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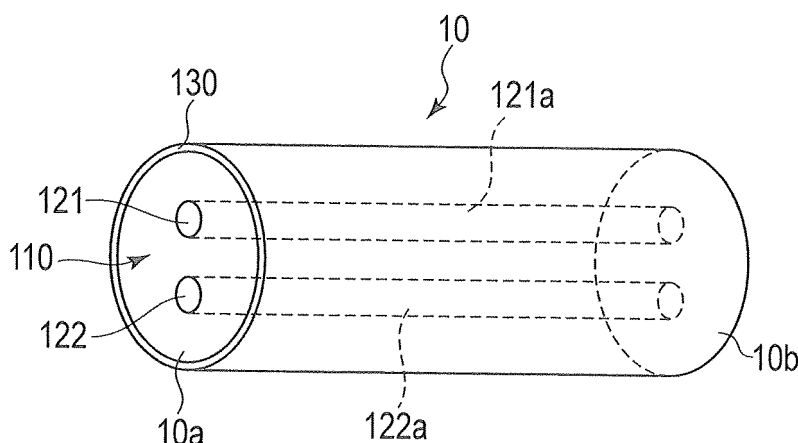
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(54) **FILTER FOR CIGARETTE AND CIGARETTE WITH FILTER**

(57) A filter for a cigarette including a filter body (110) and an flavor-releasing member (121, 122) which includes a flavorant carrier constituted of one or more discrete yarns (121a, 122a) and a plurality of flavor-releasing components carried by the flavorant carrier, characterized in that the flavor-releasing member (121, 122) is incorporated in the filter body (110), extending along a central axis of the filter body (110), one flavor-releasing

component releases flavor different from other one or more flavor-releasing components, flavor-releasing behavior of one flavor-releasing component is different from that of other one or more flavor-releasing components, and the flavor-releasing component is selected from the group consisting of a pure flavorant, a pure flavorant combined with cyclodextrin, and a pure flavorant combined with dextrin.



**FIG. 1**

## Description

### Technical Field

5 **[0001]** This invention relates to a filter for a cigarette and a filter-tipped cigarette.

### Background Art

10 **[0002]** A cigarette provided with a cigarette filter incorporating a filament containing a cigarette smoke modifier has been known (for example, Patent Documents 1 and 2). When such a cigarette is smoked, the cigarette smoke modifier can add a flavor or aroma to cigarette mainstream smoke passing through the filter.

### Citation List

15 Patent Literature

#### **[0003]**

20 Patent Literature 1: Jpn. Pat. Appln. KOKOKU Publication No. 63-38187

Patent Literature 2: U.K. Patent Application Publication No. 2070409

### Summary of Invention

#### Problem to be solved by the Invention

25 **[0004]** The above prior art documents disclose that two or more kinds of smoke modifiers are carried by filament, and a same or different type of smoke modifier is carried by two or more filaments. However, there is not disclosed such a technical idea that when a cigarette is smoked, flavors different for each puff are tasted.

30 **[0005]** This invention provides a filter for a cigarette, which enables tasting flavors different for each puff when a cigarette is smoked, and a cigarette with the filter.

#### Means for Solving the Problem

35 **[0006]** According to one aspect of the invention, there is provided a filter for a cigarette, comprising a filter body and a flavor-releasing member which includes a flavorant carrier constituted of one or more discrete yarns and a plurality of flavor-releasing components carried by the flavor carrier. The flavor-releasing member is incorporated in the filter body, extending along a central axis of the filter body. One flavor-releasing component releases flavor different from the other one or more flavor-releasing components. Flavor-releasing behavior of one flavor-releasing component is different from that of the other one or more flavor-releasing components. The flavor-releasing component is selected from the group consisting of a pure flavorant, a pure flavorant combined with cyclodextrin, and a pure flavorant combined with dextrin.

40 **[0007]** According to another aspect of the invention, there is provided a filter-tipped cigarette comprising a cigarette rod and a filter connected to one end of the cigarette rod, wherein the filter is constituted of a filter according to this invention.

45 **[0008]** A filter for a cigarette of this invention enables enjoying flavors different for each puff when a cigarette is smoked.

### 50 Brief Description of Drawings

#### **[0009]**

55 FIG. 1 is an enlarged schematic perspective view showing an example of a filter according to a first embodiment of the invention.

FIG. 2 is an enlarged schematic perspective view showing another example of a filter according to the first embodiment of the invention.

FIG. 3 is an enlarged schematic view showing an example of a filter according to a second embodiment of the

invention.

FIG. 4 is an enlarged schematic perspective view showing an example of a cigarette according to the invention.

FIG. 5 is a graph for explaining a change of delivery amount of the flavor into a cigarette mainstream smoke with respect to the number of puffs when an example of the cigarette according to this invention is smoked.

FIG. 6 is a graph showing results of sensory evaluation for each puff in a filter-tipped cigarette produced in Example 1 described.

FIG. 7 is a graph showing a flavor-releasing behavior in a filter-tipped cigarette produced in Example 2 described.

## Modes for Carrying out the Invention

**[0010]** Hereinafter, an aspect of the invention will be described.

**[0011]** A filter for a cigarette according to one aspect of the invention comprises a filter body and a flavor-releasing member which includes a flavorant carrier constituted of one or more discrete yarns and a plurality of flavor-releasing components carried by the flavorant carrier. The flavor-releasing member is incorporated in a filter body, extending along a central axis of the filter body. One flavor-releasing component releases flavor different from the other one or more flavor-releasing components. Flavor-releasing behavior of one flavor-releasing component is different from that of other one or more flavor-releasing components. The flavor-releasing component is selected from the group consisting of a pure flavorant, a pure flavorant combined with cyclodextrin, and a pure flavorant combined with dextrin.

**[0012]** The filter body incorporating the flavor-releasing member includes tow of cellulose acetate fibers, for example, and usually has a columnar shape. The length of the filter body is usually 100 mm to 140 mm, and the diameter is usually 15 mm to 26 mm.

**[0013]** The flavor-releasing member includes a flavorant carrier consisting of one or more discrete yarns and a plurality of flavor-releasing components carried by the flavorant carrier. The flavor-releasing member may be constituted of the flavorant carrier and a plurality of flavor-releasing components.

**[0014]** The yarn constituting the flavorant carrier may be constituted of a single fiber (filament) or a bundle of a plurality of fibers (filaments), and includes a monofilament yarn and a multifilament yarn. Multifilament yarns include various textured yarns.

