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(54) **CIGARETTE**

(57) A cigarette is provided with a tobacco rod including a tobacco filler. The tobacco filler includes stemmed tobacco leaf shreds, and also includes a metal carboxylate salt selected from a metal lactate salt, a metal tartar-

ate salt, a metal succinate salt, a metal 3-hydroxybutyrate salt, a metal acetate salt and a metal formate salt in an amount of 0.5 to 6.0% by weight of the weight of the stemmed tobacco leaf shreds.

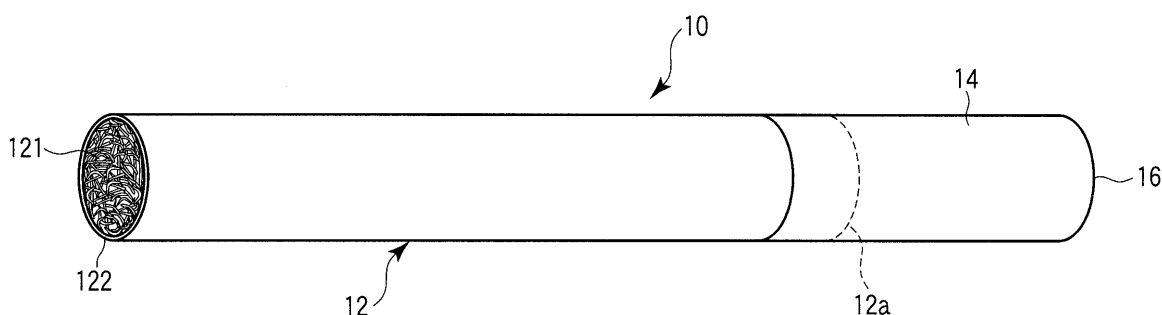


FIG. 1

Description

Technical Field

5 **[0001]** The present invention relates to a cigarette wherein the amount of benzo[a]pyrene in the mainstream smoke produced during smoking is reduced.

Background Art

10 **[0002]** Benzo[a]pyrene in the mainstream smoke produced when smoking a cigarette is a material that is desired to be removed or reduced.

[0003] Many techniques for reducing the amount of benzo[a]pyrene in the cigarette mainstream smoke have been reported. Among them, a technique of effecting a reduction by introducing an additive to tobacco shreds is one of a number of convenient and practicable techniques. For example, International Publication WO 2004/110185, and U.S. Patent Nos. 4,248,251 and 4,055,191 disclose introducing metallic palladium or a palladium salt as a major additive material to tobacco shreds to reduce the amounts of polycyclic aromatic hydrocarbons (PAHs or PCAHs) such as benzopyrene in the cigarette mainstream smoke.

[0004] However, since palladium is an expensive noble metal, like platinum and gold, it is disadvantageous in view of cost. Furthermore, palladium is known as one of the noble metals whose reserves are small, whereas there is much demand for it in the automobile, semiconductor and suchlike industries because of its high catalytic function. Thus, palladium is disadvantageous also in view of procurement.

[0005] In contrast, a metal carboxylate salt has been used aiming at reducing the amount of carbon monoxide in the cigarette mainstream smoke. For example, U.S. Patent No. 4,489,739 discloses a tobacco composition comprising an alkali metal salt of a carboxylic acid in an amount of 6.5 to 20% in order to reduce the amount of carbon monoxide produced. Jpn. Pat. Appln. KOKAI Publication No. 2006-187260 discloses that an organic alkali metal salt and an inorganic alkali metal salt are incorporated into tobacco shreds in specific amounts in order to reduce the amount of carbon monoxide in the cigarette mainstream smoke.

[0006] However, a technique for reducing the amount of benzo[a]pyrene in the cigarette mainstream smoke using a metal carboxylate salt has not been found in the prior art.

Disclosure of Invention

Technical Problem

35 **[0007]** An object of the present invention is to provide a cigarette wherein the amount of benzo[a]pyrene in the mainstream smoke produced during smoking is reduced.

