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(54) **TOBACCO FILLER AND CIGARETTE**

(57) A tobacco filler comprises a mixture of a first smoking material and a second smoking material. The first smoking material contains a base smoking material and a phosphoric acid-based compound added to the base smoking material, in which the phosphoric acid-based compound is added to the base smoking material such that the amount of phosphoric acid-based com-

pound is about 2 to about 5% of the weight of the base smoking material. The second smoking material is consisting of a material to which no phosphoric acid-based compound is added. The first smoking material accounts for 20 to 60% by weight of the above mixture and the second smoking material accounts for 80 to 40% by weight of the above mixture.

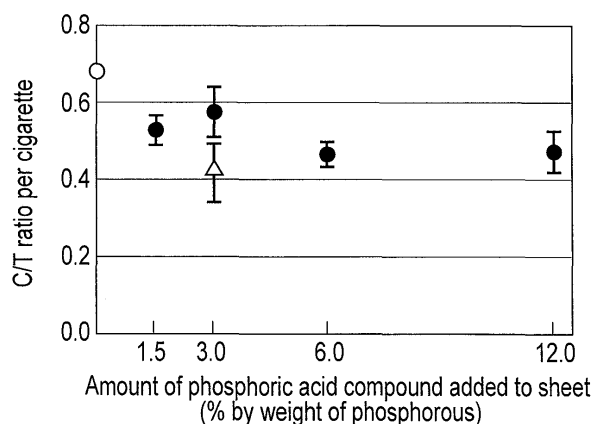


FIG. 4

Description

Technical Field

5 **[0001]** The present invention relates to a tobacco filler and a cigarette.

Background Art

10 **[0002]** When a cigarette is ignited and smoked, a tobacco filler such as cut tobacco contained in the cigarette is first thermally decomposed to form char, which is then burned by oxidation into ash. It is known that tar is primarily produced when the cigarette is thermally decomposed and carbon monoxide (CO) is primarily produced when the char is burned by oxidation.

15 **[0003]** Some technologies have been proposed for reducing the amount of carbon monoxide produced by cigarette during smoking. For example, Patent Literature 1 discloses that an alkali metal salt is added to cut tobacco in a ratio of 2 to 5% by weight to reduce the amount of CO in mainstream smoke of cigarette.

Citation List

Patent Literature

20 **[0004]**

Patent Literature 1: Jpn. Pat. Appln, KOKAI Publication No. 2006-187260.

25 Summary of Invention

Technical Problem

30 **[0005]** However, it has been found by the inventors of the present invention that prior technologies including the technologies described in Patent Literature 1 for reducing the amount of CO in mainstream smoke of cigarette can reduce the amount of CO, but also reduces the amount of tar in mainstream smoke of cigarette at the same time, with the result that these prior technologies cannot significantly reduce the ratio of carbon monoxide to tar (C/T ratio).

35 **[0006]** In light of this, it is an object of the present invention to provide a tobacco filler and a cigarette which enable significant reduction of CO in mainstream smoke of cigarette and also enable significant reduction in C/T ratio at the same time.

Solution to Problem

40 **[0007]** According to the present invention, there is provided a tobacco filler comprising a mixture of a first smoking material and a second smoking material. The first smoking material contains a base smoking material and a phosphoric acid-based compound added to the base smoking material, in which the phosphoric acid-based compound is added to the base smoking material such that the amount of phosphoric acid-based compound is about 2 to about 5% of the weight of the base smoking material. The second smoking material is consisting of a material to which no phosphoric acid-based compound is added. The first smoking material accounts for 20 to 60% by weight of the above mixture and
45 the second smoking material accounts for 80 to 40% by weight of the above mixture.

Tobacco filler

Advantageous Effects of Invention

50 **[0008]** The present invention provides a tobacco filler and a cigarette which can significantly reduce CO contained in mainstream smoke of cigarette and can significantly reduce the C/T ratio at the same time.

Brief Description of Drawings

55 **[0009]**

FIG. 1 is a bar graph showing the amounts of tar and CO produced of smoking materials produced in Example 1,

which will be explained later;

FIG. 2 is a bar graph showing the amounts of tar and CO produced of cigarettes produced in Example 2, which will be explained later;

FIG. 3 is a bar graph showing the amounts of tar and CO produced of cigarettes produced in Example 4, which will be explained later;

FIG. 4 is a bar graph showing the C/T ratio of the mainstream smoke of cigarettes produced in Example 5, which will be explained later; and

FIG. 5 is a bar graph showing the C/T ratio of the mainstream smoke of cigarettes produced in Example 6, which will be explained later.