**[0015]** The material of the yarn is not particularly limited. The yarn can be formed of, for example, a natural material such as cotton, wool, or silk, or a synthetic material such as polypropylene, polyethylene, or acetylcellulose.

**[0016]** The diameter of the yarn is usually 0.3 to 2.5 mm, and preferably 0.7 mm to 1.5 mm. The length of the yarn is usually the same as the length of the filter body. The yarn usually extends, along the central axis of the filter body, over the full length of the filter body, that is, from the distal end to the proximal end of the filter body. The outer circumference of the filter body is wrapped by a filter wrapper such as tissue paper to provide a filter.

**[0017]** The flavor-releasing component is selected from the group consisting of (i) a pure flavorant, (ii) a pure flavorant combined with cyclodextrin, and (iii) a pure flavorant combined with dextrin. The pure flavorant is a flavorant itself. Examples of the pure flavorant include acetanisole, acetophenone, acetylpyridine, 2-acetylthiazole, alfalfa extract, amyl alcohol, amyl butyrate, trans-anethole, star anise oil, apple juice, Peru balsam oil, yellow-beeswax absolute, benzaldehyde, benzoin resinoid, benzyl alcohol, benzyl benzoate, benzyl phenylacetate, benzyl propionate, 2,3-butanedione, 2-butanol, butyl butyrate, butyric acid, caramel, cardamom oil, carob absolute,  $\beta$ -carotene, carrot juice, L-carvone,  $\beta$ -caryophyllene, cassia bark oil, cedarwood oil, celery seed oil, chamomile oil, cinnamaldehyde, cinnamic acid, cinnamyl alcohol, cinnamyl cinnamate, citronella oil, DL-citronellol, clary sage extract, cocoa, coffee, cognac oil, coriander oil, cumin aldehyde, Davana oil,  $\delta$ -decalactone,  $\gamma$ -decalactone, decanoic acid, dill herb oil, 3,4-dimethyl-1,2-cyclopentanedione, 4,5-dimethyl-3-hydroxy-2,6-dihydrofuran-2-one, 3,7-dimethyl-6-octenoic acid, 2,3-dimethylpyrazine, 2,5-dimethylpyrazine, 2,6-dimethylpyrazine, ethyl 2-methylbutyrate, ethyl acetate, ethyl butyrate, ethyl hexanoate, ethyl isovalerate, ethyl lactate, ethyl laurate, ethyl levulinate, ethyl maltol, ethyl octanoate, ethyl oleate, ethyl palmitate, ethyl phenylacetate, ethyl propionate, ethyl stearate, ethyl valerianate, ethyl vanillin, ethyl vanillin glucoside, 2-ethyl-3-(5 or 6)-dimethylpyrazine, 5-methyl-3-hydroxy-4-methyl-2(5H)-furanone, 2-ethyl-3-methylpyrazine, eucalyptole, Fenugreek absolute, Genet absolute, Gentian root infusion, geraniol, geranyl acetate, grape juice, guaiacol, guava extract,  $\gamma$ -heptalactone,  $\gamma$ -hexalactone, hexanoic acid, cis-3-hexen-1-ol, hexyl acetate, hexyl alcohol, hexyl phenylacetate, honey, 4-hydroxy-3-pentenoic acid lactone, 4-hydroxy-4-(3-hydroxy-1-butenyl)-3,5,5-trimethyl-2-cyclohexene-1-one, 4-(para-hydroxyphenyl)-2-butanone, 4-hydroxyundecanoic acid sodium salt, Immortelle absolute,  $\beta$ -ionone, isoamyl acetate, isoamyl butyrate, isoamyl phenylacetate, isobutyl acetate, isobutyl phenylacetate, jasmine absolute, coconut tincture, labdanum oil, terpenless oil of lemon, liquorice extract, linalool, linalyl acetate, Lovage root oil, maltol, maple syrup, menthol (L-menthol), menthone, L-menthyl acetate, para-methoxybenzaldehyde, methyl-2-pyrrolyl ketone, methyl anthranilate, methyl phenyl acetate, methyl salicylate, 4'-methylacetophenone, methyl cyclopentenolone, 3-methylvaleric acid, mimosa absolute, molasses, myristic acid, nerol, nerolidol,  $\gamma$ -nonalactone, nutmeg oil,  $\delta$ -octalactone, octanal, octanoic acid, orange flower oil, orange oil, Orris root oil, palmitic acid, peppermint oil, petit-grain Paraguay oil, phenethyl alcohol, phenethyl phenylacetate, phenylacetic acid, piperonal, plum extract, propenyl guaethol, propyl acetate, 3-propylidenephthalide, prune

juice, pyruvic acid, raisin extract, Rose oil, rum, sage oil, sandalwood oil, spearmint oil, Styrax absolute, marigold oil, tea distillate,  $\alpha$ -terpineol, terpinyl acetate, 5,6,7,8-tetrahydroquinoxaline, 1,5,5,9-tetramethyl-13-oxacyclo-(8.3.0.0 (4.9))-tridecane, 2,3,5,6-tetramethylpyrazine, thyme oil, tomato extract, 2-tridecanone, trimethyl citrate, 4-(2,6,6-trimethyl-1, 3-cyclohexenyl)-2-butene-4-one, 2,6,6-trimethyl-2-cyclohexene-1,4-dione, 4-(2,6,6-trimethyl-1,3-cyclohexadienyl)-2-butene-4-one, 2,3,5-trimethylpyrazine,  $\gamma$ -undecalactone,  $\gamma$ -valerolactone, vanilla extract, vanillin, veratrum aldehyde, and violet leaf absolute.

**[0018]** The flavor-releasing component constituted of the pure flavorant can be carried on the yarn by dissolving it in polypropylene glycol, glycerin, ethanol, water, triglyceride, triacetin, triethyl citrate, or the like, and impregnating the yarn with the solution. The flavor-releasing component constituted of the pure flavorant combined with cyclodextrin can be carried on the yarn by suspending it in polypropylene glycol, glycerin, ethanol, water, triglyceride, triacetin, triethyl citrate, or the like, and impregnating the yarn with the suspension. An emulsifier such as sucrose fatty acid ester, a dispersant, and an antifoamer can be added to the suspension. The flavor-releasing component constituted of the pure flavorant combined with dextrin can be carried on the yarn by suspending it in polypropylene glycol, glycerin, ethanol, water, triglyceride, triacetin, triethyl citrate, or the like, and impregnating the yarn with the suspension. An emulsifier such as sucrose fatty acid ester, a dispersant, and an antifoamer can be added to the suspension. As an example, a flavor-releasing component constituted of the pure flavorant combined with dextrin can be obtained in the form of finely divided powder containing the flavorant by adding a flavorant to an aqueous solution of dextrin in which optionally an emulsifier or the like is dissolved, emulsifying it by a homomixer, and then spray-drying it by using a spray drier.