Solution to Problem

40 **[0008]** The present inventors have conducted extensive studies on a material that is effective for reducing the amount of benzo[a]pyrene in the cigarette mainstream smoke, and found that metal salts of lactic acid, tartaric acid, succinic acid, 3-hydroxybutyric acid, acetic acid and formic acid each selectively reduces the amount of benzo[a]pyrene in the cigarette mainstream smoke.

[0009] According to the present invention, there is provided a cigarette comprising a tobacco rod comprising a tobacco filler, wherein the tobacco filler comprises stemmed tobacco leaf shreds, and also contains a metal carboxylate salt selected from the group consisting of a metal lactate salt, a tartarate salt, a metal succinate salt, a metal 3-hydroxybutyrate salt, a metal acetate salt and a metal formate salt in an amount of 0.5 to 6.0% by weight of the weight of the stemmed tobacco leaf shreds.

Advantageous Effects of Invention

[0010] The metal carboxylate salt used in the present invention can selectively reduce benzo[a]pyrene in the cigarette mainstream smoke. Furthermore, since the metal carboxylate salt used in the present invention is generally more inexpensive than palladium, a cigarette that produces the mainstream smoke in which benzo[a]pyrene has been reduced can be provided more inexpensively.

Brief Description of Drawings

[0011] FIG. 1 is an enlarged perspective view schematically illustrating a cigarette according to an embodiment of the present invention.

Description of Embodiments

[0012] The present invention will explained in more detail below.

[0013] A cigarette of the present invention comprises a tobacco rod comprising a tobacco filler. The tobacco filler comprises stemmed tobacco leaf shreds, and also comprises a metal carboxylate salt in order to reduce the amount of benzo[a]pyrene in the cigarette mainstream smoke. In general, a tobacco filler used for a cigarette includes stemmed tobacco leaf shreds (cut lamina), tobacco stem shreds, reconstituted tobacco shreds, or a mixture thereof. The stemmed tobacco leaf shreds may be expanded or not expanded. In the present invention, the tobacco filler comprises a metal carboxylate salt in a specified percentage relative to the weight of the stemmed tobacco leaf shreds which produce benzo[a]pyrene in a relatively large amount. In addition, the expanded stemmed tobacco leaf shreds are tobacco shreds obtained by expanding the tissue of dried and shrunk cut lamina by means of an expanding agent such as carbon dioxide.

[0014] The metal carboxylate salt used in the present invention is selected from the group consisting of a metal lactate salt, a metal tartrate salt, a metal succinate salt, a metal 3-hydroxybutyrate salt, a metal acetate salt and a metal formate salt. The metal carboxylate salt is preferably an alkali metal salt, more preferably a potassium salt or sodium salt.

[0015] The metal carboxylate salt used in the present invention is incorporated in the tobacco filler in an amount of 0.5 to 6.0% by weight of the weight of the stemmed tobacco leaf shreds. When the amount of the metal carboxylate salt is lower than 0.5% by weight, benzo[a]pyrene tends to not be reduced significantly. The metal carboxylate salt sufficiently exhibits its effect at the amount up to 6.0% by weight. However, even the metal carboxylate salt is added by an amount exceeding 6% by weight relative to the stemmed tobacco leaf shreds, the effect of reducing benzopyrene is not increased significantly in comparison with the case when added in an amount of 6.0%, and it is not preferable since the inhaled fragrance of the cigarette tends to decrease. It is preferable that the metal carboxylate salt be added in an amount of 2 to 6.0% by weight of the weight of the stemmed tobacco leaf shreds.

