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(54) TOBACCO FILLING FOR NON-COMBUSTION-TYPE HEATING SMOKING ARTICLE

(57) The present invention provides a tobacco raw material having a good inhalation flavor and a method for manufacturing same. Provided is a tobacco raw material in which the ratio of the weight of extracts obtained by extraction using n-hexane as a solvent to the weight of extracts obtained by further extraction using water as a solvent after the abovementioned extraction is a water-extracted weight/hexane-extracted weight ratio of 0-1.5.

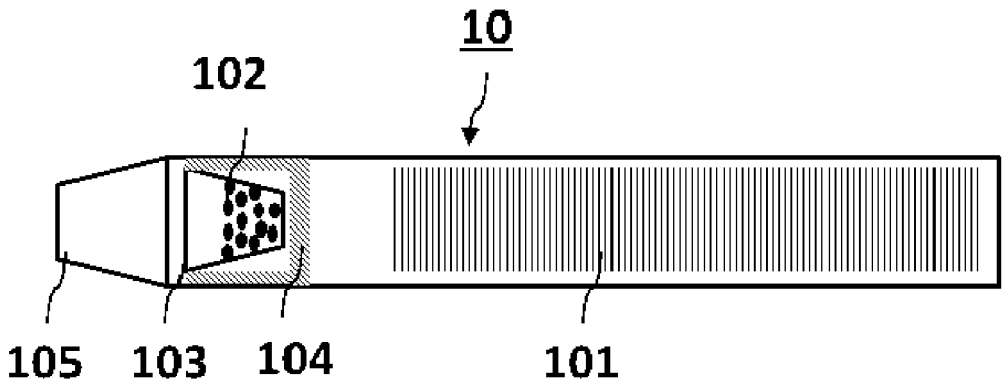

FIG. 1

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Description

[Technical Field]

[0001] The present invention relates to a tobacco filler for a non-combustion smoking article that fills a non-combustion smoking article for use.

[Background Art]

[0002] In recent years, non-combustion smoking articles that replace cigarettes and allow experience of a smoke flavor without combusting tobacco have been developed, and one in which a smoke flavor component and a component capable of generating aerosol fill a pod-shaped container for use or one having a heat source at a tip thereof is typically known.

[0003] It has been also reported that an acid is added to a filler in such non-combustion smoking articles (see PTL 1 to 3).

[Citation List]

[Patent Literature]

[0004]

[Patent Literature 1] WO 2014/190079
[Patent Literature 2] U.S. Patent Application Publication No. 2015/0020820 (Specification)
[Patent Literature 3] U.S. Patent Application Publication No. 2014/0345631 (Specification)

[Summary of Invention]

[Technical Problem]

[0005] During smoking with non-combustion smoking articles, the amount of evaporation of smoke flavor components may be insufficient compared to that from cigarettes or a user may feel so-called "smoke flavor inhibition".

[0006] An object of the present invention is to provide a tobacco filler for a non-combustion smoking article that can suppress a reduction in an amount of evaporated smoke flavor components and suppress "smoke flavor inhibition" in a non-combustion smoking article, particularly a smoking article in which a filler containing shredded tobacco is heated.

[Solution to Problem]

[0007] The inventors of the present invention carried out an extensive study in order to solve the problem and, as a result, found that by adding an acid fulfilling specific conditions to a tobacco filler, a reduction in the amount of evaporated smoke flavor components may be suppressed and "smoke flavor inhibition" may be suppressed, thereby completing the present invention.

[0008] Thus, the present invention is as follows.

<1> A tobacco filler for a non-combustion smoking article containing shredded tobacco, and liquid that generates aerosol, wherein
the tobacco filler contains an acid that has a first acid dissociation constant of 4.0 to 6.0 inclusive and a boiling point of 366°C to 600°C inclusive.
<2> The tobacco filler according to <1>, wherein the acid is at least one selected from the group consisting of ascorbic acid, isoascorbic acid, heneicosanoic acid, lignoceric acid, octacosanoic acid and nonadecanoic acid.
<3> The tobacco filler according to <1> or <2>, containing the acid at 0.25% by mass to 10% by mass inclusive of the whole tobacco filler.
<4> The tobacco filler according to any of <1> to <3>, wherein the liquid that generates aerosol contains propylene glycol (PG) .

[Advantageous Effects of Invention]

[0009] According to the present invention, a reduction in the amount of evaporated smoke flavor components may be suppressed and "smoke flavor inhibition" may be suppressed in a non-combustion smoking article in which a filler

containing shredded tobacco is heated.