**[0019]** One flavor-releasing component releases a flavor different from a flavor or flavors of other one or more flavor-releasing components. Namely, a pure flavorant contained in one flavor-releasing component is a flavorant which releases a flavor different from a pure flavor or flavorants contained in other one or more flavor-releasing components.

**[0020]** A flavor-releasing behavior of one flavor-releasing component is different from that of the other one or more flavor-releasing components. The flavor-releasing component constituted of a pure flavorant emits the flavor when a cigarette is smoked, in substantially proportion to an amount of tar in cigarette mainstream smoke flowing into a filter.

The flavor-releasing component constituted of the pure flavorant combined with cyclodextrin (in this case, the pure flavorant is clathrated in cyclodextrin) emits the flavor by a specified smoke component in the cigarette mainstream smoke (especially, a component having a steam pressure having a level distributed into both phases of a liquid phase and a solid phase at normal temperature) flowing into a filter and by the increase of heat when a cigarette is smoked. The flavor-releasing component constituted of a pure flavorant combined (mixed) with dextrin mainly emits the flavor by water in the cigarette mainstream smoke flowing into the filter and by the increase of heat.

**[0021]** Namely, in the flavor-releasing component constituted of the pure flavorant, the flavor-releasing component constituted of the pure flavorant combined with cyclodextrin, and the flavor-releasing component constituted of the pure flavorant combined with dextrin, the amount of the flavor emitted from these flavor-releasing components is different for each puff when a cigarette is smoked. Thus, in a cigarette provided with a filter including a plurality of different flavor-releasing components, when the cigarette is smoked, it is possible to taste a fragrance inhaling taste of the cigarette itself and a blend of flavors of heterogeneous flavorants having different amount for each puff.

**[0022]** In order to produce a filter body incorporating the flavor-releasing member, the method disclosed in the Japanese Examined Patent Publication No. 63-38187 can be applied, for example. Namely, in a general cigarette filter manufacturing machine, for example, immediately before a process of wrapping an opened cellulose acetate fiber bundle with a filter wrapper and forming the wrapped fiber bundle into a rod, a guide and a mandrel guiding a yarn are installed at a predetermined position in the circumference direction of the cellulose acetate fiber bundle, and the yarn is passed through the guide and the mandrel, whereby the yarn can be inserted into the cellulose acetate fiber bundle. Obviously, the yarn is impregnated with the flavor-releasing component before being inserted into the cellulose acetate fiber bundle, as described above.

**[0023]** In a first aspect of the present invention, the flavorant carrier is constituted of a plurality of discrete yarns, and a plurality of flavor-releasing components can be respectively carried by different discrete yarns. A filter for a cigarette according to the first aspect includes a filter body incorporating a plurality of flavor-releasing members constituted of one or more discrete yarns containing the flavor-releasing component, and although the flavorant of the filter is the same as the flavorant in one flavor-releasing member, the flavorant of the filter is different from the flavorant in the other one or more flavor-releasing members, and in this filter, the flavor-releasing behavior of one flavor-releasing member is different from the flavor-releasing behavior of the other one or more flavor-releasing members. In the first aspect, different yarns carrying different flavor-releasing components can be colored in colors different from each other.

**[0024]** In a second aspect of the invention, the flavorant carrier is constituted of one or more discrete yarns, and each discrete yarn carries a plurality of flavor-releasing components containing a heterogeneous pure flavorant. In this case, preferably, the discrete yarn is constituted of a plurality of filaments, a filament carries a flavor-releasing component, the other one or more filaments carry another flavor-releasing component, and these filaments are twisted together to form a yarn. Namely, in the second aspect, the flavor-releasing member is constituted of one or more discrete yarns carrying different flavor-releasing components.

**[0025]** The cigarette of the invention is provided with the filter of the invention at one end of a cigarette rod. The cigarette rod is similar to a cigarette rod of a usual filter-tipped cigarette and is constituted of a rod of a tobacco filler such as a shredded tobacco and a cigarette wrapper wrapping an outer circumferential surface of a tobacco filler rod. A filter is connected to the cigarette rod with a tip paper. The length of the cigarette rod is usually 40 mm to 70 mm, and the diameter may be the same as the diameter of the filter, or, in order to further secure the connection to the filter with the tip paper using glue, the diameter may be slightly larger than the diameter of the filter (the maximum diameter is 0.5 mm).

**[0026]** Hereinafter, an aspect of the invention will be described with reference to the drawings. Throughout the drawings, similar components are assigned the same reference numerals, and the repeated description is omitted.

**[0027]** FIG. 1 is an enlarged schematic perspective view showing an example of a filter according to the first aspect of the invention. A filter 10 shown in FIG. 1 has a columnar filter body 110 constituted of a tow of a cellulose acetate fiber bound with a plasticizer such as triacetin. The filter body 110 incorporates a plurality of flavor-releasing members extending in parallel to the central axis of the filter body 110. A plurality of flavor-releasing members is constituted of a plurality of discrete yarns carrying the flavor-releasing component containing a pure flavorant. One of those flavor-releasing members contains a pure flavorant different from a pure flavorant contained in the other one or more flavor-releasing members. In FIG. 1, two flavor-releasing members 121 and 122 are incorporated in the filter body 110. For example, the flavor-releasing member 121 is constituted of a cotton yarn 121a carrying the flavor-releasing component constituted of a pure flavorant A, and the flavor-releasing member 122 is constituted of a cotton yarn 122a carrying the flavor-releasing component constituted of a pure flavorant B combined with cyclodextrin or a pure flavorant C combined with dextrin. The pure flavorant A is a flavorant different from the pure flavorant B and/or the pure flavorant C. The cotton yarns 121a and 122a can be colored in colors different from each other. The outer circumferential surface of the filter body 110 is wrapped by a filter wrapper 130 to provide the filter 10. The filter 10 specifies a front end surface 10a and a base end surface 10b. When the filter 10 is connected to a cigarette rod, the front end surface 10a can be abutted against a base end surface of the cigarette rod. A filter region including the base end surface 10b of the filter 10 is held by a smoker.