[0016] As mentioned above, the tobacco filler used in the present invention comprises expanded and/or non-expanded stemmed tobacco leaf shreds (tobacco mesophyll shreds), and may further comprise tobacco stem shreds, reconstituted tobacco shreds, or a mixture of any of these. Namely, the tobacco filler may comprise or consist of the non-expanded stemmed tobacco leaf shreds, may comprise or consist of the expanded stemmed tobacco shreds, may comprise or consist of a mixture of the non-expanded stemmed tobacco leaf shreds and the expanded stemmed tobacco leaf shreds, may comprise or consist of a mixture of the non-expanded stemmed tobacco leaf shreds and the tobacco stem shreds and/or reconstituted tobacco shreds, may comprise or consist of a mixture of the expanded stemmed tobacco shreds and tobacco stem shreds and/or reconstituted tobacco shreds, or may comprise or consist of a mixture of the non-expanded stemmed tobacco leaf shreds and the expanded stemmed tobacco leaf shreds and the tobacco stem shreds and/or reconstituted tobacco shreds. When the tobacco filler comprises, in addition to the stemmed tobacco leaf shreds, a tobacco material (for example, stem shreds, reconstituted tobacco shreds, or a mixture thereof) other than the stemmed tobacco leaf shreds, the stemmed tobacco leaf shreds may generally account for 70% or more of the weight of the tobacco filler. The tobacco variety used includes flue-cured tobacco, burley tobacco and the like.

[0017] When the tobacco filler is a mixture of the stemmed tobacco leaf shreds and other tobacco material (for example, tobacco stem shreds and/or reconstituted tobacco shreds), the metal carboxylate salt may be added to the stemmed tobacco leaf shreds in advance, which may be mixed with the other tobacco material. For example, when the tobacco filler is a blended tobacco constituted by non-expanded stemmed tobacco leaf shreds, expanded stemmed tobacco leaf shreds and tobacco stem shreds of flue-cured tobacco and/or burley tobacco, it is preferable that the metal carboxylate salt be added in advance to the mixture of the non-expanded stemmed leaf shreds and the expanded stemmed leaf shreds in an amount of 0.5 to 6.0% by weight, preferably 2 to 6% by weight, of the total weight of the non-expanded stemmed leaf shreds and the expanded stemmed leaf shreds, and the tobacco stem shreds and/or the reconstituted tobacco shreds are incorporated into the obtained mixture. By doing so, the effect of reducing benzo[a]pyrene is further improved. In this case, it is not necessary to add the metal carboxylate salt to the tobacco stem shreds in advance. Furthermore, in the present invention, shreds of a tobacco sheet that is formed by mixing stemmed tobacco leaf shreds, a tobacco fine powder, a binder, an aerosol-forming material and the like in a solvent to form a slurry, and subjecting the slurry to papermaking and rolling may also be used as the tobacco filler. In this case, the metal carboxylate salt is added to the tobacco sheet shreds in an amount of 0.5 to 6.0% by weight, preferably 2 to 6% by weight, of the weight of the stemmed tobacco leaf shreds used.

[0018] A flavorant may be added to the tobacco filler, and for example, menthol may be added.

[0019] The metal carboxylate salt may be included in the tobacco filler by any suitable technique. For example, an aqueous solution of the metal carboxylate salt may be sprayed on the stemmed tobacco leaf shreds. The tobacco filler

comprising the stemmed tobacco leaf shreds to which the metal carboxylate salt has been added is subjected to humidity conditioning, and thereafter subjected to the preparation of cigarettes. The cigarette of the present invention can be prepared by a conventional method for the preparation of cigarettes, except that the tobacco filler comprising the carboxylic acid is used as a tobacco filler.

[0020] The tobacco filler comprising the metal carboxylate salt of the present invention is wrapped in a cigarette paper in a rod shape (generally, columnar). As the cigarette paper, any cigarette paper based on pulp such as flax pulp that is used for conventional cigarettes may be used. The cigarette paper may comprise a conventionally-used filler material such as a carbonate such as calcium carbonate or potassium carbonate, or a hydroxide such as calcium hydroxide or magnesium hydroxide, in an amount of 2 g/m² or more. The filler may be included in the cigarette paper in an amount of 2 to 8 g/m². Furthermore, the cigarette paper generally has a basis weight of 22 g/m² or more. The basis weight is generally 80 g/m² or less. The intrinsic air permeability of the cigarette paper is generally from 10 to 60 Coresta units.

