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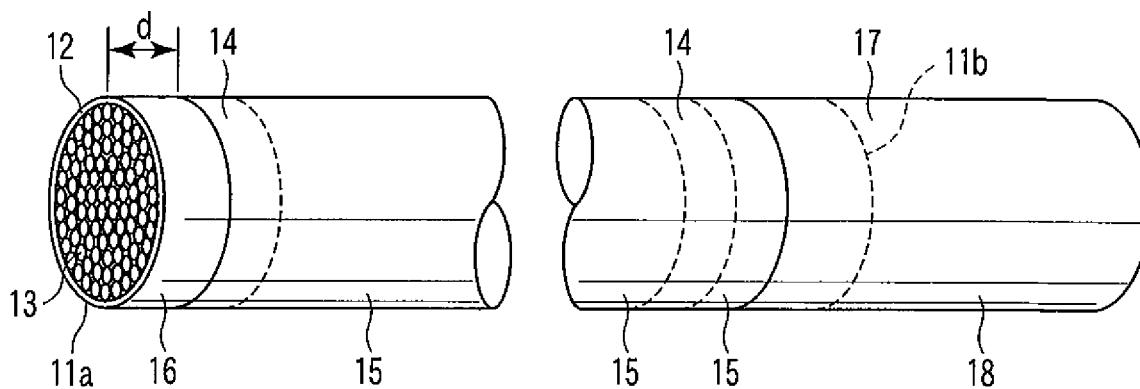
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**(54) LOWLY BURNABLE WRAPPING PAPER FOR CIGARETTE**

(57) A low ignition propensity cigarette paper includes base cigarette paper having a basis weight exceeding 22 g/m<sup>2</sup>, and a plurality of burn limiting areas arranged apart from one another on one surface of the

base cigarette paper. The burn limiting areas are formed by applying sodium alginate having a degree of polymerization of about 500 to about 900 or sodium alginate whose 3% by weight aqueous solution exhibits a viscosity of 19000 cP or more as measured at 25°C



**FIG. 1**

**Description**

## Technical Field

5 [0001] The present invention relates to a low ignition propensity cigarette paper.

## Background Art

10 [0002] A cigarette paper has been proposed which is reduced in the air permeability of base cigarette paper by applying a salt of alginic acid to at least a part of the base cigarette paper such that a cigarette is restrained from causing, for example, a floor to catch fire from the burning butt when the cigarette falls on the floor because of, for example, carelessness by the smoker (see Jpn. Pat. Appln. KOKAI Publication No. 7-300795).

## Disclosure of Invention

15 [0003] In Jpn. Pat. Appln. KOKAI Publication No. 7-300795, the air permeability of the cigarette paper coated with a salt of alginic acid is measured. However, the actual ignition propensities of the cigarette paper are not measured.

20 [0004] The inventors of the present invention have made studies as to the effect of sodium alginate out of salts of alginic acid on the actual ignition propensities of cigarette paper, and as a result, have found that the coating required to exhibit the same ignition propensities differs depending on the degree of polymerization or viscosity of sodium alginate.

25 [0005] Specifically, it is an object of the present invention to provide a cigarette paper exhibiting significantly reduced ignition propensities with a relatively small coating amount.

[0006] According to a first aspect of the present invention, there is provided a low ignition propensity cigarette paper comprising base cigarette paper having a basis weight exceeding 22 g/m<sup>2</sup>, and a plurality of burn limiting areas arranged apart from one another on one surface of the base cigarette paper, wherein the burn limiting areas are formed by applying sodium alginate having a degree of polymerization of about 500 to about 900.

[0007] According to a second aspect of the present invention, there is provided a low ignition propensity cigarette paper comprising base cigarette paper having a basis weight exceeding 22 g/m<sup>2</sup>, and a plurality of burn limiting areas arranged apart from one another on one surface of the base cigarette paper, wherein the burn limiting areas are each formed by applying sodium alginate whose 3% by weight aqueous solution exhibits a viscosity of 19000 cP or more as measured at 25°C.