**[0028]** FIG. 2 is an enlarged schematic perspective view showing another example of a filter according to the first aspect of the invention. A filter 20 shown in FIG. 2 has a structure similar to the structure of the filter 10 of FIG. 1 except that three flavor-releasing members 221, 222, and 223 are incorporated in the filter body 110. For example, the flavor-releasing member 221 is constituted of a cotton yarn 221a carrying the flavor-releasing component constituted of the pure flavorant A, the flavor-releasing member 222 is constituted of a cotton yarn 222a carrying the flavor-releasing component constituted of the pure flavorant B combined with cyclodextrin, and the flavor-releasing member 223 is constituted of a cotton yarn 223a carrying the flavor-releasing component constituted of the pure flavorant C combined with dextrin. For example, the pure flavorant A, the pure flavorant B and the pure flavorant C are flavorants different from each other and accordingly emit different flavors. The cotton yarns 221a, 222a, and 223a can be colored in colors different from each other. For example, the cotton yarn 221a may be colored in blue, the cotton yarn 222a may be colored in yellow, and the cotton yarn 223a may be colored in pink.

**[0029]** FIG. 3 is an enlarged schematic view showing an example of a filter according to the second aspect of the invention. A filter 30 shown in FIG. 3 has a structure similar to the structure of the filter 10 shown FIG. 1 except that instead of the flavor-releasing members 121 and 122, a flavor-releasing member 310 constituted of a yarn 310a carrying a plurality of flavor-releasing components is incorporated in the filter body 110. The yarn 310a carrying a plurality of flavor-releasing components can be formed by, for example, twisting together a cotton filament carrying the flavor-releasing component constituted of the pure flavorant A, a cotton filament carrying the flavor-releasing component constituted of the pure flavorant B combined with cyclodextrin, and a cotton filament carrying the flavor-releasing component constituted of the pure flavorant C combined with dextrin. The pure flavorant A, the pure flavorant B, and the pure flavorant C may be flavorants different from each other, and these pure flavorants accordingly emit different flavors. Two or more the flavor-releasing member 310 can be inserted through the filter body 110.

**[0030]** FIG. 4 is an enlarged schematic perspective view showing an example of a filter-tipped cigarette according to the invention. A filter-tipped cigarette 40 shown in FIG. 4 is provided with a cigarette rod 410 having a front end 410a and a base end 410b constituting an ignition end and a filter 420 having a front end 420a and a base end 420b. In the cigarette rod 410 and the filter 420, the base end 410b of the cigarette rod and the front end 420a of the filter are abutted against each other, whereby the cigarette rod 410 and the filter 420 are connected by a tip paper 430. The cigarette rod 410 is constituted of a rod 411 of the tobacco filler described above and a cigarette wrapper 412 wrapping an outer circumferential surface of the tobacco filler rod 411. A filter 420 is constituted of a filter of the invention. For example, the filter 420 can be constituted of the filter 10 shown in FIG. 1, the filter 20 shown in FIG. 2, or the filter 30 shown in FIG. 3.

**[0031]** FIG. 5 is a graph for explaining a change for each puff of an amount (delivery amount) of a flavorant fed from the filter 420 in the cigarette mainstream smoke passing through the filter 420 when the cigarette of FIG. 4 provided with the filter 20 of FIG. 2 as the filter 420 is smoked.

**[0032]** For example, the main body 110 of the filter 20 incorporates an flavor-releasing member (flavor-releasing

member A) constituted of the cotton yarn 221a carrying the flavor-releasing component constituted of the pure flavorant A, an flavor-releasing member (flavor-releasing member B) constituted of the cotton yarn 222a carrying the flavor-releasing component constituted of the pure flavorant B combined with cyclodextrin, and the flavor-releasing member (flavor-releasing member C) constituted of the cotton yarn 223a carrying the flavor-releasing component constituted of the pure flavorant C combined with dextrin, and the pure flavorant A, the pure flavorant B, and the pure flavorant C are different from each other. The amount of the flavorant fed into the cigarette mainstream smoke from the flavor-releasing member A gradually increases substantially linearly for each puff (curve a). Although the amount of the flavorant fed into the cigarette mainstream smoke from the flavor-releasing member B is larger than that in the flavor-releasing member A from an initial stage to an intermediate stage of puff, the amount then gradually decreases, and the delivery amount of the flavorant is smaller than that of the flavor-releasing member A in a late stage of puff (curve b). Although the amount of the flavorant fed into the cigarette mainstream smoke from the flavor-releasing member C is very small from the puff initial stage to the intermediate state, the flavorant amount rapidly increases in the puff late stage and is larger than the flavorant delivery amounts from the flavor-releasing members A and B (curve c). Thus, when a smoker smokes the filter-tipped cigarette according to the invention, the smoker can taste not only a flavor of the cigarette itself but also a blend of flavors of heterogeneous flavorants having different amounts for each puff.

[Examples]

**[0033]** Hereinafter, although this invention will be described with reference to examples, the invention is not limited by the following examples.

#### Example 1

**[0034]** In this example, a filter having a structure shown in FIG. 1 was produced, and the filter was connected to a cigarette rod to produce a filter-tipped cigarette, and, thus, to provide the cigarette to sensory evaluation.

**[0035]** Specifically, following the method disclosed in the Japanese Examined Patent Publication No. 63-38187, two sets of flavorant emitting member manufacturing apparatuses constituted of cheese of bleached cotton yarn of 20/8 in the English count, a flavorant tank, a flavorant feeding pump, a flavorant applicator, and so on were provided to be mounted to a normal filter manufacturing machine, a polypropen solution of L-menthol (concentration of 70%) was put in the flavorant bath of one of the flavorant emitting member manufacturing apparatus, and  $\alpha$ -cyclodextrin inclusion ethyl butyrate (sweet flavorant) (concentration of 50%) dispersed in polypropylene glycol was put in the flavorant bath of the other flavorant emitting member manufacturing apparatus. Both the flavorant emitting member manufacturing apparatuses and the filter manufacturing machine were driven, and a desired filter long body was produced. In the specification of cellulose acetate fiber tow constituting the filter body, a fineness was 2.5 denier, a total fineness was 35000 denier, and the cross-sectional shape of each fiber was a Y shape. In the filter wrapper, the air permeability was a 10000 cholester unit (CU), the basis weight was 24.0 g/m<sup>2</sup>, and the width was 26.5 mm. The obtained filter long body had a circumference of 24.5 mm and a length of 100 mm.