[0021] Furthermore, a burn-adjusting agent such as citric acid or a salt thereof (sodium salt, potassium salt) can be added to the cigarette paper. Generally, when the burn-adjusting agent is used, it is added in an amount of 2% by weight or less to the cigarette paper.

[0022] The present invention may have a structure and appearance similar to those of a conventional cigarette.

[0023] FIG. 1 is an enlarged perspective view schematically illustrating a cigarette according to an embodiment of the present invention. In FIG. 1, the cigarette is not to scale.

[0024] The cigarette 10 illustrated in FIG. 1 comprises a cigarette rod 12 comprising a tobacco rod (a columnar rod in FIG. 1) 121 comprising the tobacco filler comprising the metal carboxylate salt of the present invention and a cigarette paper 122 wrapping the tobacco rod. The cigarette rod 12 generally has a circumference of 17 to 26 mm, and a length of 49 to 90 mm. A conventional tobacco filter 16 can be attached to the proximal end 12a (i.e., the downstream end of the direction of smoke inhalation) of the cigarette rod 12 by a tipping paper 14. Ventilation holes (not illustrated) can be formed in the tipping paper 14 in the circumferential direction of the cigarette in order to draw in external air to dilute the mainstream smoke from the cigarette.

[0025] The cigarette of the present invention can selectively reduce benzo[a]pyrene in the mainstream smoke.

Examples

[0026] The present invention will now be explained in more detail with reference to Examples below.

Examples 1 to 5

[0027] In these Examples, the alkali metal carboxylate salts shown in Table 1 were used as the metal carboxylate salt, and stemmed tobacco leaf shreds of flue-cured tobacco were used as the tobacco filler.

[0028] 2.5 g of the alkali metal carboxylate salt shown in Table 1 was dissolved in 20 mL of ultrapure water, and the solution was sprayed on 50 g of stemmed tobacco leaf shreds of flue-cured tobacco. Thus, the alkali metal carboxylate salt was added to the stemmed tobacco leaf shreds in an amount of 5% of the weight of the stemmed tobacco leaf shreds. The stemmed tobacco leaf shreds to which the alkali metal carboxylate salt had been added was subjected to humidity conditioning in a conditioning room at a room temperature of 22°C under a relative humidity of 60% for 48 hours or more. Using the stemmed tobacco leaf shreds after the humidity conditioning and a conventional cigarette paper, cigarette rods were prepared by hand work. The amount used of the tobacco shreds to which the alkali metal carboxylate salt had been added was 735 mg per cigarette rod, the length of the cigarette rod was 57 mm, and the circumference of the cigarette rod was 25 mm. A tobacco filter (length 27 mm) having a cellulose acetate tow as a filter material was attached to one end of each of these cigarette rods with a tipping paper on which ventilation holes had been formed, whereby cigarettes were obtained.

Comparative Example 1

[0029] A cigarette was prepared in a similar manner by using 700 mg of the same stemmed tobacco leaf shreds of flue-cured tobacco as those used in Examples 1 to 5 except that the alkali metal carboxylate salt had not been added.

Examples 6 to 10

[0030] In these Examples, the alkali metal carboxylate salts as shown in Table 2 were used as the metal carboxylate salt.

[0031] 2.5 g of the alkali metal carboxylate salt as shown in Table 2 was dissolved in 20 mL of ultrapure water, and the solution was sprayed on 50 g of the stemmed tobacco leaf shreds of flue-cured tobacco. Thus, the metal carboxylate was added to the tobacco shreds in an amount of 5% of the weight of the stemmed tobacco leaf shreds. The tobacco shreds to which the alkali metal carboxylate salt had been added was subjected to humidity conditioning in a similar

manner to that of Examples 1 to 5. Cigarettes were prepared in a similar manner to that of Examples 1 to 5, except that the tobacco shreds after this humidity conditioning were used.

Comparative Example 2

[0032] A cigarette was prepared in a similar manner by using 700 mg of the same stemmed tobacco leaf shreds of flue-cured tobacco as those used in Examples 6 to 10 except that the alkali metal carboxylate salt had not been added.

