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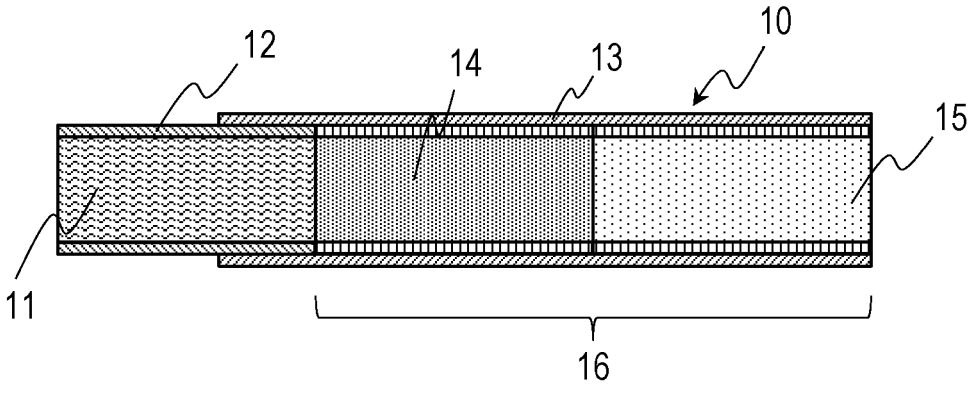
(54) **ROLLING PAPER FOR NON-COMBUSTED HEATED SMOKING ARTICLE, NON-COMBUSTED HEATED SMOKING ARTICLE, AND ELECTRIC HEATED SMOKING SYSTEM**

(57) Provided is rolling paper for a non-combusted heated smoking article that has a white section in which the discrimination score obtained by substituting color difference values in the CIE Lab color system before and after heating for three minutes at 230°C in equation (1) is a numerical value lower than 0.62 and ISO whiteness is at least 83%. (1) Discrimination score (y) $y = -0.18 \times \Delta L^* + 0.08 \times \Delta a^* + 0.13 \times \Delta b^* - 2.36$ (In equation (1), the color difference values in the CIE Lab color system before and after heating are the values for L*, a*, and b* before heating subtracted from the values for L*, a*, and b* after heating. ΔL^* represents the difference in lightness L* after heating and before heating the rolling paper. Δa^* represents the difference in color a* after heating and before heating the rolling paper. Δb^* represents the difference in color b* after heating and before heating the rolling paper.)

FIG. 1



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Description

Technical Field

[0001] The present invention relates to a wrapping paper for a non-combustion heating-type smoking article, a non-combustion heating-type smoking article, and an electric heating-type smoking system.

Background Art

[0002] Non-combustion heating-type smoking articles of a type in which heating is performed from around a tobacco rod including shredded tobacco to deliver volatile components to a user are known. In a non-combustion heating-type smoking article, a tobacco rod wrapped by a wrapping paper is heated, but the tobacco rod is left unburned after use (after heating) unlike conventional cigarettes.

[0003] In conventional cigarettes, white (colorless) paper, while having a logo or the like in some cases, is commonly used as a wrapping paper for wrapping shredded tobacco.

Summary of Invention

Technical Problem

[0004] It has been found that if a wrapping paper that has been used in conventional cigarettes is used as a wrapping paper for wrapping shredded tobacco in a non-combustion heating-type smoking article, discoloration unpleasant for users may be caused by heating during use. To solve this problem, a specific colored paper can be used to make the discoloration less noticeable, but it has been found that in order to use white paper with high versatility, it is necessary to devise a different approach.

[0005] Thus, it is an object of the present invention to provide a wrapping paper for a non-combustion heating-type smoking article, which wrapping paper does not cause appearance-related unpleasantness that may be caused by heating. Solution to Problem

[0006] To solve the problems described above, the present inventors focused on the fact that using a wrapping paper having a white part that has a specific brightness before heating and will have a discolored region in a specific range after heating makes the unpleasant discoloration less noticeable.

[0007] Paper made mostly from pulp will be scorched and discolored brown if heated at or above a certain temperature. Such discoloration cannot be easily prevented because it is caused for a physical reason due to thermal decomposition of pulp and components of the paper. However, the present inventors have found that discoloration, if caused by scorching, can be made less easily recognizable as an unpleasant scorch color if the degree of discoloration from the color of the original paper is low in a certain range.

[0008] The present inventors have discovered that such a region where the color difference is at a visually acceptable level can be expressed by a mathematical formula, and found that by using, as a wrapping paper, a paper having a white part that exhibits a specific numerical value when values of L*, a*, and b* before and after heating are substituted into the mathematical formula and that has a specific brightness before heating, the problem of unpleasant discoloration peculiar to non-combustion heating-type smoking articles can be solved.

[0009] Specifically, the present inventors have found that the problem of unpleasant discoloration described above can be solved by using a paper having a white part which has an ISO brightness before heating of 83% or more and where the color difference before and after heating is small.

[0010] The problem to be solved by the present invention is peculiar to non-combustion heating-type smoking articles heated with electric heating-type devices, and is a problem that has not arisen in conventional smoking articles (e.g., cigarettes).