Description of Embodiments

[0010] Various embodiments of the present invention will be explained.

[0011] A tobacco filler according to the present invention includes a first smoking material containing a base smoking material and a phosphoric acid-based compound added to a specified amount to the base smoking material and a second smoking material constituted of a smoking material to which no phosphoric acid-based compound is added, wherein the first and second smoking materials are blended in a specified ratio.

[0012] The base smoking material to which a phosphoric acid-based compound is added to provide the first smoking material contains one or more components of tobacco fillers constituting a tobacco rod of a usual cigarette. Examples of such a component include shreds or fine powder of stemmed leaf of tobacco, shreds of midrib of tobacco, and shreds of reconstituted tobacco sheet.

[0013] The shreds of stemmed leaf of tobacco may be swollen or not swollen.

[0014] The reconstituted tobacco sheet is itself well-known and classified by production method into a rolled sheet, slurry-processed sheet, and paper-processed sheet. The rolled sheet can be produced by adding a binder (for example, sodium carboxymethyl cellulose, methyl cellulose, ethyl cellulose, starch, or sodium alginate), and a reinforcing material (opened pulp fibers), and as required, a moisturizing agent (mixture of propylene glycol and corn syrup), water-resistance donating agent (for example, glyoxal), and also, small amount of water to scraps tobacco material (scraps of tobacco leaves, scraps of shreds of stemmed leaf of tobacco, powdered tobacco, and midrib), and by kneading and rolling the mixture (raw mixture) into a sheet-like form by a pair of rollers, followed by drying. The slurry-processed sheet can be produced by adding the above binder and reinforcing agent, and as required, the above moisturizing agent and water-resistance donating agent, and also, a relatively large amount of water to the above scraps of tobacco material to prepare a slurry containing scraps of tobacco material in a relatively high concentration, which is then developed sheet-wise on a support, followed by drying. Moreover, the paper-processed sheet can be produced by extracting a natural tobacco material (for example, tobacco leaves and midrib) with water to obtain a tobacco extract and extraction residue, by beating the extraction residue to fibrillate, and by paper-making the fibrillated residue. The above tobacco extract is concentrated and added to the sheet produced by the above paper-making process.

[0015] The phosphoric acid-based compound is to the base smoking material (for example, tobacco material) such that the amount of phosphorus contained in the phosphoric acid-based compound is about 2 to about 5% of the weight of the base smoking material.

[0016] Examples of the phosphoric acid-based compound include phosphoric acid; alkali metal salts of phosphoric acid such as di-alkali metal hydrogen phosphates (for example, disodium hydrogen phosphate and dipotassium hydrogen phosphate), alkali metal dihydrogen phosphates (for example, sodium dihydrogen phosphate and potassium dihydrogen phosphate), and tri-alkali metal phosphates (for example, trisodium phosphate and tripotassium phosphate); ammonium salts of phosphoric acid such as ammonium dihydrogen phosphate and diammonium hydrogen phosphate (DAP); alkali metal salts of pyrophosphate such as disodium pyrophosphate, tetrasodium pyrophosphate, and tetrapotassium pyrophosphate; and alkali metal salts of tripolyphosphoric acid such as pentasodium tripolyphosphate. DAP is preferable as the phosphoric acid-based compound. The phosphoric acid-based compound may be added to the base smoking material by spraying an aqueous solution containing the phosphoric acid-based compound on the base smoking material.

[0017] The second smoking material to be blended with the first smoking material is a smoking material (for example, tobacco materials) to which no phosphoric acid-based compound is added. Examples of the second smoking material like this include smoking materials constituting tobacco rods of usual cigarettes, and for example, shreds of stemmed leaf of tobacco may be used.

[0018] The first smoking material and second smoking material are blended in an amount of 20 to 60% by weight and 80 to 40% by weight, respectively (total 100%).

[0019] There is no particular limitation to the kind of tobacco material to be used as the base smoking material and the second smoking material, and a flue-cured tobacco, Burley tobacco, and the like may be preferably used.

[0020] To state again, the tobacco filler according to the present invention includes a first smoking material containing a base smoking material and a phosphoric acid-based compound added to the base smoking material in a specified

amount and a second smoking material containing a smoking material added with no phosphoric acid-based compound, wherein the first smoking material and second smoking material are blended in a specified ratio. In the present invention, it is to be noted that the phosphoric acid-based compound is not added such that the amount of phosphorus is from $0.02 \times 0.2 \times 100 (\%) = 0.4\%$ to $0.05 \times 0.6 \times 100 (\%) = 3\%$ in the entire smoking material (tobacco material). In the present

invention, the first and second smoking materials are blended as uniformly as possible.