<Measurement of number of puffs of a cigarette, and analyses of tar, nicotine and benzo[a]pyrene in the cigarette mainstream smoke>

A. Collection of particulate matters in the cigarette mainstream smoke, and measurement of number of puffs

[0033] The cellulose acetate tow was removed from the filter of each of the cigarettes prepared in Examples 1 to 10 and Comparative Examples 1 and 2, and the ventilation holes in the tipping paper were occluded with an adhesive tape. Then, the cigarettes were subjected to the following operations.

[0034] The cigarettes were smoked by a 10-channel linear smoking machine (SM 410, manufactured by Cerulean) having a particulate matter-collecting device equipped with a Cambridge filter (the weight thereof was measured in advance) to trap particulate matters in the Cambridge filter. The cigarette had a puff duration of 2 seconds and a puff volume of 35 mL per puff, and a puff interval of 60 seconds. The cigarette was burned over only a length of 49 mm from the tip of the cigarette, and the number of puffs for the cigarette was measured and the average value thereof was calculated. The results are shown in Tables 1 and 2.

B. Analyses of tar and nicotine

[0035] The total weight of the particulate matters was calculated by measuring the weight of the Cambridge filter in which the particulate matters had been collected, and subtracting, from that weight, the weight of the Cambridge filter that had been measured in advance.

[0036] 10 mL of isopropanol (containing quinoline and ethanol as internal standards for analysis) was added to the Cambridge filter, in which the particulate matters had been collected, to extract the particulate matters. For the extract liquid, the amounts of water and nicotine were quantitatively determined by an internal standard method by using a GC-FID/TCD (6890N manufactured by Agilent). The amount of tar was calculated by subtracting the weights of water and nicotine as obtained from the total weight of the particulate matters.

C. Analysis of benzo[a]pyrene

[0037] Benzo[a]pyrene was analyzed by a gas chromatography mass spectroscopy (GC-MS) as described below for Examples 1 to 10 and Comparative Examples 1 and 2, and analyzed by a high-performance liquid chromatography (HPLC) as d below for Examples 11 to 16 and Comparative Examples 3 and 4 as mentioned below.

C-1: GC-MS

[0038] An isopropanol extract liquid of the particulate matters was obtained in a similar manner to that in the analyses of tar and nicotine. An internal standard solution (a methanol solution of deuterated benzo[a]pyrene) and 14 mL of ultrapure water were added to 6 mL of the extract liquid to prepare a test solution. The test solution was loaded on a CH column (MEGA BE-CH, 1GM 6 ML, manufactured by Varian). The column was dried and then eluted with 5 mL of cyclohexane. The eluate was loaded on an Si column (Sep-Pak Vac 3cc [500 mg] Silica Cartridge, manufactured by Waters), and eluted with 5 mL of a mixed solvent of dichloromethane/cyclohexane (1/4). The eluate was concentrated, and quantitatively determined by an internal standard method using a GC-MS (6890N, manufactured by Agilent).

C-2: HPLC

[0039] Cyclohexane was added to the Cambridge filter in which the particulate matters had been collected so that the concentration of the particulate matters became about 1 mg/mL, and extraction was carried out for 30 minutes under shaking. The extract liquid was filtered with a membrane filter of 0.45 μ m, and 8 mL of the filtrate was collected by using a glass syringe to which a solid-phase extraction cartridge (Sep-Pak NH2 plus, manufactured by Waters) had been connected, and recovered through the cartridge. The cartridge used was washed with 7 mL of hexane, and the wash liquid was combined with the recovered filtrate. The combined liquid was dried to give a solid, and the solid was dissolved

again in 1 mL of acetonitrile and subjected to a quantitative analysis of benzo[a]pyrene by an absolute calibration method using an HPLC-FLD (series 1000, manufactured by Hewlett Packard).

[0040] The results of these analyses are shown in Tables 1 and 2.