[0008] According to a third aspect of the present invention, there is provided a low ignition propensity cigarette paper comprising base cigarette paper containing a filler in an amount of 2 g/m<sup>2</sup> or more, and having a basis weight exceeding 22 g/m<sup>2</sup> and an inherent air permeability of 30 to 60 CORESTA units, and a plurality of burn limiting areas arranged apart from one another on one surface of the base cigarette paper, wherein the burn limiting areas are each formed by applying sodium alginate in an amount less than 3 g/m<sup>2</sup>, and the cigarette paper provides a cigarette exhibiting a PFLB value of 0 to 10% when measured according to ASTM E-2187-04.

## Brief Description of Drawings

40 [0009]

45 FIG. 1 is a partially broken schematic perspective view illustrating an example of a cigarette wrapped with a cigarette paper according to one embodiment of the present invention.

## Best Mode for Carrying Out the Invention

[0010] The present invention will be explained in more detail.

[0011] A cigarette paper of the present invention is a paper in which a plurality of burn limiting areas where a burn limiting agent constituted of sodium alginate is applied are provided apart from one another on a base cigarette paper.

[0012] The base cigarette paper is ordinary cigarette paper using, as the base, ordinary pulp such as flax pulp. Such base cigarette paper may contain a generally used filler, including a carbonate such as calcium carbonate or potassium carbonate and a hydroxide such as calcium hydroxide or magnesium hydroxide in an amount of 2 g/m<sup>2</sup> or more. The filler may be contained in an amount of 2 to 8 g/m<sup>2</sup> in the base cigarette paper. The base cigarette paper usually has a basis weight exceeding 22 g/m<sup>2</sup>. The basis weight is usually 80 g/m<sup>2</sup> or less and preferably more than 20 g/m<sup>2</sup> but 28 g/m<sup>2</sup> or less. The inherent air permeability of the base cigarette paper is usually 30 to 60 CORESTA units.

[0013] The base cigarette paper may be added with a burn adjusting agent such as citric acid or its salt (a sodium salt, potassium salt). Generally, the burn adjusting agent, if added, is used in an amount of 2% by weight or less in the

base paper.

[0014] A plurality of burn limiting areas, which are respectively formed by application of a burn limiting agent (sodium alginate), are arranged apart from one another on one surface of the base cigarette paper. When the cigarette paper wraps a tobacco rod, these burn limiting areas may extend in the longitudinal direction of the tobacco rod, so that they are arranged in the form of plural stripes apart from one another in the direction of the circumference of the tobacco rod. Alternatively, these burning areas may extend in the circumferential direction of the tobacco rod, so that they are arranged in the form of plural circular bands apart from one another in the longitudinal direction of the tobacco rod.

[0015] In the present invention, sodium alginate is used as the burn limiting agent. Alginic acid is polyuronic acid consisting of two types of monomers,  $\beta$ -D-mannuronic acid and  $\alpha$ -L-guluronic acid. In an embodiment of the invention, a sodium salt of alginic acid having a degree of polymerization of 500 to 900 is used. In another embodiment of the invention, sodium alginate whose 3% by weight aqueous 3% solution exhibits a viscosity of 19000 cP or more when measured at 25°C is used. The degree of polymerization and viscosity of alginic acid are correlated with each other to some extent. When sodium alginate having such a high degree of polymerization or viscosity is used, the same level of reduced ignition propensities can be attained even in a smaller coating amount than in the case of using other sodium alginate. The above viscosity is usually 40000 cP or less.

[0016] Generally, the total coating amount (dry basis) of the sodium alginate burn limiting agent is less than 3g per m<sup>2</sup> of the coating area. A coating amount of as low as 0.2 to 2 g/m<sup>2</sup> can achieve sufficiently reduced ignition propensities. The cigarette paper according to the invention can provide a cigarette (cigarette in which a tobacco filler is wrapped by the cigarette paper) exhibiting a percent full-length burn (PFLB) of 0 to 10% when measured according to ASTM E-2187-04.