[0021] Though the tobacco filler of the present invention does not include a smoking material (tobacco material) other than the first and second smoking materials, a perfume creating the smoking taste of tobacco may be added. Such a perfume is well-known in the fields concerned.

[0022] As is confirmed by the following examples, the tobacco filler obtained by blending the first smoking material with the second smoking material does not more significantly reduce the amount of tar produced, but more significantly reduces the amount of CO produced and C/T than a tobacco material added with no phosphoric acid anion. Thus, it may be said that the phosphoric acid-based compound acts as a flame retardant that restrains oxidation combustion of char produced by thermal decomposition though it does not restrain the thermal decomposition of the tobacco material.

[0023] The cigarette of the present invention is provided with a (cylinder-form) cigarette rod containing a rod of the tobacco filler of the present invention and cigarette wrapper that wraps the outer periphery of the tobacco filler rod. The cigarette of the present invention can be produced in the same manner as a usual cigarette except that the tobacco filler of the present invention is used as the tobacco filler. As the cigarette wrapper, usual cigarette wrapper may be used. The cigarette rod usually has a circumferential length of 17 to 26 mm and a length of 49 to 90 mm. The tobacco filler may be filled at a packing density of 130 to 230 mg/cm³. A usual tobacco filter is attached to the base end of the cigarette rod (specifically, the downstream end in the direction of smoking) by tip paper. The tip paper may be provided with ventilation holes drilled in the direction of the periphery of the cigarette to facilitate the introduction of external air to thereby dilute the main-stream smoke of the cigarette.

Examples

[0024] The present invention will be explained by way of examples, which are, however, not intended to be limiting of the present invention.

Example 1

[0025] Water was added to midribs of flue-cured tobacco in an amount ten times that of the midrib, which was heated at 60° with stirring for 1 hour. This mixture was filtered to obtain an extract and an extraction residue. The extract was concentrated by an evaporator. The extraction residue was, on the other hand, beaten to a freeness of 300 to fibrillate the residue. A sheet was manufactured from the obtained fiber by a paper-making process and dried. The areal weight of the dried sheet was 60 g/m². The whole amount of the above concentrated extract was applied to the dried sheet by a size press to obtain a reconstituted tobacco sheet.

[0026] 10 and 20 mL of an aqueous DAP solution having a concentration of 10 wt% were each sprayed to 10 g of each of the reconstituted tobacco sheets and dried to obtain a smoking material sheet to which 10% by weight of DAP (phosphorus = about 2.40% by weight based on the weight of the reconstituted tobacco sheet) was added and a smoking material sheet to which 20% by weight of DAP (phosphorus = about 4.79% by weight based on the weight of the reconstituted tobacco sheet) was added. Both smoking material sheets were respectively cut to obtain two kinds of shreds of smoking materials (first smoking material).

[0027] A quartz tube provided with an air-inflow end and air-outflow end was prepared. A glass fiber filter whose weight was measured in advance was attached to the air-outflow end of the quartz tube and a gas bag was also attached to the filter. 150 mg of each shred of smoking material was filled in the quartz tube and each treating shred of smoking material was heated by infrared rays from the outside of the quartz tube while flowing air at a rate of 1000 mL/min into the quartz tube from the air-inflow end. The temperature rise rate of the smoking material was 1000°C/min and the temperature of the smoking material reached 800°C after 46 seconds. After that, air is made to flow at the above rate for 5 seconds while keeping the temperature of the shreds of smoking material at 800°C and then, the heating was stopped. After the heating was stopped, air was also made to flow at the above rate for 9 seconds. Gas was collected for 60 seconds in this manner to trap granular substances by the glass filter.

[0028] Then, the gas in the gas bag was subjected to gas chromatography (trade name: Micro GC M200H, manufactured by Agilent Technologies, Inc.) to measure the amount of CO. Further, the weight of the filter which trapped granular substances and then, the weight of the filter measured in advance was subtracted from the weight of the filter to calculate the total weight of the granular substances. Next, 10 mL of isopropanol (containing quinoline and ethanol as an internal standard for analysis) was added to the filter with collected granular substances to extract the granular substances. With regard to the extract, GC-FID/TCD (trade name: 6890N, manufactured by Agilent Technologies, Inc.) was used to measure the amounts of water and nicotine by the internal standard method. The calculated weights of water and nicotine

were subtracted from the total weight of the granular substances to calculate the amount of tar.