Table 1

	Alkali metal carboxylate salt	Puff number	Tar	Nicotine	Benzo[a]pyrene	
			mg/cigarette	mg/cigarette	ng/cigarette	%a)
Comp. Ex. 1	-	7.8	29.3	3.35	22.1	
Ex. 1	Potassium lactate	8.2	28.9	3.21	17.4	-21
Ex. 2	Sodium lactate	8.7	28.8	3.28	17.3	-22
Ex. 3	potassium tartarate	7.7	26.8	2.91	17.4	-21
Ex. 4	Sodium tartarate	8.4	27.1	2.86	16.2	-27
Ex. 5	Sodium succinate	9.6	26.8	3.02	18.8	-15
a) Increase/reduction ratio relative to Comparative Example 1						

Table 2

	Alkali metal carboxylate salt	Puff number	Tar	Nicotine	Benzo[a]pyrene	
			mg/cigarette	mg/cigarette	ng/cigarette	%a)
Comp. Ex. 2	-	7.6	25.1	2.72	13.9	
Ex. 6	Sodium 3-hydroxybutyrate	9.2	27.4	2.72	12.3	-12
Ex. 7	Potassium acetate	8.2	24.6	2.88	11.9	-15
Ex. 8	Sodium acetate	9.3	24.6	2.92	11.6	-17
Ex. 9	Potassium formate	8.5	23.5	2.78	11.1	-20
Ex. 10	Sodium formate	9.3	23.5	2.83	10.7	-23
a) Increase/reduction ratio relative to Comparative Example 2						

[0041] As is apparent from Table 1, the amount of benzo[a]pyrene per cigarette was reduced by 15 to 27% in the cigarettes of Examples 1 to 5 in comparison with that for the cigarette of Comparative Example 1. Furthermore, as shown in Table 2, the amount of benzo[a]pyrene was reduced by 12 to 23% despite of increase in the number of puffs, in comparison with that for the cigarette of Comparative Example 2. In either of the results in Tables 1 and 2, the amounts of tar and nicotine changed little. Therefore, these results show that the metal carboxylate salt used in the present invention selectively reduces the amount of benzo[a]pyrene in cigarette mainstream smoke.

Examples 11 to 16

[0042] In these Examples, the amount of potassium lactate added (weight percentage relative to the weight of the stemmed tobacco leaf shreds; hereinafter simply referred to as "addition amount") was studied.

[0043] As tobacco fillers, blended tobaccos A and B constituted by non-expanded stemmed leaf shreds, expanded stemmed tobacco leaf shreds and stems of flue-cured tobacco and burley tobacco were prepared. Blended tobaccos A and B are different in the kind and incorporation ratio of the tobacco shreds. In the preparation of these blended tobaccos, an aqueous solution of potassium lactate was sprayed with a spray nozzle on 10 kg of a mixture of the non-expanded shreds and expanded shreds while the mixture was stirred in a mixer. After completion of the spraying, the mixture was dried in a large-sized drier, and stems were incorporated to prepare the blended tobacco. The addition amounts of potassium lactate relative to the stemmed tobacco leaf shreds (non-expanded stemmed leaf shreds + expanded stemmed tobacco leaf shreds) are shown in Table 3.

[0044] A cigarette rod with a filter was manufactured by a cigarette making machine using blended tobacco A or B prepared as above in the amount shown in Table 3 (amount per cigarette), using a conventional cigarette paper as a cigarette paper, using a cellulose acetate filter as a filter and using a conventional tipping paper as a tipping paper. The

length of each cigarette rod was 57 mm, the circumference of the cigarette rod was 25 mm, and the length of the filter was 27 mm.

Comparative Examples 3 and 4

[0045] Cigarettes were prepared in the same manner as in Examples 11 to 16 using blended tobaccos A and B, to which potassium lactate had not been added, in the amounts shown in Table 3, respectively.