**[0036]** With the use of the filter long body and a tobacco filler, a cigarette wrapper, and a tip paper required for producing a cigarette rod of a commercially available cigarette product (SALEM ALASKA), a filter-tipped cigarette was manufactured by a normal cigarette hoisting machine. In this case, the filter long body was divided into four portions, and a length of 25 mm per one cigarette was butted against the cigarette rod.

**[0037]** In the specification of the cigarette rod, the circumferential length was 24.5 mm, and the length was 84 mm.

**[0038]** 20 filter-tipped cigarettes produced thus were put in a normal cigarette package, and the cigarette package was sealed. The cigarette package was stored for one month under an environment of a temperature of 22°C and a relative humidity of 60%. After the storage, the filter-tipped cigarette was removed from the package. The cigarette was smoked by seven panelists, and sensory evaluation of the fragrance inhaling taste was performed.

**[0039]** In the sensory evaluation, the following fragrance inhaling taste evaluation items per one cigarette were scored for each puff from first puff to seventh puff.

<Fragrance inhaling taste evaluation items>

**[0040]** Sense of menthol: seven expert evaluators of the company of the applicant who were professionally trained in the fragrance inhaling taste evaluation of a cigarette and were put in charge of evaluating the fragrance inhaling taste and developing the fragrance inhaling taste scored sensory score by the following standards, and an average value was calculated.

**[0041]** In cigarette products sold by the company of the applicant, the sensory score of the sense of menthol of the cigarette product showing the strongest sense of menthol was set to 2.0 points (reference point), and the sensory score of the sense of menthol of the cigarette product having no sense of menthol was set to 1.0 point (reference point). The

evaluation point of the cigarette manufactured in the example 1 relative to both the reference points was scored at steps of 0.1 point.

**[0042]** Sense of sweet: the above seven expert evaluators scored the sensory score by the following standards, and the average value was calculated.

**[0043]** In the cigarette products sold by the company of the applicant, the sensory score of the sense of sweet of the cigarette product showing the strongest sense of sweet was set to 2.0 points (reference point), and the sensory score of the sense of sweet of the cigarette product having the weakest sense of sweet was set to 1.0 point (reference point). The evaluation point of the cigarette manufactured in the example 1 relative to both the reference points was scored at steps of 0.1 point.

**[0044]** The results obtained by averaging the evaluation results from the seven people are shown as the sensory score in the following Table 1.

[Table 1]

Table 1: sensory score for each puff (average value)

|                  | First puff | Second puff | Third puff | Fourth puff | Fifth puff | Sixth puff | Seventh puff |
|------------------|------------|-------------|------------|-------------|------------|------------|--------------|
| Sense of sweet   | 1.50       | 1.53        | 1.44       | 1.46        | 1.46       | 1.28       | 1.33         |
| Sense of menthol | 1.28       | 1.29        | 1.36       | 1.44        | 1.49       | 1.55       | 1.60         |

**[0045]** The results shown in Table 1 are shown as a graph in FIG. 6. In FIG. 6, a line segment a shows the results of the sense of sweet, and a line segment b shows the results of the sense of menthol.

**[0046]** As seen in the above results, the sense of sweet and the sense of menthol were significantly changed as the puff progresses. Namely, it is considered that menthol which is not clathrated in cyclodextrin transfers from cotton yarn to other portions (shredded cigarette, cellulose acetate fiber, and so on) during the storage and is distributed in the cigarette in a state of being close to an equilibrium state. The delivery of menthol to the cigarette mainstream smoke is similar to a behavior for each puff of tar in the cigarette mainstream smoke. On the other hand, the sweet flavorant (ethyl butyrate) clathrated in cyclodextrin stays in the cotton yarn during the storage, and from the moment the mainstream smoke is passed in the filter by smoking, the sweet flavorant is emitted strongly depending on the amount of the passed mainstream smoke; therefore, the sense of sweet is strongly expressed in the early part of smoking in comparison with menthol which is not clathrated in cyclodextrin.

#### Example 2

**[0047]** In this example, an L-menthol-containing dextrin powder was produced as follows.

**[0048]** Namely, 1 part by weight of sucrose fatty acid ester ("Ryoto Sugar Ester S-1170" manufactured by Mitsubishi Kagaku Foods Corporation) was added to 59 parts by weight of purified water, and the mixture was stirred at 60°C for 10 minutes. 40 parts by weight of dextrin (produced by Sanwa Starch Co., Ltd., "Sandec #185") was added to the prepared solution, and the mixture was stirred for 30 minutes. While the prepared solution was kept at 50 to 60°C, 13.67 parts by weight of L-menthol was added and dissolved. The prepared solution was emulsified at 12000 rpm for 10 minutes by a TK homomixer to produce a spray solution. While the spray solution is kept at 50 to 60°C, the solution was sent to a spray dryer ("spray dryer MDL-050M" manufactured by Fujisaki Electric Co., Ltd.) and spray dried at 180°C. Consequently, a dextrin powder containing L-menthol in an amount of 25% by weight was obtained.

**[0049]** Next, a flavorant emitting member manufacturing apparatus constituted of cheese of bleached cotton yarn of 20/16 in the English count, a flavorant tank, a flavorant feeding pump, a flavorant applicator, and so on was provided to be mounted to a normal filter manufacturing machine, and a polypropen solution of L-menthol (concentration of 70%) or the L-menthol-containing dextrin powder dispersed in polypropylene glycol was put in the flavorant bath of the flavorant emitting member manufacturing apparatus. The flavorant emitting member manufacturing apparatus and the filter manufacturing machine were driven, and a desired filter long body was produced. In the specification of cellulose acetate fiber tow constituting the filter body, the fineness was 3.5 denier, the total fineness was 35000 denier, and the cross-sectional shape of each fiber was a Y shape. The filter wrapper used in the example 1 was used. The obtained filter long body had a circumference of 24.5 mm and a length of 100 mm. A cotton yarn carrying a flavorant was inserted through the center of the filter long body.

**[0050]** Two kinds of filter-tipped cigarette samples A and B were produced as in the example 1 except for using the obtained filter long body. The filter-tipped cigarette sample A contained L-menthol (additive amount: 11.5 g per a filter length of 25 mm) not contained in dextrin, and the filter-tipped cigarette sample B contained L-menthol (additive amount: 10.0 g per a filter length of 25 mm) contained in the above dextrin powder. In the cigarette samples A and B, the ventilation resistances of both the filters were the same.