[0029] The above analysis was also made for the shreds of reconstituted tobacco sheet to which no DAP was added.

[0030] The results are shown in FIG. 1. In FIG. 1, bar graph A shows the results of the shreds of processed smoking material tobacco added with no DAP, bar graph B shows the results of the shreds added with 10% of DAP, and bar graph C shows the results of the shreds added with 20% of DAP.

[0031] As is clear from FIG. 1, the smoking material added with DAP was increased by about 20% in the amount of tar produced but reduced by about 30 to 40% in the amount of CO produced in comparison with the shred of tobacco added with no DAP. It is obvious from these results that if a smoking material added with DAP is blended with a smoking material added with no phosphoric acid-based compound, the amount of CO produced is significantly reduced and, at the same time, the C/T ratio is also significantly reduced.

Example 2

[0032] 20 parts by weight, 40 parts by weight, and 60 parts by weight of shreds of tobacco sheets added with 10% by weight of DAP obtained in Example 1, were mixed with 80 parts by weight, 60 parts by weight, and 40 parts by weight of shreds of reconstituted tobacco sheets added with no DAP, respectively, to prepare three kinds of tobacco fillers. Each tobacco filler was hand-wrapped with a general wrapper to prepare each cigarette. In each cigarette, the amount of tobacco filler was 730 mg, and the length and diameter of the cigarette were 57 and 8 mm, respectively.

[0033] Each cigarette was smoked by a linear smoking tester for smoking 10 cigarettes (trade name: SM410, manufactured by Cerulean Co., Ltd.) equipped with a Cambridge filter (its weight was measured in advance) and a gas bag to collect granular substances on the Cambridge filter and to collect smoke in the gas bag. The puff time was 2 seconds, puff volume was 35 mL per one puff on the cigarette and the interval between puffs was 60 seconds. The cigarette was burned by a length of 49 mm from its end while recording the number of puffs. The amounts of tar and CO produced in tobacco smoke were measured in the same manner as in Example 1 to calculate the amounts of tar and CO per puff.

A cigarette manufactured in the same manner by using only shreds of reconstituted tobacco sheet to which the above DAP was not added was also analyzed in the same manner as above. The results are shown in FIG. 2. In FIG. 2, bar graph A shows the results of the cigarette manufactured using the tobacco filler constituted only of the shreds of tobacco sheet added with no DAP, bar graph B shows the results of the cigarette manufactured using the tobacco filler formulated with 20 parts by weight of the shreds of tobacco sheet added with 10% by weight of DAP, bar graph C shows the results of the cigarette manufactured using the tobacco filler formulated with 40 parts by weight of the shreds of tobacco sheet added with 10% by weight of DAP, and bar graph D shows the results of the cigarette manufactured using the tobacco filler formulated with 60 parts by weight of the shreds of tobacco sheet added with 10% by weight of DAP.

[0034] As is clear from the results of FIG. 2, there is almost no variation in the amount of tar produced per puff though the amount of CO per puff was further reduced with increase in the blending amount of shreds of tobacco added with a phosphoric acid-based compound as compared with the case of using the shreds of tobacco added with no phosphoric acid-based compound (C/T ratio was reduced significantly).

Example 3

[0035] Shreds of reconstituted tobacco sheet were prepared in the same manner as in Example 1 except that phosphoric acid or potassium phosphate having a concentration of 10 wt%, and an aqueous 10 wt% ammonium phosphate solution were respectively used in place of the aqueous DAP solution having a concentration of 10 wt%. Shreds of reconstituted tobacco sheet added with 10% by weight of phosphoric acid (phosphorus = about 3.23% by weight based on the weight of the shreds of reconstituted tobacco sheet), shreds of reconstituted tobacco sheet added with 10% by weight of potassium phosphate (phosphorus = about 2.32% by weight based on the weight of the shreds of reconstituted tobacco sheet), and shreds of reconstituted tobacco sheet added with 10% by weight of ammonium phosphate (phosphorus = about 2.75% by weight based on the weight of the shreds of reconstituted tobacco sheet) were thus obtained. 40 parts by weight of each of the cut tobacco sheets added with a phosphoric acid-based compound was blended with 60 parts by weight of shreds of reconstituted tobacco sheet added with no phosphoric acid-based compound to prepare a tobacco filler. Each tobacco filler was hand-wrapped with a general wrapping paper to prepare each cigarette. The specification of each cigarette was the same as that of Example 2. These cigarettes were analyzed in the same manner as in Example 2. As a result, the amounts of CO and tar per puff and the C/T ratio were those as shown in the following Table 1. The results of a cigarette manufactured using a tobacco filler formulated with 40% of shreds of reconstituted tobacco sheet added with 10% of DAP were also shown together in Table 1.