Table 3:

		Addition amount of potassium lactate	weight of tobacco filler
		% by weight	mg/cigarette
Blended tobacco A	Comp. Ex. 3	0	474
	Ex. 11	0.5	478
	Ex. 12	2.4	487
	Ex. 13	4.8	504
Blended tobacco B	Comp. Ex. 4	0	632
	Ex. 14	1.1	639
	Ex. 15	3.2	650
	Ex. 16	5.3	663

[0046] For the cigarettes prepared in Examples 11 to 16 and Comparative Examples 3 and 4, the number of puffs for a cigarette, and the amounts of tar and nicotine in cigarette mainstream smoke were measured in the same manner as described above, and the amount of benzo[a]pyrene was measured by HPLC. The results are shown in Tables 4 and 5.

Table 4:

	Addition amount of potassium lactate (%)	Puff number	Tar	Nicotine	Benzo[a]pyrene	
			mg/cigarette	mg/cigarette	ng/cigarette	%a)
Comp. Ex. 3	0	5.0	17.3	1.19	14.7	
Ex. 11	0.5	4.9	17.1	1.18	12.2	-17
Ex. 12	2.4	4.9	16.5	1.17	13.0	-12
Ex. 13	4.8	5.0	15.8	1.16	12.3	-16
a) Increase/reduction ratio relative to Comparative Example 3						

Table 5:

	Addition amount of potassium lactate (%)	Puff number	Tar	Nicotine	Benzo [a] pyrene	
			mg/cigarette	mg/cigarette	ng/cigarette	%a)
Comp. Ex. 4	0	6.9	22.2	1.62	19.1	
Ex. 14	1.1	6.7	21.0	1.54	17.8	-7
Ex. 15	3.2	6.9	19.9	1.55	15.5	-19
Ex. 16	5.3	6.9	18.7	1.47	14.5	-24
a) Increase/reduction ratio relative to Comparative Example 4						

[0047] As is apparent from Tables 4 and 5, it was confirmed that the amount of benzo[a]pyrene was reduced in all Examples. However, the effect of reducing benzo[a]pyrene was different according to the kind of blended tobacco when the addition amount of potassium lactate was low. In Examples 11 to 13 which were studied using blended tobacco A,

a reduction ratio of the amount of benzo[a]pyrene of 17% could be obtained even the addition amount of potassium lactate was 0.5%. On the other hand, in Examples 14 to 16 which were studied using blended tobacco B, the reduction ratio of the amount of benzo[a]pyrene was low when the addition amount of potassium lactate was as low as 1.1%. The results suggest that the effect of potassium lactate differs according to the raw materials used and the incorporation ratios thereof.

[0048] From the above results, it is considered that about 0.5 to 6% is necessary as the addition amount of potassium lactate at which the effect of reducing benzo[a]pyrene is exhibited. However, since it is envisaged that the effect of reduction by addition differs according to the raw materials and the incorporate ratio thereof of the blended tobacco, it is more preferable that the addition amount is 2 to 6%.

Claims

1. A cigarette comprising a tobacco rod comprising a tobacco filler, wherein the tobacco filler comprises stemmed tobacco leaf shreds, and also comprises a metal carboxylate salt selected from the group consisting of a metal lactate salt, a metal tartarate salt, a metal succinate salt, a metal 3-hydroxybutyrate salt, a metal acetate salt and a metal formate salt in an amount of 0.5 to 6.0% by weight of the weight of the stemmed tobacco leaf shreds.
2. The cigarette according to claim 1, wherein the tobacco rod is wrapped in a cigarette paper.
3. The cigarette according to claim 2, wherein the metal carboxylate salt is an alkali metal salt.
4. The cigarette according to claim 3, wherein the alkali metal salt is a sodium salt or a potassium salt.
5. The cigarette according to any one of claims 1 to 4, wherein the tobacco filler comprises the metal carboxylate salt in an amount of 2 to 6% by weight of the weight of the stemmed tobacco leaf shreds.
6. The cigarette according to claim 2, wherein the stemmed tobacco leaf shreds comprise a mixture of non-expanded stemmed tobacco leaf shreds and expanded stemmed tobacco leaf shreds.
7. The cigarette according to claim 6, wherein the tobacco filler comprises a blend of non-expanded stemmed tobacco leaf shreds, expanded stemmed tobacco leaf shreds, and tobacco stem shreds and/or reconstituted tobacco shreds.
8. The cigarette according to claim 7, wherein the metal carboxylate salt is added to the non-expanded stemmed tobacco leaf shreds and the expanded stemmed tobacco leaf shreds.
9. The cigarette according to claim 8, wherein the metal carboxylate salt is added to the non-expanded stemmed tobacco leaf shreds and the expanded stemmed tobacco leaf shreds in an amount of 2 to 6% by weight of the total weight of the non-expanded stemmed tobacco leaf shreds and the expanded stemmed tobacco leaf shreds.
10. The cigarette according to any one of claims 6 to 9, wherein the metal carboxylate salt is an alkali metal salt.
11. The cigarette according to claim 10, wherein the alkali metal salt is a sodium salt or a potassium salt.