[0051] The obtained filter-tipped cigarette samples A and B were stored for one month as in the example 1, and then the amount of menthol in the mainstream smoke for each puff was measured as follows.

[0052] With the use of a five link type rotary automatic smoker, five filter-tipped cigarette samples having the same specification were set, smoking up to seven puffs was performed under ISO standard smoking conditions. For each puff, cigarette mainstream smoke components were collected by a glass fiber filter installed in advance, the cigarette mainstream smoke components were extracted with ethanol, and the menthol amount was measured by a gas chromatograph. The same operation was performed twice with respect to the cigarette samples having the same specification, and an average value of the menthol amount in the mainstream smoke was calculated. The average value was divided by an average value of a total menthol amount of seven puffs and expressed in percentage, and the evaluation results were obtained. The results are shown in the following Table 2.

[Table 2]

Table 2: ratio (%) of emitting menthol in mainstream smoke

|          | First puff | Second puff | Third puff | Fourth puff | Fifth puff | Sixth puff | Seventh puff |
|----------|------------|-------------|------------|-------------|------------|------------|--------------|
| Sample A | 5.32       | 12.52       | 13.95      | 15.86       | 16.54      | 16.54      | 19.23        |
| Sample B | 2.07       | 4.68        | 6.59       | 7.86        | 10.05      | 17.23      | 51.52        |

[0053] The results shown in Table 2 are shown as a graph in FIG. 7. In FIG. 7, a line segment a shows the results of the sample A, and a line segment b shows the results of the sample B.

[0054] As seen in comparison of the results of the samples A and B, as puff progresses, the menthol amount in the mainstream smoke, that is, the strength of the sense of menthol is significantly different between them. In the sample B, since menthol is contained in (carried by) dextrin, menthol is emitted from dextrin by water in the mainstream smoke passing through a filter, and therefore, the menthol amount in the mainstream smoke significantly increases in the seventh puff. It is considered that this phenomenon is caused by the fact that accumulation of water up to the sixth puff and relative reduction of dilution of the mainstream smoke according to a cigarette wrapper having an air permeability due to that a combustion portion approaches the filter increase the water temperature in the mainstream smoke passing through the filter.

[0055] As shown in the examples 1 and 2, the flavor-releasing behavior from the flavor-releasing member carrying various flavorants becomes apparent. It will be apparent from the results of the flavor-releasing behaviors that a cigarette to which a filter incorporating a plurality of flavorant-releasing members carrying different flavorants is provided to be mounted can provide different flavors for each puff in accordance with the present invention.

#### Reference Signs List

#### [0056]

|                                    |                         |
|------------------------------------|-------------------------|
| 10, 20, 30, 420                    | Filter                  |
| 110                                | Filter body             |
| 121 to 122, 221 to 223, 310        | Flavor-releasing member |
| 121a, 122a, 221a, 222a, 223a, 310a | Discrete yarn           |
| 130                                | Filter wrapper          |
| 40                                 | Filter-tipped cigarette |
| 410                                | Cigarette rod           |
| 411                                | Tobacco filler rod      |
| 412                                | Cigarette wrapper       |
| 430                                | Tip paper               |

#### Claims

1. A filter for a cigarette comprising:

a filter body; and

an flavor-releasing member which includes a flavorant carrier constituted of one or more discrete yarns and a plurality of flavor-releasing components carried by the flavorant carrier,

**characterized in that** the flavor-releasing member is incorporated in the filter body, extending along a central

axis of the filter body,

one flavor-releasing component releases flavor different from other one or more flavor-releasing components, flavor-releasing behavior of one flavor-releasing component is different from that of other one or more flavor-releasing components, and the flavor-releasing component is selected from the group consisting of a pure flavorant, a pure flavorant combined with cyclodextrin, and a pure flavorant combined with dextrin.

2. The filter for a cigarette according to claim 1, wherein the flavorant carrier is constituted of a plurality of discrete yarns, and each of the plurality of flavor-releasing components is carried by the discrete yarns separately.

3. The filter for a cigarette according to claim 1, wherein the plurality of flavor-releasing components are carried by one single yarn.

4. The filter for a cigarette according to any one of claims 1 to 3, wherein the discrete yarn is colored.

5. A filter-tipped cigarette comprising:

a cigarette rod; and

a filter connected to one end of the cigarette rod,

wherein the filter is constituted of the filter according to any one of claims 1 to 4.