Table 1

Tobacco filler	Amount of CO produced per puff (mg)	Amount of tar produced per puff (mg)	C/T ratio
Added with no phosphoric acid compound	3.66	3.25	1.13
Formulated with shreds added with phosphoric acid	3.23	3.91	0.83
Formulated with shreds added with potassium phosphate	3.31	3.59	0.92
Formulated with shreds added with ammonium phosphate	2.95	3.49	0.85
Formulated with shreds added with DAP	3.04	3.53	0.86

[0036] As is clear from the results of Table 1, the cigarette manufactured using a tobacco filler containing a smoking material added with a phosphoric acid-based compound was more reduced by 10 to 20% in the amount of CO per puff than the cigarette manufactured using a smoking material added with no phosphoric acid anion. The amount of tar of the cigarette manufactured using a tobacco filler containing a smoking material added with a phosphoric acid-based compound was almost not reduced more than that of the cigarette manufactured using a smoking material added with no phosphoric acid-based compound (namely, the C/T ratio is reduced).

Example 4

[0037] Aqueous solutions containing each of DAP, potassium dihydrogen phosphate, sodium dihydrogen phosphate, dipotassium hydrogen phosphate, disodium hydrogen phosphate, tripotassium phosphate, trisodium phosphate, tetrapotassium pyrophosphate, disodium pyrophosphate, tetrasodium pyrophosphate, and pentasodium tripolyphosphate were prepared. Each solution was added to a reconstituted tobacco sheet prepared in the same manner as in Example 1 such that the amount of phosphorus contained in the phosphoric acid-based compound was 3% of the weight of the shreds of reconstituted tobacco sheet to manufacture 10 types of smoking material sheets added with a phosphoric acid-based compound. Each of these smoking material sheets was cut to obtain 10 types of cut smoking materials added with a phosphoric acid-based compound (first smoking material). 40 parts by weight of each of these cut smoking material added with a phosphoric acid-based compound was blended with 60 parts by weight of midrib of cut flue-cured tobacco leaves to obtain 10 types of tobacco fillers, which were each used to manufacture cigarettes in the same manner as in Example 3. Further, cigarettes were manufactured in the same manner as above except that shreds of reconstituted tobacco sheets added with no phosphoric acid-based compound. These cigarettes were analyzed in the same manner as in Example 2, and as a result, the C/T ratio per cigarette was that shown in FIG. 3. In FIG. 3, bar graph A shows the results of a cigarette manufactured using a tobacco filler added with no phosphoric acid-based compound, bar graph B shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with DAP, bar graph C shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with potassium dihydrogen phosphate, bar graph D shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with sodium dihydrogen phosphate, bar graph E shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with dipotassium hydrogen phosphate, bar graph F shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with disodium hydrogen phosphate, bar graph G shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with tripotassium phosphate, bar graph H shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with trisodium phosphate, bar graph I shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with tetrapotassium pyrophosphate, bar graph J shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with disodium pyrophosphate, bar graph K shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with tetrasodium pyrophosphate, and bar graph L shows the results of a cigarette manufactured using a tobacco filler containing a cut sheet added with pentasodium tripolyphosphate.

[0038] As shown in FIG. 3, the cigarettes (bar graphs B to L) manufactured using tobacco fillers containing smoking materials added with phosphoric acid-based compounds were each more reduced by 5 to 30% in C/T ratio than the cigarettes (bar graph A) using smoking material added with no phosphoric acid-based compound.

Example 5

[0039] Cigarettes were produced and analyzed in the same manner as in Example 4 except that shreds of reconstituted tobacco sheets added with potassium dihydrogen phosphate in amounts of 1.5, 3, 6, and 12% of the weight of the reconstituted tobacco sheet as phosphorus were respectively used. As a result, the C/T ratio per cigarette was as shown in FIG. 4 (each is shown by a black spot). FIG. 4 shows the results (white spot) of a cigarette manufactured using a tobacco filler formulated with 40 parts by weight of shreds of reconstituted tobacco sheet added with no phosphoric acid-based compound and also the results (triangular spot) of a cigarette manufactured using shreds of reconstituted tobacco sheet added with DAP in an amount of 3% of the weight of the reconstituted tobacco sheet.

