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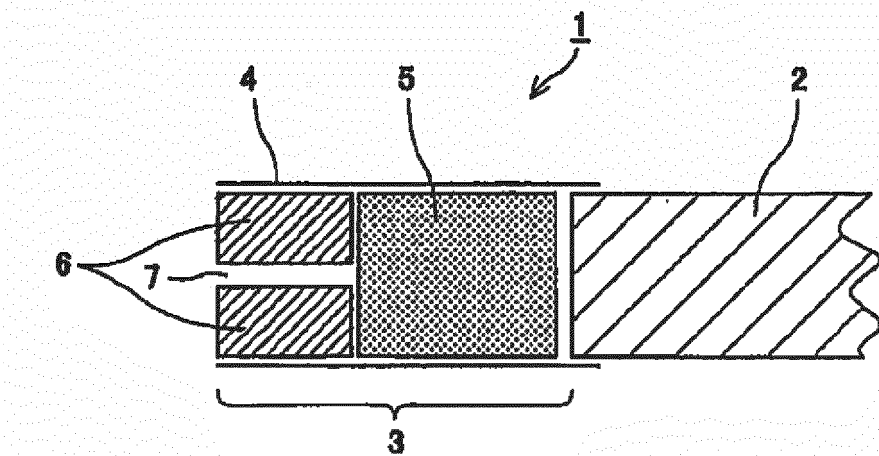
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(54) **METHOD FOR MANUFACTURING HOLLOW TOBACCO FILTER MEMBER**

(57) Provided is a method for quickly producing a hollow cigarette filter that uses cellulose acetate as its material but has no fiber fragment textured on its inner cavity. A hollow cigarette filter member 6 is formed by thermo-

forming a raw material containing a cellulose ester and an ester-based plasticizer without having the raw material undergo a fibrous shape.

[Fig. 1]



Description

Technical Field

5 [0001] The present invention relates to a method for producing a hollow cigarette filter member.

Background Art

10 [0002] As a cigarette filter provided on the mouthpiece side of a cigarette, a filter such as a tubular filter has recently been used which has an inner cavity extending in its axial direction.

[0003] Similarly to a solid-core filter having no inner cavity, such a hollow filter is generally produced from cellulose acetate fiber and a plasticizer. Further, a cigarette filter produced from a material other than cellulose acetate fiber, such as polypropylene fiber, is also known.

15 [0004] As a method for producing a hollow filter, Patent Literature 1 describes a method in which a non-woven web comprising thermoplastic fiber is formed into a cylindrical shape (Pages 6 to 7). This literature describes that a hollow filter is produced using a cigarette wrapping machine having a double cone comprising an inner cone and an outer cone by wrapping the fibrous web around the outer periphery of the inner cone.

Citation List

20

Patent Literature

[0005] PTL 1:JP 64-71470 A

Summary of Invention

Technical Problem

30 [0006] A conventional hollow cigarette filter is produced by forming thermoplastic fiber into a hollow filter, and therefore has a problem in its appearance because fragments of the fiber constituting the filter may be looked as a texture on the inner cavity of the filter. Further, the conventional hollow cigarette filter also has a problem that its production process, including spinning of thermoplastic fiber and forming thermoplastic fiber into a hollow filter, takes time, which leads to an increase in production cost.

35 [0007] Further, there is a possibility that a filter produced from a material other than cellulose acetate adversely affects the taste of a cigarette and health.

[0008] In view of the above circumstances, it is an object of the present invention to provide a method for quickly producing a hollow cigarette filter that uses cellulose acetate as its material but has no fiber fragment textured on into its inner cavity.

Solution to Problem

40 [0009] In order to achieve the above object, the present inventors have employed a method in which a hollow cigarette filter is formed by thermoforming a material containing cellulose acetate without using cellulose acetate fiber.

45 [0010] More specifically, the present invention relates to a method for producing a hollow cigarette filter member, comprising forming a hollow cigarette filter member by thermoforming a raw material containing a cellulose ester and an ester-based plasticizer without having the raw material undergo a fibrous shape.