[0017] A cigarette paper according to one embodiment of the invention includes base cigarette paper containing a filler in an amount of 2 g/m<sup>2</sup> or more and having a basis weight exceeding 22 g/m<sup>2</sup> and an inherent air permeability of 30 to 60 CORESTA units, and a plurality of burn limiting areas arranged apart from one another on one surface of the base cigarette paper. The burn limiting area is formed by applying sodium alginate in an amount less than 3 g/m<sup>2</sup>. A cigarette prepared by winding the cigarette paper around wrapping a tobacco filler rod with this cigarette paper exhibits a PFLB value of 0 to 10% when measured according to ASTM E-2187-04.

[0018] The low ignition propensity cigarette paper of the invention is used to wrap a tobacco rod constituted of a tobacco filler such as shredded tobacco, and usually, the surface to which the burn limiting agent is applied is brought into contact with the tobacco rod.

[0019] FIG. 1 illustrates a cigarette wrapped with a cigarette paper to which the burn limiting agent is applied in the form of a circular band.

[0020] Referring to FIG. 1, a cigarette 10 has a tobacco rod 11 constituted of a tobacco filler 13 wrapped with a base cigarette paper 12 in a columnar shape. The tobacco rod 11 usually has a circumferential length of 17 mm to 26 mm and a length of 49 mm to 90 mm. An ordinary filter 18 may be fitted to a proximal end (i.e., the downstream end in the smoking direction) 11b of the tobacco rod 11 by using a tipping paper 17 according to an ordinary method.

[0021] A plurality of circular band areas 14 to which burn limiting agents (sodium alginate) are applied are formed on the base cigarette paper 12 and respectively define burn limiting areas. These circular band burn limiting areas 14 are formed apart from one another in the longitudinal direction of the tobacco rod.

[0022] A usual burn area 15 to which no burn adjusting agent is applied is defined between the adjacent band burn limiting areas 14. Since this area 15 is constituted of the part of the base cigarette paper 12, it can be burned in the usual smoking condition like the base cigarette paper 12 itself. Therefore, the area 15 acts as the usual burn area. The base cigarette paper 12 may be provided with, for example, two or three circular band burn limiting areas 14. Also, the circular band burn limiting area 14 may have a width of 4 mm to 7 mm in the longitudinal direction and its thickness may usually be 0.1 to 5  $\mu$ m. The spacing between the adjacent burn limiting areas 14 is preferably 18 mm to 25 mm.

[0023] In the cigarette illustrated in FIG. 1, no burn limiting agent is applied to an area 16 at a distance d from the distal end of the cigarette. The end part where no burn limiting agent is applied constitutes a usual burn area 16 and can correspond to the area burned by one or two puffs of the usual cigarette. The distance d may be designed to be 10 mm to 25 mm from the distal end 11a of the tobacco rod. It is not particularly necessary to form the burn limiting area 14 on the inside surface of the cigarette paper corresponding to the part of the cigarette paper 12 covered with the tipping paper 17.

[0024] Now, when the cigarette 10 is ignited at the distal end 11a of the cigarette rod 11 and smoked to burn the cigarette, the cigarette can be burned like a usual cigarette in the usual burn area 15 to be able to enjoy a smoking taste. However, in the case of putting the cigarette 10 in the burned state on inflammables such as a carpet, tatami, wood products, fabrics and clothes, the fire is extinguished by the heat absorption of the burn limiting area 14 in a burning direction and inflammables in combination with tobacco shreds contained in the tobacco filler, which suppresses the inflammables to catch fire.

[0025] The present invention will be explained by way of Examples, which are, however, not intended to be limiting of the invention.

[0026] Examples 1 to 6 and Comparative Examples 1 to 9.

[0027] First, the polymerization degree and viscosity of sodium alginate used in the Examples and Comparative Examples are shown in Table 1 below. All the sodium alginates used are manufactured by KIMIKA (trademark) Company and sodium alginates identified by ALG-1, ALG-2, ALG-3, ALG-4 and ALG-5 are available under the tradenames of ULV, IL-2, I-1, I-5 and I-S, respectively.