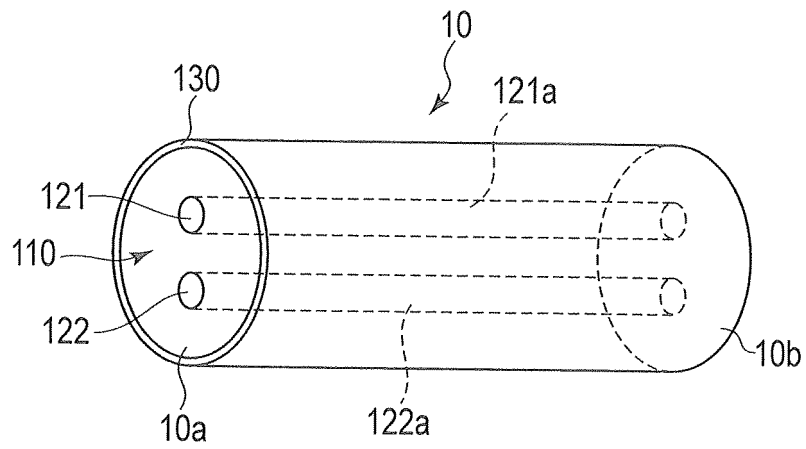


FIG. 1

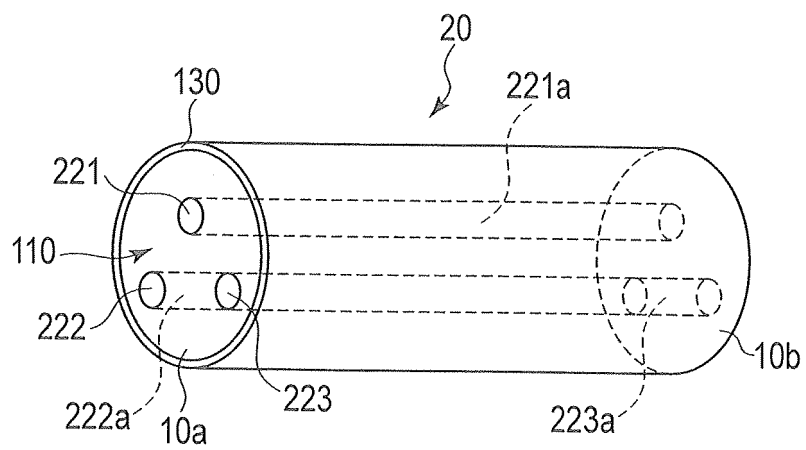


FIG. 2

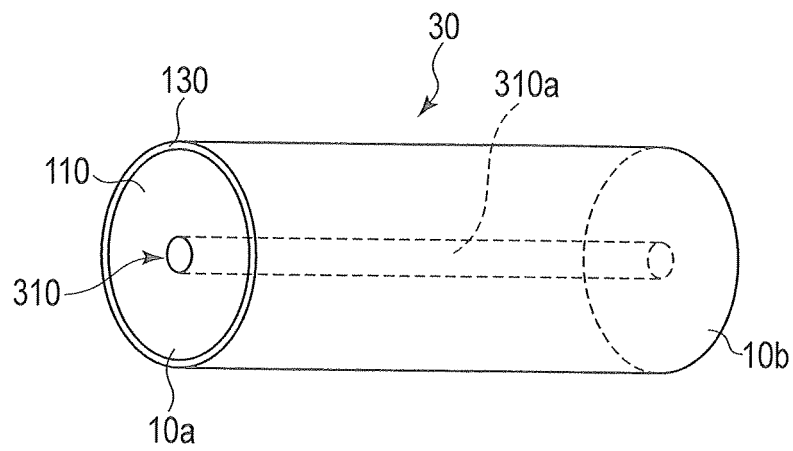


FIG. 3

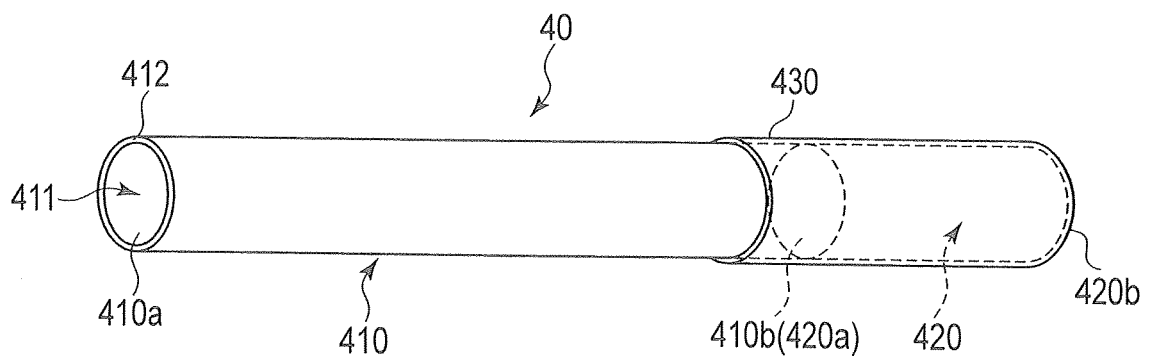


FIG. 4

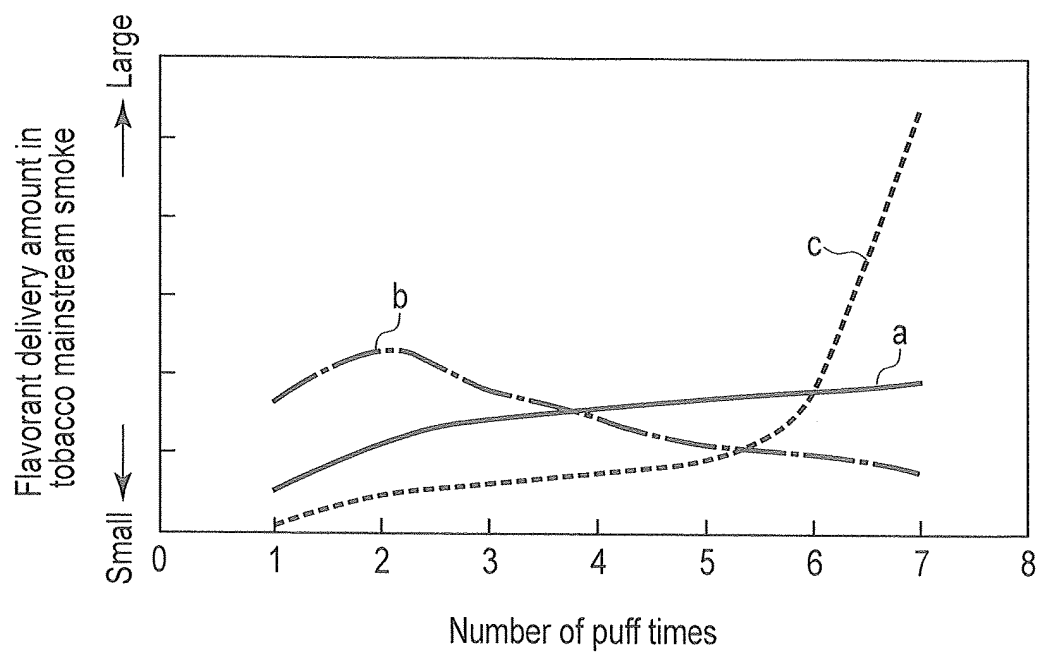


FIG. 5

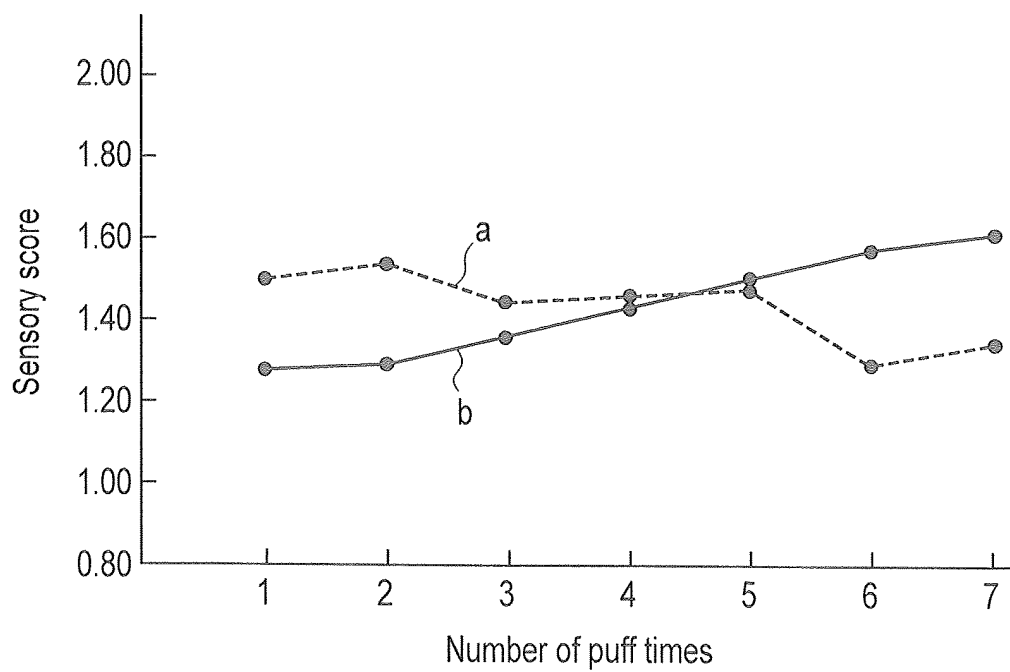


FIG. 6

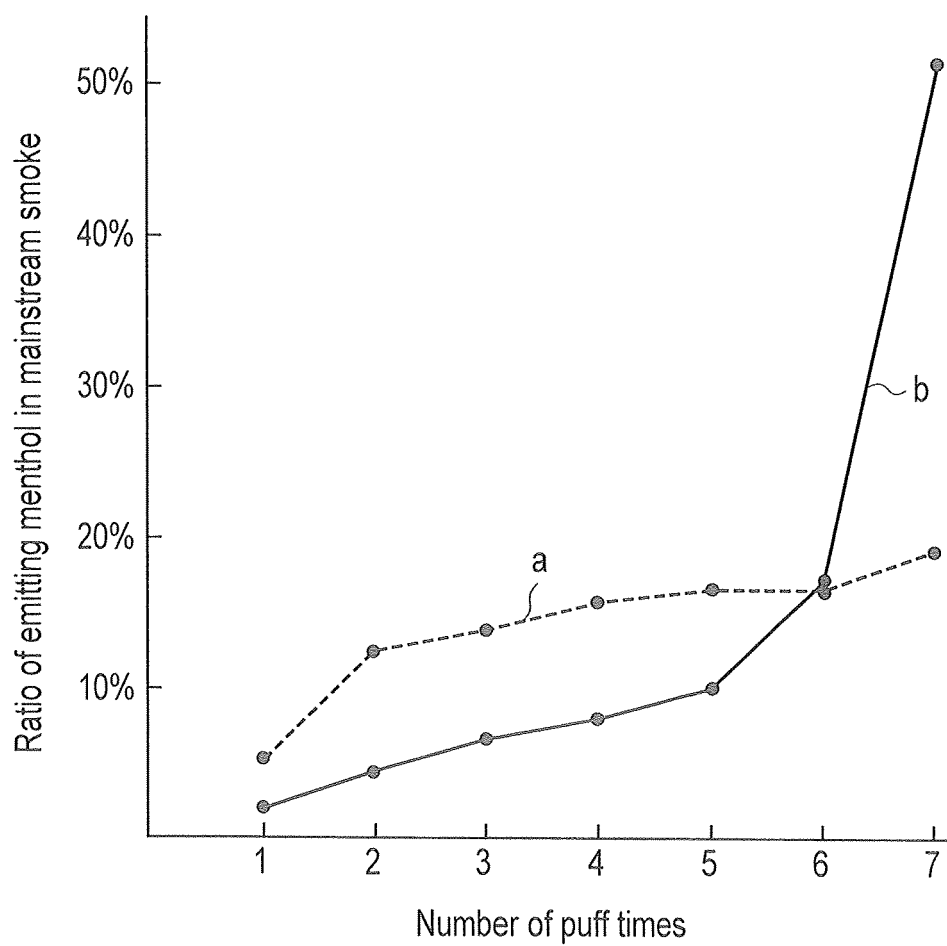


FIG. 7

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/051839

## A. CLASSIFICATION OF SUBJECT MATTER

A24D3/04(2006.01) i, A24D3/14(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)

A24D3/04, A24D3/14

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

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                              | Relevant to claim No. |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A         | JP 2011-229481 A (Japan Tobacco Inc.),<br>17 November 2011 (17.11.2011),<br>entire text; all drawings<br>(Family: none)                                                                                                                                                                                         | 1-5                   |
| A         | JP 2010-536336 A (Philip Morris Products S.A.),<br>02 December 2010 (02.12.2010),<br>entire text; fig. 2, 4 to 7<br>& US 2009/0044817 A1 & EP 2025251 A1<br>& EP 2175749 A2 & WO 2009/024866 A2<br>& AR 67942 A & KR 10-2010-0045410 A<br>& MX 2009013969 A & EA 201070284 A<br>& CN 101790329 A & CO 6251217 A | 1-5                   |

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