[0040] As shown in FIG. 4, a tendency was observed wherein the C/T ratio of the cigarette was reduced with increase in the addition amount of a phosphoric acid-based compound.

Example 6

[0041] 10% by weight of DAP was added to shreds of stemmed leaf of flue-cured tobacco in the same manner as in Example 1. With regard to this shreds added with DAP, the amounts of CO and tar produced were measured in the same manner as in Example 1. With regard to the shreds of stemmed leaf of flue-cured tobacco itself (DAP was not added), the same measurement as above was made. The results are shown in FIG. 5. In FIG. 5, bar graph A shows the results of the shreds added with no DAP and bar graph B shows the results of the shreds added with DAP.

[0042] As shown in FIG. 5, the shreds added with DAP was further reduced by about 30% in the amount of CO produced in comparison with the shreds added with no phosphoric acid anion though both shreds were no different in the amount of tar produced. It is obvious from the result that when a smoking material added with DAP is formulated with a smoking material added with no phosphoric acid anion, the amount of CO produced is significantly reduced and, at the same time, the C/T ratio is also significantly reduced.

Claims

1. A tobacco filler comprising a mixture of a first smoking material and a second smoking material, wherein the first smoking material contains a base smoking material and a phosphoric acid-based compound added to the base smoking material, in which the phosphoric acid-based compound is added to the base smoking material such that the amount of phosphorus contained in the phosphoric acid-based compound is about 2 to about 5% of the weight of the base smoking material, the second smoking material is constituted of a smoking material to which no phosphoric acid-based compound is added, and the first smoking material accounts for 20 to 60% by weight in the mixture and the second smoking material accounts for 80 to 40% by weight in the mixture.
2. The tobacco filler according to claim 1, wherein the phosphoric acid-based compound added to the base smoking material is selected from the group consisting of phosphoric acid, an alkali metal salt of phosphoric acid, an ammonium salt of phosphoric acid, an alkali metal salt of pyrophosphoric acid, and an alkali metal salt of tripolyphosphoric acid.
3. The tobacco filler according to claim 1, wherein the phosphoric acid-based compound added to the base smoking material is diammonium hydrogen phosphate.
4. The tobacco filler according to any one of claims 1 to 3, wherein the base smoking material includes shreds of stemmed leaf of tobacco.
5. The tobacco filler according to any one of claims 1 to 4, wherein the smoking material constituting the second smoking material includes shreds of stemmed leaf of tobacco.
6. A cigarette comprising a cigarette rod, the cigarette rod comprising a rod of the tobacco filler according to any one of claims 1 to 5 and a cigarette wrapper wrapped around the outer periphery of the tobacco filler rod.
7. The cigarette according to claim 6 comprising a filter on one end of the cigarette rod.