[Brief Description of Drawings]

[0010]

Fig. 1 is a section view illustrating an example of a non-combustion smoking article.
Fig. 2 is a graph illustrating the relationship between the first acid dissociation constant of acid and the amount of evaporated smoke flavor components.
Fig. 3 is a graph illustrating the relationship between the boiling point of acid having a first acid dissociation constant of 4.0 to 6.0 inclusive and smoke flavor inhibition.
Fig. 4 is a graph illustrating the relationship between the boiling point of acid having a first acid dissociation constant of 4.0 to 6.0 inclusive and chemical odor.
Fig. 5 is a graph illustrating the relationship between the acid content and smoke flavor inhibition.
Fig. 6 is a graph illustrating the relationship between the type of liquid that generates aerosol and smoke flavor inhibition.

[Description of Embodiment]

[0011] The present invention is described by way of specific examples. However, the present invention is not limited to the following content, and may be appropriately modified and practiced without departing from the scope of the present invention.

<Tobacco filler for a non-combustion smoking article>

[0012] The tobacco filler (hereinafter abbreviated as "tobacco filler of the present invention") for a non-combustion smoking article according to one embodiment of the present invention contains shredded tobacco, and liquid that generates aerosol, and is characterized in that the tobacco filler contains an acid that has a first acid dissociation constant of 4.0 to 6.0 inclusive and a boiling point of 366°C to 600°C inclusive.

[0013] The inventors of the present invention have revealed various issues on non-combustion smoking articles, particularly smoking articles in which a filler containing shredded tobacco is heated.

[0014] For example, when an acid is added to a filler (which generally contains liquid that generates aerosol) containing shredded tobacco, the amount of evaporated smoke flavor components may be reduced. This may be caused by penetration of added acid into shredded tobacco together with liquid that generates aerosol and formation of salts with smoke flavor components in shredded tobacco. In non-combustion smoking articles which are heated to high temperature, salts may be dissociated by heating or a reduction in the amount of evaporated smoke flavor components may be suppressed due to high temperature, while the influences may be significant in non-combustion smoking articles which are heated to low temperature.

[0015] During smoking using non-combustion smoking articles, users may feel "smoke flavor inhibition" such as receiving a stimulus that is different from tobacco or generating physiological spontaneous actions such as "choking". This may be caused by components that inhibit smoke flavor in a filler, and volatilization of the components together with solvents such as propylene glycol may cause "smoke flavor inhibition".

[0016] The inventors of the present invention revealed that formation of salts from acids and smoke flavor components in shredded tobacco is correlated with the first acid dissociation constant (pKa_1) representing the strength of acid and formation of salts may be suppressed by selecting an acid having a first acid dissociation constant within a specific range, and less chemical odor (chemical smell) or the like may be sensed by selecting an acid having a boiling point at or above a certain temperature. Namely, the inventors of the present invention found that by adding an "acid that has a first acid dissociation constant of 4.0 to 6.0 inclusive and a boiling point of 366°C to 600°C inclusive" to a tobacco filler, a reduction in the amount of evaporated smoke flavor components may be suppressed and "smoke flavor inhibition" may be suppressed.

[0017] The "first acid dissociation constant" means an acid dissociation constant in water at normal temperature (25°C).

[0018] The "boiling point" means a boiling point at pressure of 760 mmHg.

[0019] The "non-combustion smoking article", "shredded tobacco", "liquid that generates aerosol", "acid that has a first acid dissociation constant of 4.0 to 6.0 inclusive and a boiling point of 366°C to 600°C inclusive" and the like are hereinafter specifically described.

[0020] The tobacco filler of the present invention is a tobacco filler for a non-combustion smoking article containing shredded tobacco, and liquid that generates aerosol. The non-combustion smoking article which is filled with the tobacco filler of the present invention is not particularly limited as to the specific structure and the like thereof, and may appropriately

be any well-known non-combustion smoking article. The non-combustion smoking article is hereinafter described by way of specific examples.

[0021] Examples of the non-combustion smoking article include the one that has the structure as a non-combustion smoking article 10 illustrated in Fig. 1. Fig. 1 is a section view of the cylindrical non-combustion smoking article 10 along the longitudinal direction. The non-combustion smoking article 10 has the structure having a battery 101, a pod 103 that accommodates a filler 102 and a heater 104 and a mouthpiece 105. By filling the pod 103 with the tobacco filler of the present invention and heating the same, aerosol is generated.

[0022] The heating temperature of the tobacco filler in the non-combustion smoking article is generally 22°C or higher, preferably 100°C or higher and more preferably 150°C or higher, and generally 350°C or lower, preferably 300°C or lower and more preferably 250°C or lower. The non-combustion smoking article having a heating temperature of a tobacco filler within the above range tends to have an issue of "smoke flavor inhibition", and thus characteristics of the tobacco filler of the present invention may be more efficiently exploited.

[0023] Examples of the type of the shredded tobacco include flue-cured tobacco, Burley tobacco, Japanese domestic tobacco, regenerated tobacco and the like. Examples of the region used include the leaf (expanded tobacco), stem, rib (cut stem), root, flower and the like.