[0028] The viscosities shown in Table 1 are results when 200g of a 3% by weight aqueous sodium alginate solution was placed in a 200 mL or 300 mL beaker, which was then placed in a constant-temperature water bath, the aqueous solution was kept at  $25 \pm 0.5^{\circ}\text{C}$ , the solution was stirred slowly with a glass rod for about one minute so as not to introduce air bubbles thereinto and was then allowed to stand for 10 minutes, followed by measuring the viscosity of the solution by a B-type viscometer.

[0029] The 3% by weight aqueous sodium alginate solution was applied to (printed on) base cigarette paper (width: 27 mm, length: 1.500m) having a specification as shown in Table 2 so as to have a fixed width of 7 mm in the longitudinal direction in a stripe form at fixed intervals of 20 mm by using a direct gravure system, thereby forming a total of 56 burn limiting agent coating areas. With regard to the obtained cigarette paper, the total coating amount of sodium alginate was measured using the following method. The results are shown also in Table 2. As shown in Table 2, the cigarette papers obtained in Examples 1 to 6 had the coating amount of the burn limiting agent per  $\text{m}^2$  of the area to which the burn limiting agent (sodium alginate) was applied was 1.5 to 2g. When the coating amount of the burn limiting agent is calculated based on unit area of the cigarette paper, it is 0.39 to 0.52  $\text{g}/\text{m}^2$  because the coating amount should be multiplied by 7/27.

[0030] The obtained cigarette paper was used to wrap a tobacco rod made of American blend shreds (amount of tar in the case of setting no filter: 19 to 20 mg) and the obtained tobacco rod was cut such that the first coating area was located with a band space of 5 mm from the burning tip end of the cigarette. The length of one cigarette was 59 mm and the cigarette had two burn limiting agent coating areas.

[0031] The obtained cigarette was subjected to an ignition propensity test according to ASTM E-2187-04 to measure the PFLB value. The results are shown in Table 2.

<Measurement of the total coating amount of sodium alginate>

[0032] The coating amount of sodium alginate was measured in the following procedures according to "Quantitative analysis method for sodium alginate in foods" described in "Journal of Food Hygiene", vol. 5, pp. 297-302 (1988) without performing defatting, dilute sulfuric acid treatment and deproteinization treatment.

[0033] The cigarette paper (length: 1.500m, width: 27 mm) (about 1.0g) coated with the above burn limiting agent was cut into 5 mm square, added with 40 mL of a 1% by weight aqueous sodium bicarbonate solution, heated at  $60^{\circ}\text{C}$  in a hot bath for 5 minutes and then sufficiently mixed and stirred, followed by centrifugation (3500 rpm, 10 minutes; the same as follows) to obtain a supernatant (extract). The extraction residue was extracted again in the same manner as above to obtain a supernatant (extract) and also, 20 mL of a 1% by weight aqueous sodium bicarbonate solution was added to the extraction residue, which was then sufficiently mixed and stirred to obtain a supernatant (extract). The obtained three extracts were combined and a 1% by weight aqueous sodium bicarbonate solution was added to the mixed extract to be 100 mL, which was used as a test solution.

[0034] 2 mL of a copper-hydrochloric acid solution (8.5M hydrochloric acid containing 0.05% by weight of copper sulfate) and 1 mL of a naphthoresorcinol solution (0.4% by weight aqueous 1,3-dihydroxynaphthalene solution) were added to each of 1 mL of a sodium alginate standard solution (1% by weight aqueous sodium bicarbonate solution containing sodium alginate at a concentration of 0 to 0.2 mg/mL) and 1 mL of the above test solution. Each solution was heated in a boiling water bath for 65 minutes and then cooled in ice water. 4 mL of butyl acetate was added to the solution, which was then shaken and centrifuged.

