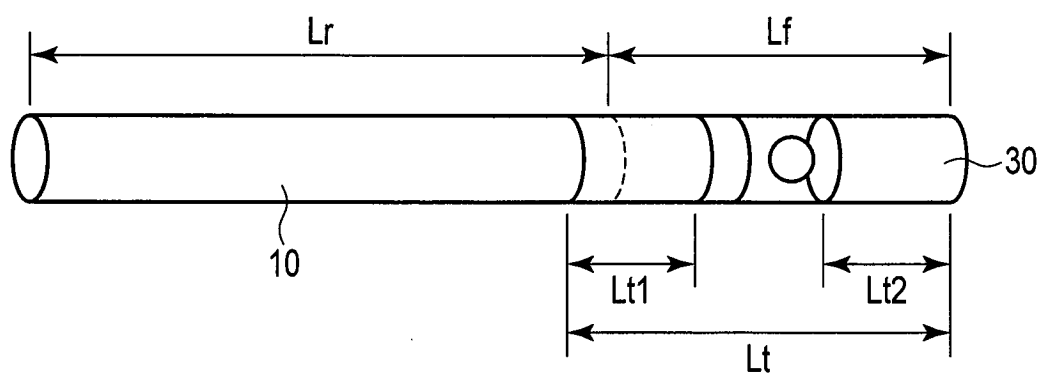


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/069456

A. CLASSIFICATION OF SUBJECT MATTER

A24D1/02 (2006.01) i, A24D3/04 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24D1/02, A24D3/04

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2012
Kokai Jitsuyo Shinan Koho	1971-2012	Toroku Jitsuyo Shinan Koho	1994-2012

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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

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"&" document member of the same patent family

Date of the actual completion of the international search
26 October, 2012 (26.10.12)Date of mailing of the international search report
06 November, 2012 (06.11.12)Name and mailing address of the ISA/
Japanese Patent Office

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/069456

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/069456

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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REFERENCES CITED IN THE DESCRIPTION

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