[0024] The dimension of the shredded tobacco is not particularly limited. The shredded tobacco preferably has a sphere equivalent diameter of generally 1.5 mm or less and preferably 0.5 mm or less and generally 0.01 mm or more as measured by a projected sectional-area method (such as the method using Camsizer (Retsch Technology GmbH)).

[0025] The tobacco filler of the present invention contains shredded tobacco at generally 20% by mass or more, preferably 30% by mass or more and more preferably 40% by mass or more, and generally 80% by mass or less, preferably 70% by mass or less and more preferably 60% by mass or less. The content within the above range allows easier suppression of a reduction in the amount of evaporated smoke flavor components and more effective suppression of "smoke flavor inhibition".

[0026] Examples of the liquid that generates aerosol include polyhydric alcohols such as glycerol, propylene glycol, triethylene glycol and tetraethylene glycol; aliphatic esters of carboxylic acids such as methyl stearate, dimethyl dodecanedioate and dimethyl tetradecanedioate and the like. The liquid used is not limited to one type and may be a combination of two or more.

[0027] The liquid that generates aerosol preferably contains propylene glycol. Propylene glycol is used for food and medicinal products as a highly safe solution and can easily generate visible smoke because of the low boiling point and liability of vaporisation. Meanwhile, propylene glycol has high vapour pressure, and thus is liable to volatilise in the oral cavity. Because of this, propylene glycol may create an atmosphere in which components inhibiting smoke flavor contained in aerosol are liable to volatilise, thereby more easily causing an issue of "smoke flavor inhibition". Consequently, characteristics of the tobacco filler of the present invention may be more efficiently exploited.

[0028] The tobacco filler of the present invention contains liquid that generates aerosol at generally 20% by mass or more, preferably 30% by mass or more and more preferably 40% by mass or more, and generally 80% by mass or less, preferably 70% by mass or less and more preferably 60% by mass or less. The content within the above range allows easier suppression of a reduction in the amount of evaporated smoke flavor components and more effective suppression of "smoke flavor inhibition".

[0029] The tobacco filler of the present invention is characterised in that the tobacco filler contains an acid that has a first acid dissociation constant of 4.0 to 6.0 inclusive and a boiling point of 366°C to 600°C inclusive (hereinafter also abbreviated as "acid"). Specific acids are not particularly limited as far as the acids fulfil the conditions and well-known acids may be appropriately used according to the purpose. Specific examples are hereinafter described.

[0030] The acid has a first acid dissociation constant of preferably 4.5 or more and preferably 5.5 or less.

[0031] The acid has a boiling point of preferably 400°C or higher and preferably 560°C or lower.

[0032] The first acid dissociation constant and the boiling point within the above ranges allows more effective suppression of "smoke flavor inhibition".

[0033] Examples of the acid include ascorbic acid, isoascorbic acid, heneicosanoic acid, lignoceric acid, octacosanoic acid, nonadecanoic acid and the like.

[0034] Among others, ascorbic acid and isoascorbic acid are particularly preferred.

[0035] The acid as described above allows easier suppression of a reduction in the amount of evaporated smoke flavor components and more effective suppression of "smoke flavor inhibition".

[0036] The tobacco filler of the present invention contains the acid at generally 0.25% by mass or more and preferably 1% by mass or more and generally 10% by mass or less. The content within the above range allows easier suppression of a reduction in the amount of evaporated smoke flavor components and more effective suppression of "smoke flavor inhibition".

[0037] The tobacco filler of the present invention contains shredded tobacco, and liquid that generates aerosol. Generally, components contained in shredded tobacco such as water elute in the liquid that generates aerosol, and thus it can be regarded that the tobacco filler of the present invention also contains water.

[0038] The tobacco filler of the present invention contains water at generally 5% by mass or more, preferably 7.5% by mass or more and more preferably 10% by mass or more, and generally 30% by mass or less, preferably 25% by mass or less and more preferably 20% by mass or less of the whole tobacco filler. The content within the above range allows easier suppression of a reduction in the amount of evaporated smoke flavor components and more effective suppression of "smoke flavor inhibition".

Examples

[0039] The present invention is more specifically described by way of Examples. The present invention may be appropriately modified within the scope of the present invention.

<Examples 1 to 6, Comparative Examples 1 to 21: Effect by first acid dissociation constant and boiling point of acids>

[0040] To shredded flue-cured tobacco (produced in Japan, 100 mg), 100 mg of liquid obtained by mixing propylene glycol and glycerol at 1:1 (weight ratio) was added and the acid indicated in Table 1 was added at 5% by mass in terms of the mass of the whole composition, thereby preparing a sample. Shredded tobacco used was obtained by grinding tobacco in a household mixer followed by shaking on a sieve (AS200, manufactured by Retsch Technology GmbH) under the condition: amplitude-1.5 mm/"g" for 2 minutes, and had a mesh size of 0.5 mm or less.