[0035] 1 mL of the upper layer of the solution after the centrifugation was collected, and diluted with the addition of 3 mL of butyl acetate, and colorimetric quantitative determination at 566 nm was conducted, thereby calculating the total coating amount. [Table 1]

Table 1:

Identification symbol of sodium alginate	Polymerization degree of alginic acid (Number of monomers)	Viscosity (cP)
ALG-1	30-180	900
ALG-2	250-400	4700
ALG-3	550-580	19800

(continued)

5	Identification symbol of sodium alginate	Polymerization degree of alginic acid (Number of monomers)	Viscosity (cP)
	ALG-4	650-670	30000

[Table 2]

Table 2:

Examples	Base cigarette paper				Burn limiting agent	Coating amount of burn limiting agent (g/m <sup>2</sup> )	PFLB (%)
	Amount of filler (g/m <sup>2</sup> )	Basis weight (g/m <sup>2</sup> )	Amount of burn adjusint agent (% by weight)	Air permeability (C.U.)			
Comp. Ex. 1	7.7	25.5	0.3	35.2	None	-	100
Comp. Ex. 2	7.7	25.5	0.3	35.2	ALG-1	3.6	0-5
Comp. Ex. 3	7.7	25.5	0.3	35.2	ALG-2	2.8	0-5
Comp. Ex. 4	7.7	25.5	0.3	35.2	ALG-1	3	40-60
Comp. Ex. 5	7.7	25.5	0.3	35.2	ALG-2	2.1	40-60
Comp. Ex. 6	7.7	25.5	0.3	35.2	ALG-1	1.5	80-100
Comp. Ex. 7	7.7	25.5	0.3	35.2	ALG-2	1.5	70-80
Example 1	7.7	25.5	0.3	35.2	ALG-3	2	0-5
Example 2	7.7	25.5	0.3	35.2	ALG-4	1.4	0-5
Example 3	7.7	25.5	0.3	35.2	ALG-3	1.8	40-60
Example 4	7.7	25.5	0.3	35.2	ALG-4	1.2	40-60
Example 5	7.7	25.5	0.3	35.2	ALG-3	1.5	50-70
Example 6	7.7	25.5	0.3	35.2	ALG-4	1.5	0-5

45 [0036] When comparing Comparative Examples 2 and 3 with Examples 1 and 2, it is seen that the amount of the burn limiting agent (sodium alginate) required to attain the same PFLB value (0 to 5) is significantly smaller in the case of Examples 1 and 2. Also, when comparing Comparative Examples 6 and 7 with Examples 5 and 6, it is seen that Example 5 and 6 exhibit a significantly lower PFLB value when the same coating amount (1.5 g/m<sup>2</sup>) is used.

50 [0037] As has been described above, the present invention provides a cigarette paper exhibiting superior reduced ignition propensities.

## Claims

55 1. A low ignition propensity cigarette paper comprising base cigarette paper having a basis weight exceeding 22 g/m<sup>2</sup>, and a plurality of burn limiting areas arranged apart from one another on one surface of the base cigarette paper, wherein the burn limiting areas are formed by applying sodium alginate having a degree of polymerization of about 500 to about 900.

2. The cigarette paper according to claim 1, wherein a basis weight of the base cigarette paper is 80 g/m<sup>2</sup> or less.

3. A low ignition propensity cigarette paper comprising base cigarette paper having a basis weight exceeding 22 g/m<sup>2</sup>, and a plurality of burn limiting areas arranged apart from one another on one surface of the base cigarette paper, wherein the burn limiting areas are each formed by applying sodium alginate whose 3% by weight aqueous solution exhibits a viscosity of 19000 cP or more as measured at 25°C.

4. The cigarette paper according to claim 3, wherein a basis weight of the base cigarette paper is 80 g/m<sup>2</sup> or less and the viscosity of the sodium alginate is 40000 cP or less.

5. A low ignition propensity cigarette paper comprising base cigarette paper containing a filler in an amount of 2 g/m<sup>2</sup> or more, and having a basis weight exceeding 22 g/m<sup>2</sup> and an inherent air permeability of 30 to 60 CORESTA units, and a plurality of burn limiting areas arranged apart from one another on one surface of the base cigarette paper, wherein the burn limiting areas are each formed by applying sodium alginate in an amount less than 3 g/m<sup>2</sup>, and the cigarette paper provides a cigarette exhibiting a PFLB value of 0 to 10% when measured according to ASTM E-2187-04.