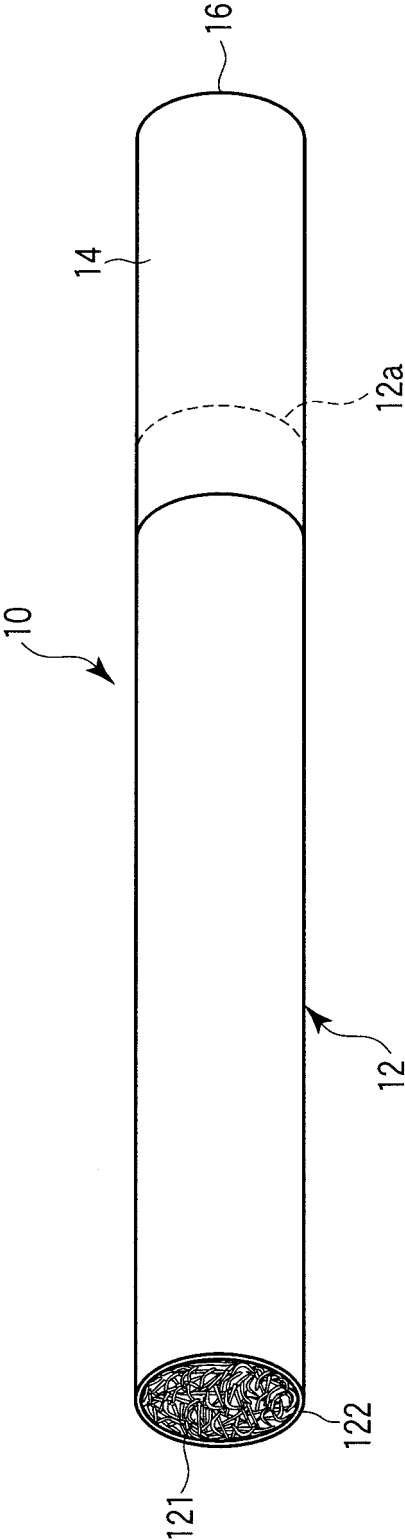


FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/050065

A. CLASSIFICATION OF SUBJECT MATTER

A24B15/28 (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)

A24B15/28

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	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4489739 A (Kimberly-Clark Corp.), 25 December 1984 (25.12.1984), entire text & FR 2527055 A & FR 2527055 A1 & PH 19062 A	1-11
Y	JP 60-48155 B2 (Bayer AG.), 25 October 1985 (25.10.1985), entire text & JP 54-14598 A & US 4296762 A & GB 2000427 A & DE 2729759 A & FR 2395715 A & BE 868608 A & CH 640112 A & NL 7807037 A & SE 7807372 A & FI 782088 A & CA 1097901 A & DK 299378 A & IT 1105374 A & IT 1105374 B & IT 7850094 A0	1-11

☒ 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
05 April, 2010 (05.04.10)Date of mailing of the international search report
13 April, 2010 (13.04.10)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/050065

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

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