[0041] The prepared sample was placed so as to attach to a pod dedicated to a product with the product name "Ploom®" marketed by Japan Tobacco Inc., and stored for 2 days or more under the conditions of 22°C and humidity of 60%. It was verified that the heating temperature (during stable operation) of shredded tobacco using Ploom was about 160°C to 170°C by preliminary measurement using a thermocouple.

[0042] In smoking test, the prepared pod was attached to Ploom and the amount of evaporated smoke flavor components during initial 10 puffs was measured under specified smoking conditions (55 ml/2s, smoking interval: 30s) on a smoking machine (Borgwaldt, RM-26). In the present experiment, the indicative component selected was nicotine, which can be easily measured as a smoke flavor component. Smoke was trapped with a Cambridge filter pad, the smoke trapped on the filter was extracted in a methanol solvent while shaking for 40 minutes and nicotine was assayed by GC-FID.

[0043] The sensory evaluation of the smoking test was carried out by four evaluators and "smoke flavor inhibition" and "chemical odor" as the taste of acid were evaluated on a 7-grade scale of 1 to 7. "Chemical odor" means the smell of chemicals and is unwanted odor during smoking by human beings. The higher the score is, the stronger the chemical odor is. In the results of the present Examples, it was regarded that the region in which the evaluated scores on smoke flavor inhibition and chemical odor were 2 or less was a region with an excellent effect in which evaluators could sufficiently recognize the difference. The evaluation was made and written down according to the sensation during smoking.

[0044] The physical values of acids, the amount of evaporated smoke flavor component and the results of the sensory test are respectively indicated in Table 1.

[Table 1]

[0045]

Table 1. Type and physical values of acids and evaluation results

	Type of acid, physical values				Smoke flavor inhibition	Chemical odor	Amount of evaporated smoke flavor components (nicotine, in this case) [mg/10 puffs]
	Classification	Name	Boiling Point [°C]	Acid dissociation constant pKa_1			
Comparative Example 1	No addition	No addition	-	-	3.8	1.7	0.25
Comparative Example 2	Inorganic acid	Phosphoric acid	213	1. 97	1.0	2.0	0.04
Comparative Example 3	Aromatic Carboxylic acid	Benzoic acid	249	4.21	4.3	4.2	0.21
Comparative Example 4		Cinnamic acid	300	4.44	3.1	5.3	0.14

(continued)

	Type of acid, physical values				Smoke flavor inhibition	Chemical odor	Amount of evaporated smoke flavor components (nicotine, in this case) [mg/10 puffs]
	Classification	Name	Boiling Point [°C]	Acid dissociation constant pKa_1			
Comparative Example 5	Aliphatic Carboxylic acid	Acetic acid	118	4.76	4.3	4.8	023
Comparative Example 6		Decanoic acid	269	4.90	2.0	6.7	0.23
Comparative Example 7		Lauric acid	299	5.20	2.2	5.8	0.22
Comparative Example 8		Myristic acid	326	≈ 5.00	1.5	6.2	0.23
Comparative Example 9		Palmitic acid	351		1.8	3.0	0.28
Comparative Example 10		Stearic acid	361		2.2	1.5	0.21
Example 1		Heneicosanoic acid	384		2.0	1.3	0.27
Example 2		Lignoceric acid	406		1.7	1.7	0.24
Example 3		Octacosanoic acid	431		2.0	1.5	0.26
Comparative Example 11	Unsaturated Carboxylic acid	Linolenic acid	365		2.8	2.5	0.19
Example 4		Nonadecanoic acid	368		1.9	2.0	0.22
Comparative Example 12		Sorbic acid	228	4.76	4.0	2.8	0.22

(continued)

	Type of acid, physical values				Smoke flavor inhibition	Chemical odor	Amount of evaporated smoke flavor components (nicotine, in this case) [mg/10 puffs]
	Classification	Name	Boiling Point [°C]	Acid dissociation constant pKa_1			
Comparative Example 13	Hydroxy acid	Citric acid	175	3.09	1.7	3.3	0.07
Comparative Example 14		Lactic acid	122	3.86	1.7	2.3	0.11
Comparative Example 15		Oxalic acid	150	1.27	1.3	5.3	0.04
Comparative Example 16		Tartaric acid	399	3.22	2.0	2.8	0.05
Comparative Example 17		Succinic acid	235	4.20	1.3	2.3	0.14
Comparative Example 18		Fumaric acid	290	3.03	1.3	3.5	0.05
Comparative Example 19		Malic acid	322	3.40	2.6	3.7	0.08
Comparative Example 20	Keto acid	Levulinic acid	245	4.44	1.3	3.0	0.23
Comparative Example 21		Pyruvic acid	165	2.50	1.2	3.8	0.17
Example 5	Other	Ascorbic acid	553	4.17	1.3	1.7	0.20
Example 6		Isoascorbic acid	503	4.13	1.5	2.0	0.21