[0011] According to an embodiment of the present invention, it is possible to form the hollow cigarette filter member by melt-extrusion molding of pellets containing the cellulose ester and the ester-based plasticizer.

50 [0012] According to another embodiment of the present invention, it is possible to form the hollow cigarette filter member by attaching the ester-based plasticizer to cellulose ester flakes and subjecting the flakes to compression molding with heating.

[0013] In the present invention, the ester-based plasticizer is preferably one containing triacetin but not containing a phosphoric acid ester.

Advantageous Effects of Invention

[0014] According to the production method of the present invention, it is possible to quickly produce a hollow cigarette filter having no fiber fragment textured on its inner cavity. Further, the hollow cigarette filter uses cellulose acetate as

its material, and therefore there is no fear that the hollow cigarette filter adversely affects the taste of a cigarette and health.

Brief Description of Drawings

[0015]

Fig. 1 is a sectional view of a mouthpiece-side end of a cigarette, which is taken along the axial direction of the cigarette. Fig. 2(a) is a sectional view of a hollow cigarette filter using a cylindrical cigarette filter member, which is taken along a direction perpendicular to the axial direction of the hollow cigarette filter, and Figs. 2(b) and 2(c) are each a sectional view of a hollow cigarette filter using a cigarette filter member having recesses provided in its outer periphery, which is taken along a direction perpendicular to the axial direction of the hollow cigarette filter.

Description of Embodiments

[0016] Hereinbelow, embodiments of the present invention will be described.

[0017] Fig. 1 is a sectional view of a mouthpiece-side end of a cigarette, which is taken along the axial direction of the cigarette. A cigarette 1 comprises a cigarette rod 2 comprising cut tobacco and a cigarette filter 3 connected to one end of the cigarette rod 2. The cigarette rod 2 is wrapped by cigarette paper, but the cigarette paper is not shown. The cigarette filter 3 comprises a solid-core cigarette filter member 5 having no inner cavity, a hollow cigarette filter member 6 connected to downstream of the member 5 and having a through hole 7 extending in its axial direction, and tipping paper 4 wrapped around the outside of the members 5 and 6.

[0018] In the present invention, the hollow cigarette filter member refers to a filter member that constitutes a cigarette filter having a cavity passing through it in its axial direction when wrapped by tipping paper. Such a hollow cigarette filter member has a cylindrical shape having an inner cavity passing through a cylinder in its axial direction or has a shape having recesses continuously formed in the outer periphery of a cylinder in its axial direction. Fig. 1 is a sectional view of the cylindrical cigarette filter member 6 along its axial direction.

[0019] Figs. 2(a) to 2(c) are each a sectional view (sectional view along a direction perpendicular to an axial direction) of a hollow cigarette filter formed by wrapping a hollow cigarette filter member by tipping paper. Similarly to Fig. 1, Fig. 2(a) shows a cylindrical cigarette filter member having a through hole 7 in its center. In Figs. 1(b) and 1(c), recesses 8 are provided in the outer periphery of the cigarette filter member. The recesses 8 are continuously formed in the axial direction of the cigarette filter member so that when the outside of the cigarette filter member is wrapped by tipping paper, cavities are formed between the cigarette filter member and the tipping paper so as to pass through the cigarette filter in its axial direction. The filter member shown in Fig. 1(b) has recesses provided by allowing the filter member to have a wavy outer periphery, and the filter member shown in Fig. 1(c) has a shape obtained by forming recesses intermittently in the outer periphery of a cylinder, but the hollow cigarette filter member is not limited thereto. In either case, the cigarette filter can have cavities passing through it in its axial direction when the outside of the filter member is wrapped by tipping paper.

[0020] The present invention is directed to a method for producing such a hollow cigarette filter member as described above. In a conventional method for producing a hollow cigarette filter member, a hollow cigarette filter member is produced by forming thermoplastic fiber into a hollow member. However, in the method according to the present invention, a hollow cigarette filter member is produced by thermoforming without having the raw material undergo a fibrous shape. In the present invention, thermoforming refers to forming a cigarette filter member into a hollow shape with heating.