[0011] Thus, the present invention is as follows.

[1] A wrapping paper for a non-combustion heating-type smoking article, the wrapping paper including a white part that has a discriminant score of lower than 0.62 and an ISO brightness of 83% or more, the discriminant score being obtained by substituting color differences in the CIELab color system between before and after heating at 230 °C for 3 minutes into formula (1).

Discriminant score (y)

$$y = -0.18 \times \Delta L^* + 0.08 \times \Delta a^* + 0.13 \times \Delta b^* - 2.36 \qquad (1)$$

(In formula (1), the color differences in the CIELab color system between before and after heating are values obtained by subtracting pre-heating L*, a*, and b* values from post-heating L*, a*, and b* values, respectively. ΔL* represents a difference in lightness L* between before and after the wrapping paper is heated, Δa* represents a difference in chromaticity a* between before and after the wrapping paper is heated, and Δb* represents a difference in chromaticity b* before and after the wrapping paper is heated.)

[2] The wrapping paper for a non-combustion heating-type smoking article according to [1], wherein the wrapping paper for a non-combustion heating-type smoking article contains a loading material with a loading material content of 15 to 45 wt% and has a basis weight of 25 to 45 gsm,
when the basis weight is 25 gsm or more and 35 gsm or less, the loading material content is 15 to 45 wt%, and when the basis weight is more than 35 gsm and 45 gsm or less, the loading material content is 25 to 45 wt%.

[3] The wrapping paper for a non-combustion heating-type smoking article according to [1] or [2], the wrapping paper having a tensile strength of at least 8 N/15 mm

[4] The wrapping paper for a non-combustion heating-type smoking article according to [2] or [3], wherein the loading material is calcium carbonate, and the wrapping paper has an opacity of 60% or more.

[5] The wrapping paper for a non-combustion heating-type smoking article according to any one of [1] to [4], wherein the white part has a discriminant score of less than 0.

[6] The wrapping paper for a non-combustion heating-type smoking article according to any one of [1] to [5], wherein the wrapping paper does not contain a combustion improver.

[7] A non-combustion heating-type smoking article including: a tobacco rod portion including a filler and a first wrapping paper wrapping around the filler, the filler containing shredded tobacco and an aerosol-source material; and a mouthpiece portion constituting an end portion opposite to the tobacco rod portion, the tobacco rod portion and the mouthpiece portion being joined together with a second wrapping paper that is the same as or different from the wrapping paper wrapping around the filler, wherein at least one of the first wrapping paper and the second wrapping paper is the wrapping paper according to any one of [1] to [6].

[8] An electric heating-type smoking system including: an electric heating-type device including a heater member, a heat-transfer member that transfers heat from the heater member, a battery unit that serves as a power source of the heater member, and a control unit for controlling the heater member; and the non-combustion heating-type smoking article according to [7] configured to be fitted so as to be in contact with the heat-transfer member.

Advantageous Effects of Invention

[0012] According to the present invention, a wrapping paper for a non-combustion heating-type smoking article, which wrapping paper does not cause appearance-related unpleasantness that may be caused by heating, can be provided.

Brief Description of Drawings

[0013]

[Fig. 1] Fig. 1 is a schematic view illustrating one aspect of a non-combustion heating-type smoking article.

[Fig. 2] Fig. 2 is a schematic view illustrating another aspect of the non-combustion heating-type smoking article.

[Fig. 3] Fig. 3 is a schematic view illustrating one aspect of an electric heating-type smoking system.

[Fig. 4A] Fig. 4A is a graph showing the relationship between ΔL* values before and after heating and appearance impressions of paper samples.

[Fig. 4B] Fig. 4B is a graph showing the relationship between Δa* values before and after heating and the appearance impressions of the paper samples.

[Fig. 4C] Fig. 4C is a graph showing the relationship between Δb* values before and after heating and the appearance impressions of the paper samples.

[Fig. 5] Fig. 5 shows the results of a discriminant analysis performed using the relationship between the Δ values of L*, a*, and b* and the appearance impressions of the paper samples before and after heating.

[Fig. 6] Fig. 6 is a graph showing the relationship between the Δa* values and the Δb* values of the paper samples before and after heating.

[Fig. 7] Fig. 7 plots the relationship between loading material content in wrapping paper and discriminant score for each basis weight.

Description of Embodiments

[0014] The present invention will now be described in detail with reference to embodiments, examples, and the like. The present invention is not limited to the following embodiments, examples, and the like, and any modifications can be made without departing from the spirit of the present invention.

<Wrapping paper for non-combustion heating-type smoking article>

[0015] As used herein, "a wrapping paper for a non-combustion heating-type smoking article" refers to a wrapping paper used for a non-combustion heating-type smoking article described below. Hereinafter, it is also referred to simply as a wrapping paper according to an embodiment of the present invention. For applications of the wrapping paper according to an embodiment of the present invention, "for a non-combustion heating-type smoking article" means being used to produce a tobacco rod by wrapping around a filler containing shredded tobacco or being used to wrap around the outer circumferences of a tobacco rod and a member adjacent thereto in order to join them together.