[0046] Fig. 2 indicates a graph illustrating the relationship between the first acid dissociation constant of acids and the amount of evaporated smoke flavor components. From Fig. 2, it resulted that acids having low first acid dissociation constant had low amounts of smoke flavor components, and for most of acids having an acid dissociation constant of 4.0 or more, the amounts of smoke flavor components were equivalent to the amount of smoke flavor components without addition of acid. From this result, it was found that by using an acid having a first acid dissociation constant of 4.0 or more, the amount of evaporated smoke flavor components does not decrease. As most of acids have a first acid dissociation constant or 6.0 or less by taking the pH of acids into account, the ideal range of the first acid dissociation constant is 4.0 to 6.0 inclusive.

[0047] Fig. 3 indicates a graph illustrating the relationship between the boiling point of acids having a first acid dissociation constant of 4.0 to 6.0 inclusive and smoke flavor inhibition. It was found that at a boiling point of 366°C or higher, smoke flavor inhibition could be reduced with almost all acids, and thus the boiling point was important for reduction of smoke flavor inhibition.

[0048] Fig. 4 indicates a graph illustrating the relationship between the boiling point of acids having a first acid dissociation constant of 4.0 to 6.0 inclusive and chemical odor. It was found that chemical odor decreased with acids having a boiling point of 366°C or higher. When the boiling point of acid is too high, the amount of acid released by heating decreases, and thus it is believed that the boiling point is preferably 600°C or lower.

[0049] From the above, under the conditions where the amount of smoke flavor components kept constant, use of an acid that has a first acid dissociation constant of 4.0 to 6.0 inclusive and a boiling point of 366°C to 600°C inclusive had low effects on the taste and flavor and could reduce smoke flavor inhibition.

<Examples 7 to 12: Effect by acid content>

[0050] The test was carried out in the same manner as in previous Examples except that the contents of acids, isoascorbic acid, lignoceric acid and nonadecanoic acid, were changed from 5% by mass in previous Examples to 3% by mass or 1% by mass. In the present evaluation, only an effect on smoke flavor inhibition was focused because the amounts of evaporated smoke flavor components are equivalent.

[Table 2]

[0051]

Table 2. Type and physical values of acids and evaluation results

	Acid name	Content [wt%]	Boiling Point [°C]	Acid Dissociation constant pKa_1	Smoke flavor inhibition
Example 7	Isoascorbic acid	1.00	503	4.13	2.0
Example 8		3.00			1.7
Example 6		5.00			1.5
Example 9	Lignoceric acid	1.00	406	≈ 5.00	2.0
Example 10		3.00			2.0
Example 2		5.00			1.7
Example 11	Nonadecanoic acid	1.00	368		2.0
Example 12		3.00			2.0
Example 4		5.00			1.9

[0052] Fig. 5 indicates a graph illustrating the relationship between the acid content and smoke flavor inhibition. From Fig. 5, it may be observed that even when the content is reduced to 1% by mass, the effect of acid is high. This is merely because a highly effective acid can exhibit the effect at a low content. Because acids such as isoascorbic acid, lignoceric acid and nonadecanoic acid have high boiling points, the acids tend to be evaporated by heating, generate aerosol by condensation and remain in particles, and it is predicted that a high effect is obtained because the acids remain in aerosol even after dilution in the oral cavity during smoking. When the acid content is excessive, characteristics of acid may be noticeable, and thus a suitable content may be 10% by mass or less.

<Examples 13 to 16, Comparative Examples 22 to 25: Effect by liquid that generates aerosol>

[0053] The test was carried out in the same manner as in previous Examples and Comparative Examples except that the liquid that generates aerosol was varied. In the present test, the solvents which were liquids that generate aerosol used were, in addition to propylene glycol, glycerol, diacetin and triethyl citrate (TEC), and the acid used was nonadecanoic acid. The results are shown in Fig. 6. When propylene glycol was used, the highest smoke flavor inhibition was obtained and the smoke flavor inhibition was low for other liquids. This indicates that the liquid that generates aerosol which is likely to exhibit the highest effect is propylene glycol, and the present technology is effective when a whole or a small amount of the liquid contained is propylene glycol.

[Table 3]

[0054]

Table 3. Type and physical values of liquids that generate aerosol and evaluation results

	Liquid	Content [wt%]	Acid	Content [wt%]	Smoke flavor inhibition
Example 13	Propylene glycol	50	Nonadecanoic acid	5 (additional amount)	3.0
Example 14	Glycerol				1.3
Example 15	Diacetin				1.3
Example 16	Triethyl citrate				2.5
Comparative Example 22	Propylene glycol	50	No addition	-	6.0
Comparative Example 23	Glycerol				1.8
Comparative Example 24	Diacetin				1.5
Comparative Example 25	Triethyl citrate				3.5

[Industrial Applicability]

[0055] The tobacco filler of the present invention may fill a non-combustion smoking article for smoking.