[0021] By performing thermoforming without having the raw material undergo a fibrous shape, it is possible to avoid a problem in appearance of texture on the inner cavity of a hollow cigarette filter. Further, it is also possible to avoid the necessity for performing a spinning process etc. and therefore to quickly produce a hollow cigarette filter.

[0022] Further, in the present invention, a raw material containing a cellulose ester and an ester-based plasticizer is used as a raw material constituting a hollow cigarette filter member. It is preferred that triacetin is used but a phosphoric acid ester is not used as the ester-based plasticizer. Therefore, there is no fear that the hollow cigarette filter member adversely affects the taste of a cigarette and health.

[0023] The cellulose ester used in the present invention is a known one, and specific examples thereof include cellulose acetate, cellulose propionate, cellulose butyrate, cellulose acetate propionate, and cellulose acetate butyrate. Other examples of the cellulose ester include polycaprolactone grafted cellulose acetate, acetyl methyl cellulose, acetyl ethyl cellulose, acetyl propyl cellulose, acetyl hydroxyethyl cellulose, and acetyl hydroxypropyl cellulose.

[0024] The cellulose ester is preferably one having an average degree of substitution of 2.7 or less, and is more preferably one having an average degree of substitution of 1.7 to 2.7. The polymerization degree of the cellulose ester is about 100 to 1000, preferably about 100 to 500 in terms of viscosity-average polymerization degree.

[0025] Examples of the ester-based plasticizer used in the present invention include, but not limited to, aromatic carboxylic acid esters [e.g., di-C1-12 alkyl phthalates such as dimethyl phthalate, diethyl phthalate, dibutyl phthalate,

dihexyl phthalate, dioctyl phthalate, and di-2-ethylhexyl phthalate, C1-6 alkoxy C1-12 alkyl phthalates such as dimethoxyethyl phthalate, C1-12 alkyl-aryl-C1-3 alkyl phthalates such as butyl benzyl phthalate, C1-6 alkylphthalyl C2-4 alkylene glycolates such as ethylphthalyl ethylene glycolate and butylphthalyl butylene glycolate, tri-C1-12 alkyl trimellitates such as trimethyl trimellitate, triethyl trimellitate, trioctyl trimellitate, and tri-2-ethylhexyl trimellitate, and tetra-C1-12 alkyl pyromellitates such as tetraoctyl pyromellitate];

fatty acid esters [e.g., adipic acid esters such as dibutyl adipate, dioctyl adipate, butoxyethoxy ethyl-benzyl adipate, and dibutoxyethoxy ethyl adipate, azelaic acid esters such as diethyl azelate, dibutyl azelate, and dioctyl azelate, sebacic acid esters such as dibutyl sebacate and dioctyl sebacate, butyl oleate, and methyl acetyl ricinoleate];

short-chain fatty acid esters of polyhydric alcohols (e.g., glycerin, trimethylol propane, pentaerythritol, and sorbitol) [e.g., triacetin and diglycerin tetraacetate];

glycol esters (e.g., dipropylene glycol dibenzoate);

citric acid esters [e.g., acetyl tributyl citrate];

ester oligomers (e.g., caprolactone oligomer); and

phosphoric acid esters.

[0026] Among them, triacetin (glycerol triacetate), citric acid esters, and phosphoric acid esters are preferred. Particularly, it is preferred that triacetin is used but a phosphoric acid ester is not used as the ester-based plasticizer. Triacetin has been used for many years as a plasticizer in cigarette filters, and therefore the use of only triacetin as the ester-based plasticizer has no fear that health and the taste of a cigarette are adversely affected.

[0027] Triacetin that can be used in the present invention is not limited to one composed of only triacetin pure in its chemical structure, and may be one that has a triacetin purity of, for example, 80 wt% or more, preferably 90 wt% or more and contains monoacetin and/or diacetin as the rest.

[0028] The phosphoric acid ester that can be used in the present invention is a known one. For example, a phosphoric acid ester described in JP 2003-261711 A as a flame retardant may be used.