6. The cigarette paper according to claim 5, wherein the filler is contained in an amount of 8 g/m<sup>2</sup> or less in the base cigarette paper and the sodium alginate is applied to the base cigarette paper in an amount of 0.2 to 2 g/m<sup>2</sup>.

7. The cigarette paper according to claim 1, wherein the burn limiting areas are in a form of plurality of stripes which extend in a longitudinal direction of the tobacco rod and are apart from one another in a circumferential direction of the tobacco rod, when the cigarette paper wraps a tobacco rod.

8. The cigarette paper according to claim 3, wherein the burn limiting areas are in a form of plurality of stripes which extend in a longitudinal direction of the tobacco rod and are apart from one another in a circumferential direction of the tobacco rod, when the cigarette paper wraps a tobacco rod.

9. The cigarette paper according to claim 5, wherein the burn limiting areas are in a form of plurality of stripes which extend in a longitudinal direction of the tobacco rod and are apart from one another in a circumferential direction of the tobacco rod, when the cigarette paper wraps a tobacco rod.

10. The cigarette paper according to claim 1, wherein the burn limiting areas are in a form of plurality of circular bands which extend in the circumferential direction of the tobacco rod and are apart from one another in the longitudinal direction of the tobacco rod, when the cigarette paper wraps a tobacco rod.

11. The cigarette paper according to claim 3, wherein the burn limiting areas are in a form of plurality of circular bands which extend in the circumferential direction of the tobacco rod and are apart from one another in the longitudinal direction of the tobacco rod, when the cigarette paper wraps a tobacco rod.

12. The cigarette paper according to claim 5, wherein the burn limiting areas are in a form of plurality of circular bands which extend in the circumferential direction of the tobacco rod and are apart from one another in the longitudinal direction of the tobacco rod, when the cigarette paper wraps a tobacco rod.

13. A cigarette paper according to claim 1, which provides a cigarette exhibiting a PFLB value of 0 to 10% when measured according to ASTM E-2187-04.

14. A cigarette paper according to claim 3, which provides a cigarette exhibiting a PFLB value of 0 to 10% when measured according to ASTM E-2187-04.

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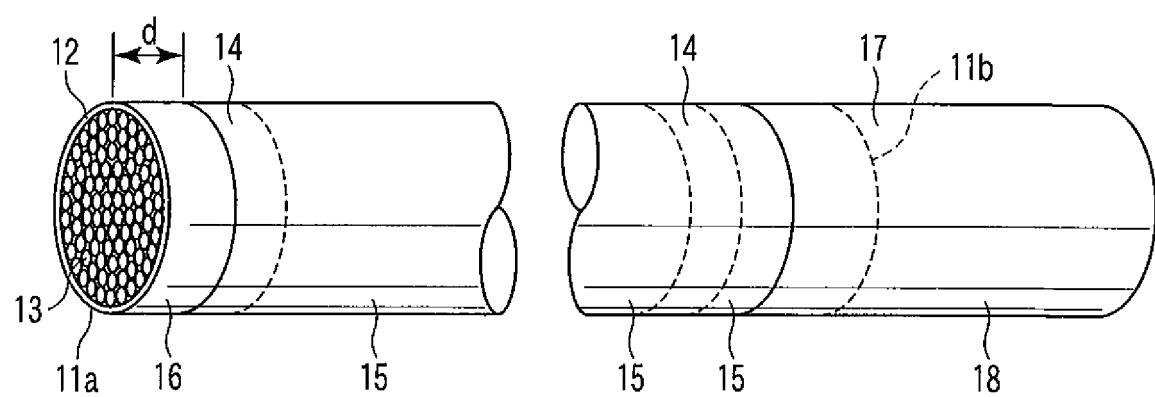


FIG. 1

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- JP 7300795 A **[0003]**

**Non-patent literature cited in the description**

- Quantitative analysis method for sodium alginate in foods. *Journal of Food Hygiene*, 1988, vol. 5, 297-302 **[0032]**