Claims

1. A tobacco filler for a non-combustion smoking article comprising a shredded tobacco, and liquid that generates aerosol, wherein
the tobacco filler contains an acid that has a first acid dissociation constant of 4.0 to 6.0 inclusive and a boiling point of 366°C to 600°C inclusive.

2. The tobacco filler according to claim 1, wherein the acid is at least one selected from the group consisting of ascorbic acid, isoascorbic acid, heneicosanoic acid, lignoceric acid, octacosanoic acid and nonadecanoic acid.

3. The tobacco filler according to claim 1 or 2, wherein the tobacco filler containing the acid at 0.25% by mass to 10% by mass inclusive of the whole tobacco filler.

4. The tobacco filler according to any one of claims 1 to 3, wherein the liquid that generates aerosol contains propylene glycol (PG) .

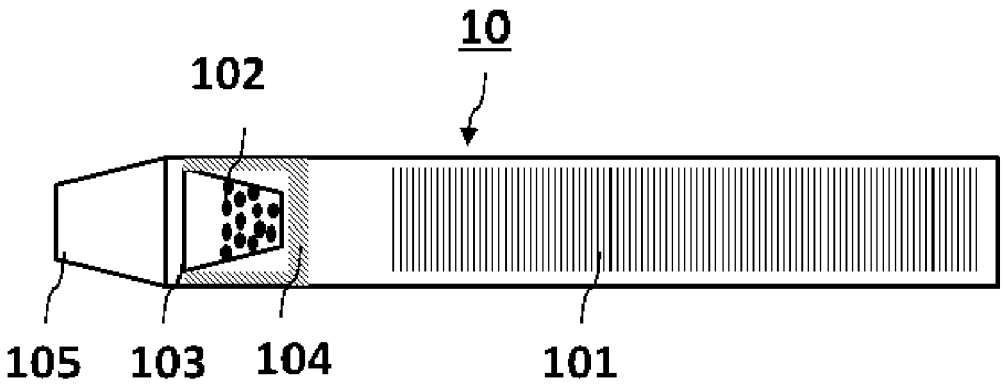
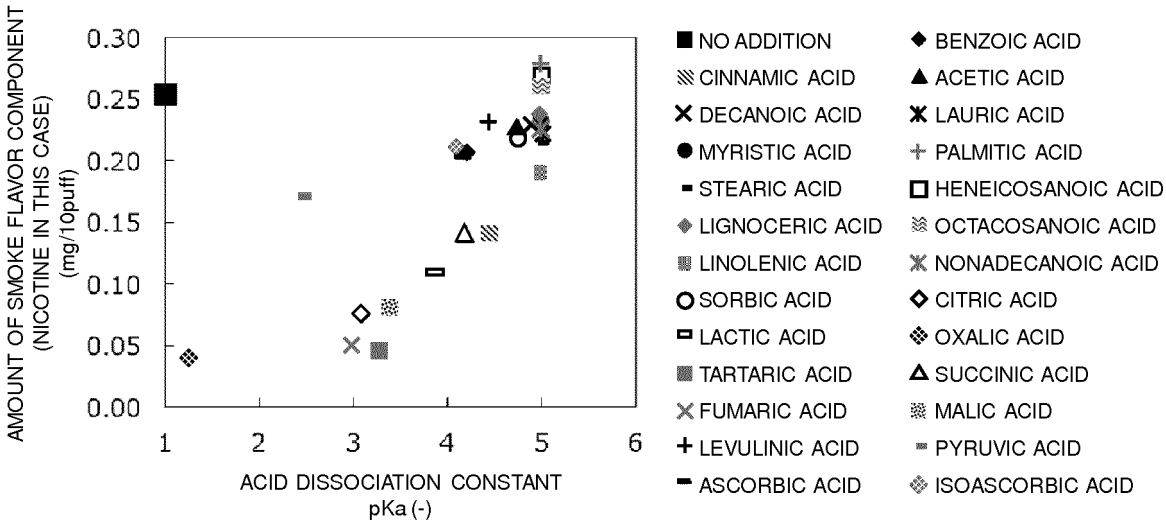