## \* Special categories of cited documents:

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

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"&amp;" document member of the same patent family

Date of the actual completion of the international search  
11 April, 2012 (11.04.12)Date of mailing of the international search report  
24 April, 2012 (24.04.12)Name and mailing address of the ISA/  
Japanese Patent Office

Authorized officer

Facsimile No.

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/051839

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Relevant to claim No. |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A         | <p>JP 63-038187 B2 (Cigarette Components Ltd.),<br/> 28 July 1988 (28.07.1988),<br/> entire text; all drawings</p> <p>&amp; JP 55-58084 A                      &amp; US 4281671 A<br/> &amp; GB 2020158 A                      &amp; DE 2914892 A<br/> &amp; FR 2423169 A                      &amp; BE 875736 A<br/> &amp; CH 630513 A                      &amp; CH 635232 A<br/> &amp; CH 635233 A                      &amp; AR 218125 A<br/> &amp; AT 303179 A                      &amp; NL 7903179 A<br/> &amp; AU 4551479 A                      &amp; PT 69507 A<br/> &amp; SE 7903445 A                      &amp; ES 479763 A<br/> &amp; ES 484500 A</p> | 1-5                   |

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**REFERENCES CITED IN THE DESCRIPTION**

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- JP 63038187 A [0003] [0022] [0035]
- GB 2070409 A [0003]