[0029] In the present invention, the amount of the ester-based plasticizer blended may be about 10 to 30 wt%, preferably 20 to 30 wt% per 100 parts by weight of cellulose acetate. When the amount of the ester-based plasticizer blended is within the above range, a hollow cigarette filter member can be produced by thermoforming without having the raw material undergo a fibrous shape.

[0030] The raw material used in the present invention may contain a commonly-used additive. Examples of such an additive include other stabilizers (e.g., antioxidants, ultraviolet absorbers, heat stabilizers, and light resistant stabilizers), colorants (e.g., dyes and pigments), flame retardants, antistatic agents, lubricants, anti-blocking agents, dispersants, fluidizers, dripping inhibitors, and antimicrobial agents. As a white pigment, titanium oxide can be used.

[0031] According to one embodiment of the method of the present invention for forming a hollow cigarette filter member by thermoforming without having the raw material undergo a fibrous shape, a hollow cigarette filter member can be formed by producing pellets from the raw material containing the cellulose ester and the ester-based plasticizer and then subjecting the pellets to melt-extrusion molding.

[0032] A specific method for producing the pellets is not particularly limited. For example, components of the above-described raw material are first preliminarily mixed by a dry or wet method using a mixer such as a tumbler mixer, a Henschel mixer, a ribbon mixer, or a kneader, to prepare a mixture, and then the mixture is melt-kneaded by an extruder such as a single or twin screw extruder and formed into pellets.

[0033] A specific method for forming a hollow cigarette filter member from the pellets by melt-extrusion molding is not particularly limited. Examples of the method include injection molding, extrusion molding, vacuum molding, profile molding, foaming molding, injection pressing, press molding, blow molding, and gas injection molding.

[0034] According to another embodiment of the method of the present invention, a hollow cigarette filter member is formed by attaching the ester-based plasticizer to the surface of cellulose ester flakes and subjecting the flakes to compression molding with heating. The compression molding may be performed using a commercially-available compression molding machine at a temperature of 150°C to 240°C, desirably 230°C and a pressure of 0.01 MPa or more, desirably 0.5 MPa for 30 seconds or more, desirably about 2 minutes. The term "cellulose ester flakes" refers to cellulose ester in flake form obtained by acetylating cellulose, subjecting the acetylated cellulose to hydrolysis reaction to adjust an average degree of substitution, and purifying and drying the hydrolysate.

[0035] The hollow cigarette filter member obtained by the present invention may be one that can be directly used as the hollow cigarette filter member 7 shown in Fig. 1 or may be a long member from which the hollow cigarette filter member 7 can be obtained by cutting it in a direction perpendicular to its axial direction. The cigarette filter 3 can be formed by wrapping the hollow cigarette filter member by the tipping paper 4 so that the hollow cigarette filter member is connected to the solid-core cigarette filter member 5.

Examples

[0036] The present invention will be described below in more detail with reference to examples, but the present

invention is not limited to these examples.

(Examples 1 to 3)

[0037] Components shown in Table 1 were placed in a Henschel mixer and mixed with stirring, and the mixture was supplied to a twin screw extruder (cylinder temperature: C1/C2-C6 = 180°C/200°C, die temperature: 230°C, screw rotation speed: 250 rpm) and pelletized to obtain pellets. The pellets were supplied to an injection molding machine and subjected to injection molding under conditions of a cylinder temperature of 200°C, a die temperature of 50°C, and a molding cycle of 30 seconds (injection for 15 seconds, cooling for 15 seconds) to prepare a hollow test piece having an outer diameter of 7.7 mm and an inner diameter of 5.0 mm.

[0038] It is to be noted that the components shown in Table 1 are as follows.

Cellulose acetate: "L40" (trade name) manufactured by Daicel Corporation, degree of substitution: 2.5,6% viscosity: 83×10^2 mPa·s

Triacetin: "DRA150" (trade name) manufactured by Daicel Corporation

Phosphoric acid ester one described in Synthesis Example 1 (Table 2) in JP 2003-261711 A

Titanium oxide: commercially-available titanium oxide (purity: 98% or more)

Evaluations shown in Table 1 were made according to the following criteria.

(Thermoplasticity)

[0039] The pellets prepared under the above-described conditions were visually observed to evaluate thermoplasticity according to the following criteria.