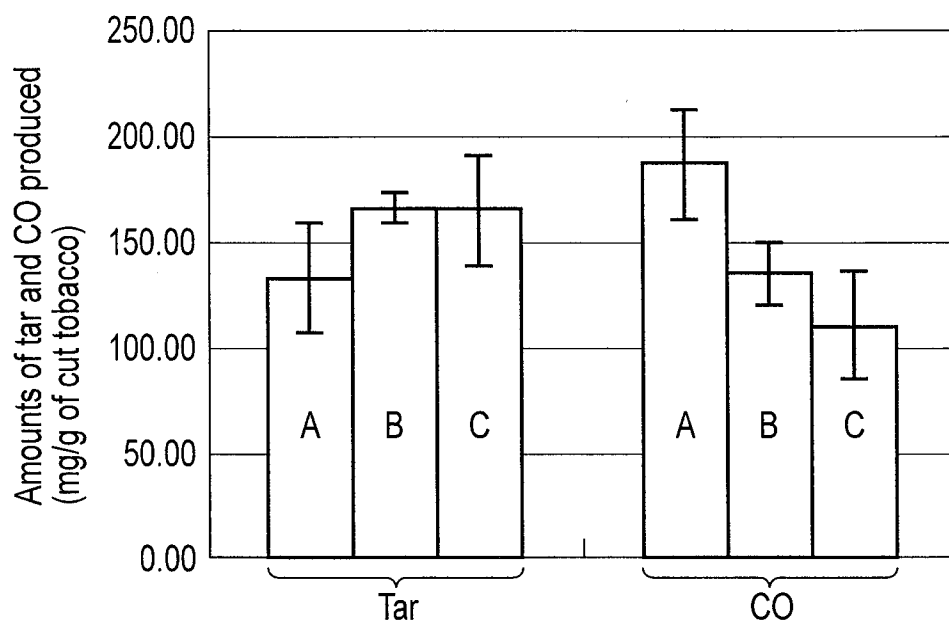


FIG. 1

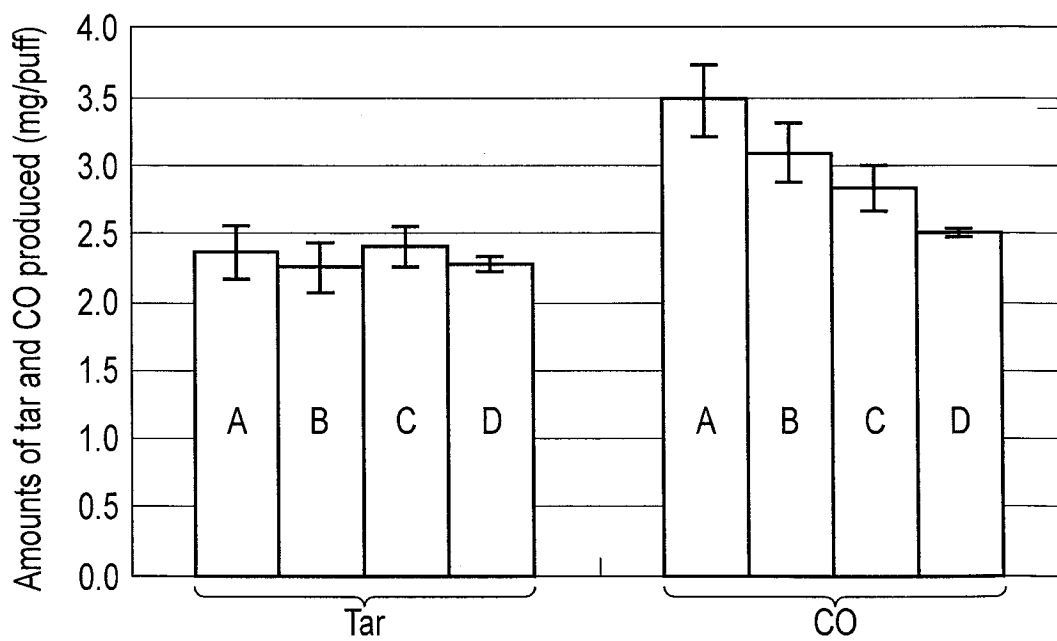


FIG. 2

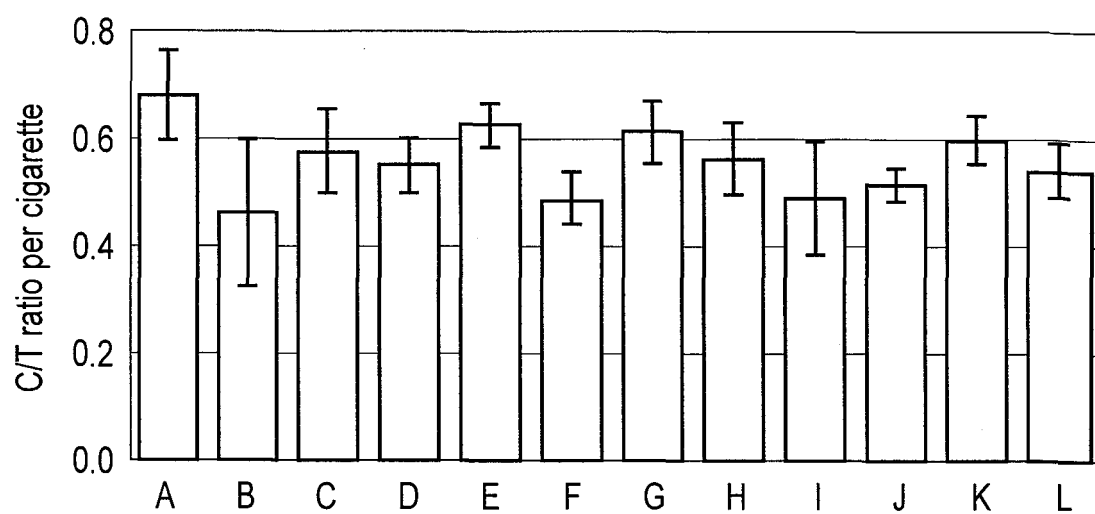


FIG. 3

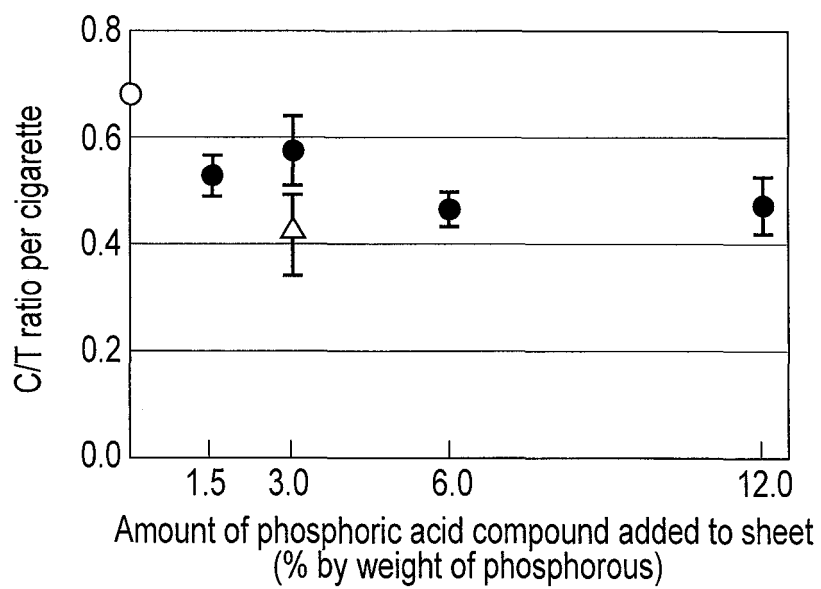


FIG. 4

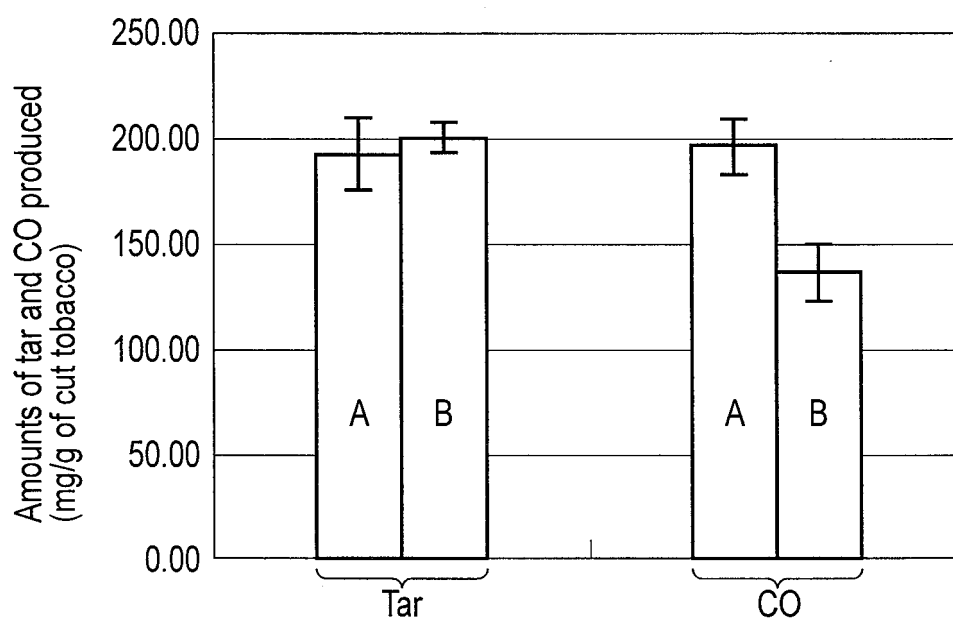


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/053953

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	1996-2011
Kokai Jitsuyo Shinan Koho	1971-2011	Toroku Jitsuyo Shinan Koho	1994-2011

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.
X	JP 2761533 B2 (Brown & Williamson Tobacco Corp.), 04 June 1998 (04.06.1998), entire text; all drawings & JP 8-504598 A & US 5377698 A & US 5765570 A & EP 699034 A & WO 1994/024892 A1 & DE 69401934 C & DE 69401934 D & ES 2101528 T & CA 2160236 A & DK 699034 T & AT 149296 T & PH 31225 A & GR 3023330 T & KR 10-0166409 B	1-7
Y	JP 2002-153251 A (Japan Tobacco Inc.), 28 May 2002 (28.05.2002), entire text; all drawings (Family: none)	4-5

☒ 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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"&" document member of the same patent family

Date of the actual completion of the international search

26 May, 2011 (26.05.11)

Date of mailing of the international search report

07 June, 2011 (07.06.11)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/053953

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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