FIG. 1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0.20
0.15
0.10
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0.00
1
2
3
4
5
6
ACID DISSOCIATION CONSTANT pKa (-)
NO ADDITION
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CINNAMIC ACID
ACETIC ACID
DECANOIC ACID
LAURIC ACID
MYRISTIC ACID
PALMITIC ACID
STEARIC ACID
HENEICOSANOIC ACID
LIGNOCERIC ACID
OCTACOSANOIC ACID
LINOLENIC ACID
NONADECANOIC ACID
SORBIC ACID
CITRIC ACID
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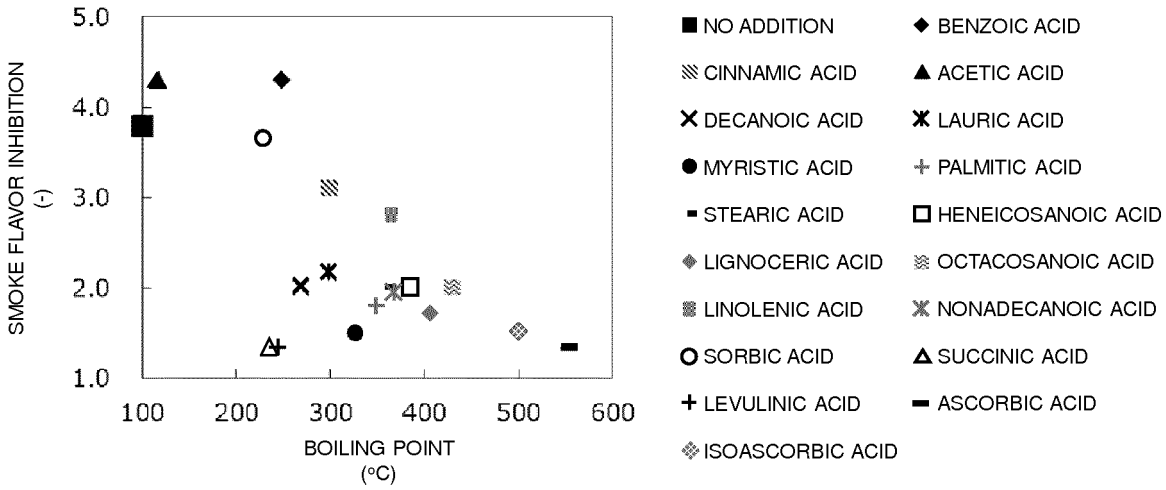
ISOASCORBIC ACID

FIG. 2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CINNAMIC ACID
ACETIC ACID
DECANOIC ACID
LAURIC ACID
MYRISTIC ACID
PALMITIC ACID
STEARIC ACID
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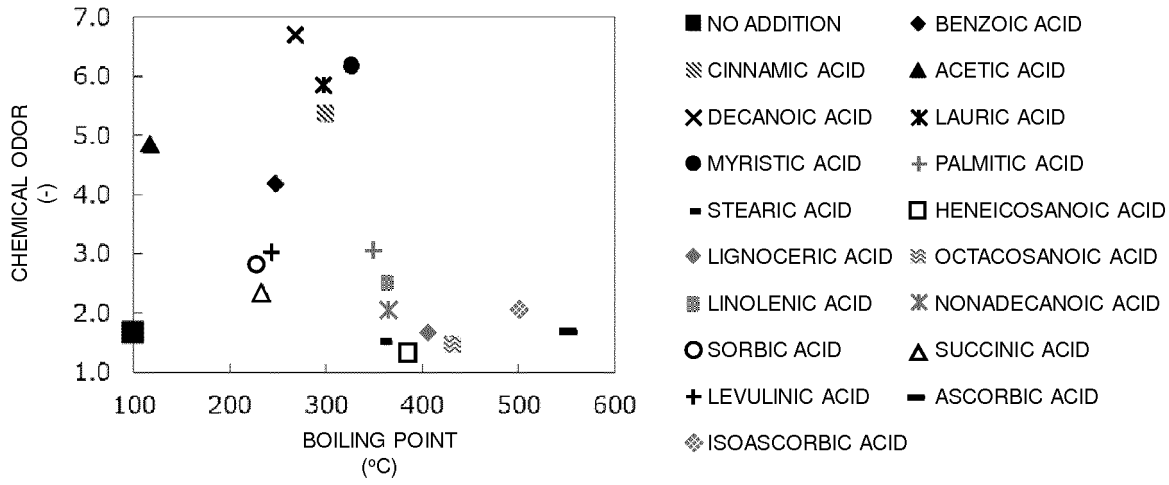
FIG. 3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CINNAMIC ACID
ACETIC ACID
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ASCORBIC ACID
ISOASCORBIC ACID