○: The pellets are in a uniform block form (excellent thermoplasticity).

×: The kneaded mixture is not in a block form and cellulose acetate remains in powder form (poor thermoplasticity).

(Moldability)

[0040] The hollow test piece prepared under the above-described conditions was visually observed to evaluate moldability according to the following criteria.

○: The test piece is kept in the shape of the die (excellent moldability).

×: The test piece is not kept in the shape of the die (poor moldability).

(Track record of use for cigarette)

[0041]

○: All the components used have a track record of use as a constituent material of a cigarette filter.

×: At least one of the components used does not have a track record of use as a constituent material of a cigarette filter.

[Table 1]

		Example 1	Example 2	Example 3
Components	Cellulose acetate (parts by weight)	100	100	100
	Triacetin (parts by weight)	25	25	0
	Phosphoric acid ester (parts by weight)	0	18	17
	Titanium oxide (parts by weight)	0.5	0	0
Evaluations	Thermoplasticity	○	○	○
	Moldability	○	○	○
	Track record of use for cigarette	○	×	×

[0042] As can be seen from Table 1, Examples 1 to 3 succeeded in producing a hollow cigarette filter member from a cellulose ester and an ester-based plasticizer by thermoforming without having the raw material undergo a fibrous shape. Examples 1 to 3 were all excellent in thermoplasticity and moldability. Particularly, Example 1 succeeded in producing a hollow cigarette filter member using only materials having a track record of use as a material for cigarette filter.

Reference Signs List

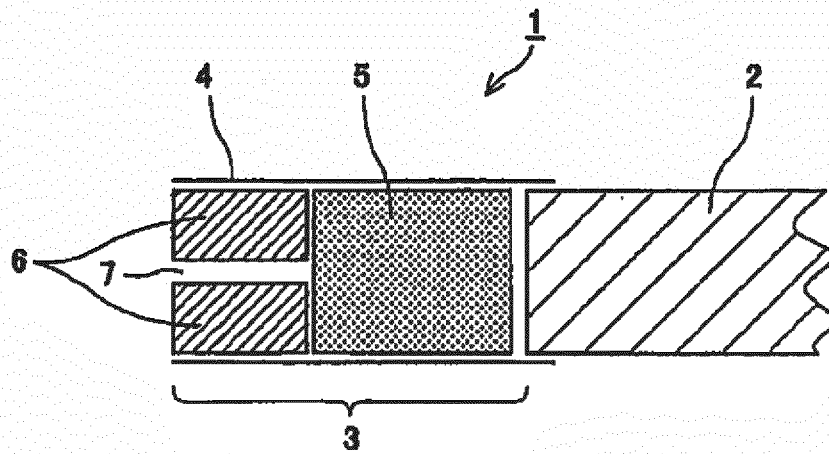
[0043]

- 1 cigarette
- 2 cigarette rod
- 3 cigarette filter
- 4 tipping paper
- 5 solid-core cigarette filter member
- 6 hollow cigarette filter member
- 7 through hole
- 8 recess

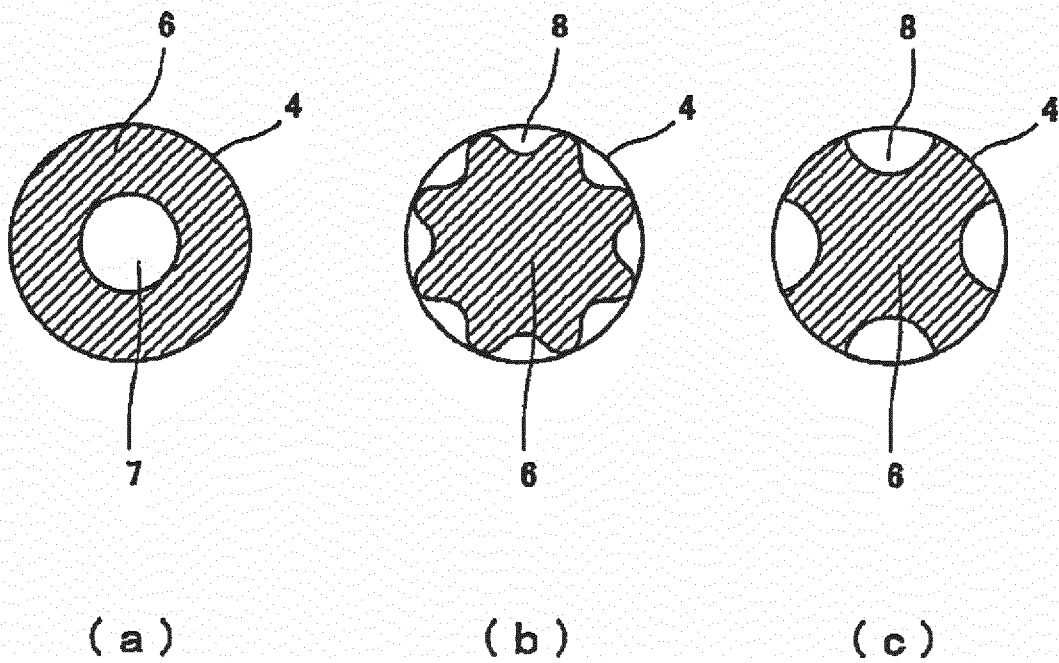
Claims

1. A method for producing a hollow cigarette filter member, comprising forming a hollow cigarette filter member by thermoforming a raw material containing a cellulose ester and an ester-based plasticizer without having the raw material undergo a fibrous shape.
2. The production method according to claim 1, wherein the hollow cigarette filter member is formed by subjecting pellets containing the cellulose ester and the ester-based plasticizer to melt-extrusion molding.
3. The production method according to claim 1, wherein the hollow cigarette filter member is formed by attaching the ester-based plasticizer to cellulose ester flakes and subjecting the flakes to compression molding with heating.
4. The production method according to any one of claims 1 to 3, wherein the ester-based plasticizer contains triacetin but does not contain a phosphoric acid ester.

[Fig. 1]



[Fig. 2]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2015/003066

A. CLASSIFICATION OF SUBJECT MATTER

A24D3/02(2006.01)i, A24D3/10(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)

A24D3/02, A24D3/10

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 1996-2015

Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

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.
Y	JP 63-65367 B2 (Celanese Corp.), 15 December 1988 (15.12.1988), entire text; all drawings & JP 54-128070 A & US 4180536 A & GB 2015921 A & DE 2909096 A & FR 2419751 A	1-4
Y	JP 2604419 B2 (Cigarette Components Ltd.), 30 April 1997 (30.04.1997), column 4, line 36 to column 5, line 33; column 6, lines 33 to 41; all drawings & JP 64-47366 A & GB 2203324 A & CH 676911 A	1-4

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

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Date of the actual completion of the international search
27 August 2015 (27.08.15)Date of mailing of the international search report
08 September 2015 (08.09.15)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

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Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2015/003066

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 59-63179 A (Mitsubishi Acetate Co., Ltd.), 10 April 1984 (10.04.1984), page 3, upper left column, lines 1 to 9; lower right column, lines 3 to 9; all drawings (Family: none)	1-4
Y	JP 61-88868 A (British American Tobacco Co., Ltd.), 07 May 1986 (07.05.1986), page 3, lower left column, line 8 to lower right column, line 7; all drawings & US 4649942 A & GB 2165135 A & EP 177227 A1	3-4
Y	JP 4959342 B2 (Daicel Corp.), 20 June 2012 (20.06.2012), paragraph [0115] (Family: none)	3-4
A	JP 7-313871 A (British American Tobacco Co., Ltd.), 05 December 1995 (05.12.1995), entire text; all drawings & US 5954059 A & EP 614620 A2 & CN 1099242 A	1-4
A	JP 60-20986 B2 (Brown & Williamson Tobacco Corp.), 24 May 1985 (24.05.1985), entire text; all drawings & JP 56-169579 A & US 4380241 A & GB 2078086 A & DE 3116052 A & FR 2481581 A & CH 641016 A	1-4

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 6471470 A [0005]
- JP 2003261711 A [0028] [0038]