FIG. 4

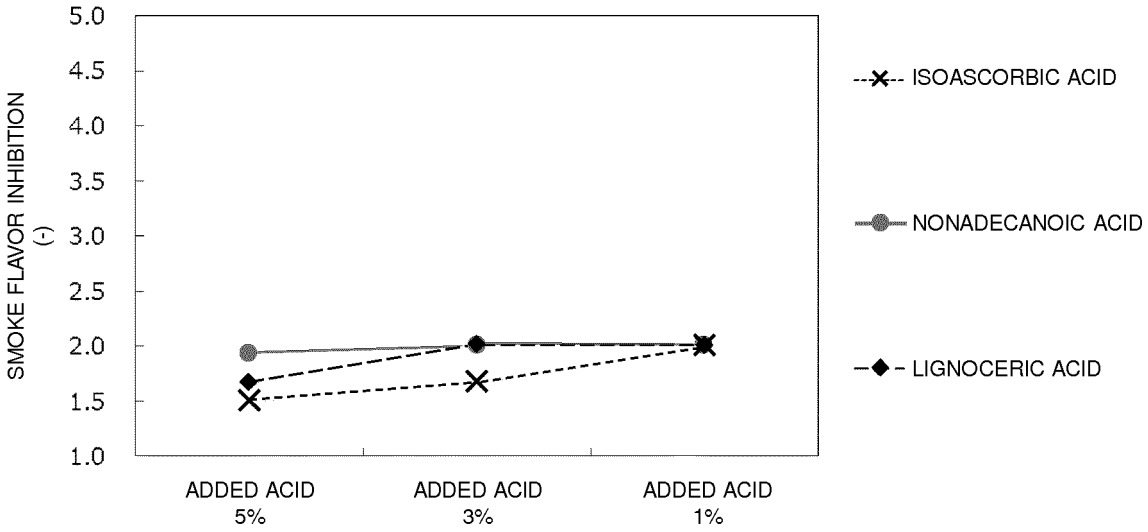
SMOKE FLAVOR INHIBITION (-)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
ADDED ACID 5%
ADDED ACID 3%
ADDED ACID 1%
ISOASCORBIC ACID
NONADECANOIC ACID
LIGNOCERIC ACID

FIG. 5

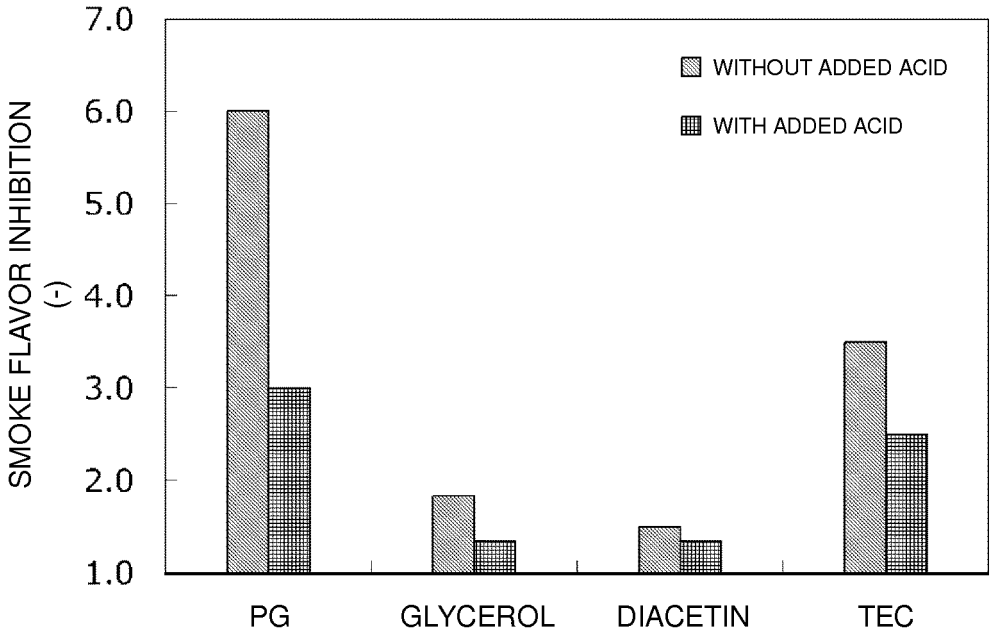
SMOKE FLAVOR INHIBITION (-)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
WITHOUT ADDED ACID
WITH ADDED ACID
PG
GLYCEROL
DIACETIN
TEC

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2016/065717

A. CLASSIFICATION OF SUBJECT MATTER
A24F47/00(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)
A24F47/00

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 1996-2016
Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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	US 2014/0345635 A1 (NJOY, INC.), 27 November 2014 (27.11.2014), entire text; all drawings & WO 2014/190079 A2	1-4
Y	US 2015/0344456 A1 (R.J. REYNOLDS TOBACCO CO.), 03 December 2015 (03.12.2015), paragraphs [0013] to [0014], [0092] to [0104] & WO 2015/183801 A1	1-4
A	US 2014/0345631 A1 (PLOOM, INC.), 27 November 2014 (27.11.2014), entire text; all drawings & WO 2014/182736 A1 & EP 2993999 A & CN 105263345 A & KR 10-2016-0004298 A	1

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

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 July 2016 (14.07.16)	26 July 2016 (26.07.16)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2014190079 A **[0004]**
- US 20150020820 A **[0004]**
- US 20140345631 A **[0004]**