[0016] The wrapping paper according to an embodiment of the present invention has a white part having a value of y (discriminant score) of smaller than 0.62 and an ISO brightness of 83% or more, the value of y being obtained by measuring L*, a*, and b* before and after heating at 230°C for 3 minutes (also referred to simply as before and after heating), and substituting differences of each value between before and after heating (values obtained by subtracting the values before heating from the values after heating), the differences being expressed as ΔL^*, Δa^*, and Δb^*, into the following formula (1).

$$y\ (\text{discriminant score}) = -0.18 \times \Delta L^* + 0.08 \times \Delta a^* + 0.13 \times \Delta b^* - 2.36 \qquad (1)$$

[0017] As long as the wrapping paper according to an embodiment of the present invention has a white part having a discriminant score, as determined by substituting values of ΔL^*, Δa^*, and Δb^* into the above formula (1), of smaller than 0.62, values of L*, a*, and b* before heating are not particularly limited.

[0018] The white part having the above discriminant score may be present throughout the wrapping paper according to an embodiment of the present invention, or may be present at least at a portion subjected to heating (heating with an electric heating-type device described later).

[0019] The ISO brightness can be determined by the following method.

[0020] The ISO brightness is measured using a brightness and opacity meter (manufacturer: MURAKAMI COLOR RESEARCH LABORATORY, model number: WMS-1) in accordance with JIS 8148: 2001, Paper, board and pulps-Measurement of diffuse blue reflectance factor (ISO brightness).

[0021] The above white part, when having a high pre-heating L* value (when being bright and having a light color), tends to have an ISO brightness of 83% or more. In a wrapping paper in one embodiment, the pre-heating L* value of the white part may be 95% or more.

[0022] When y (discriminant score) obtained by the above formula (1) is smaller than 0.62, appearance-related unpleasantness that may be caused by heating does not occur, which has been demonstrated in EXAMPLES given later. When y (discriminant score) obtained by the above formula (1) is less than 0, a wrapping paper whose appearance will not be impaired after heating is more reliably provided.

[0023] In the wrapping paper according to an embodiment of the present invention, the values of L*, a*, and b* before and after heating are each a simple average of values measured at five points in a white part of a sample paper. The measurement is performed at randomly selected points in the white part of the paper, but when the paper has a letter or design such as a logo, the measurement is performed at points in the white part where such a letter or logo is not present. The values of L*, a*, and b* can be measured by using a spectrophotometer.

[0024] Specifically, a spectrophotometer (manufactured by X-Rite Inc., product name: SpectroEye) is used. The measurement is performed under the conditions of a D65 light source, no light source filter, and a viewing angle of 2°, with a sample placed on a paper having an ISO brightness of 92%, and a measurement unit of the spectrophotometer held against the sample.

[0025] To obtain a paper including a white that has a discriminant score, as determined by the above formula (1), of smaller than 0.62 and an ISO brightness of 83% or more (also referred to as a paper having the above-described characteristics), any known method can be used. In the case of a wrapping paper having, throughout its surface, a white part that has a discriminant score of smaller than 0.62 and an ISO brightness of 83% or more, such a wrapping paper can be produced by controlling the type and content of pulp and loading material at the stage of paper manufacturing. Specifically, for example, the content of a loading material described later is increased, or the amount of colored material is decreased as much as possible.

[0026] By contrast, in the case of a wrapping paper partially having a colored part to the extent that the appearance impression after heating is not impaired, a colored part that exhibits a desired hue may be provided, for example, by printing. Example s of the method of printing include, but are not limited to, gravure printing and offset printing. The colored part refers to a part having an ISO brightness of less than 83%.

[0027] When a logo or a partial design is provided as a colored part on a base paper by printing, the printed surface (printed area) is not used as a target for spectrophotometric colorimetry. When a colored part is provided on a wrapping paper by printing, the area fraction of the colored part is, for example, 10% or less, preferably 5% or less, more preferably

3% or less. To put it the other way around, in the wrapping paper according to an embodiment of the present invention, the area fraction of the white part described above is, for example, 90% or more, preferably 95% or more, more preferably 97% or more. However, when a regular pattern is provided as a colored part and does not influence the appearance impression before and after heating, the area fraction of the white part may be 50% or more in some cases.

[0028] In the surface of the wrapping paper, at least a portion to be heated (portion subjected to heating with an electric heating-type device) preferably has a discriminant score, as determined by the above formula (1), of smaller than 0.62 and an ISO brightness of 83% or more. In the surface of the wrapping paper, when the portion to be heated with the electric heating-type device described later has the above-described characteristics, deterioration in appearance impression after heating can be prevented.

[0029] The basis weight of a base paper of the wrapping paper according to an embodiment of the present invention is, for example, typically 20 gsm or more, preferably 25 gsm or more. The basis weight is typically 65 gsm or less, preferably 50 gsm or less, still more preferably 45 gsm or less. The relationship between the basis weight and the loading material content will be described later.

[0030] The thickness of the wrapping paper having the above-described characteristics is not particularly limited, and in view of rigidity, air permeability, and ease of adjustment in paper manufacturing, the thickness is typically 10 μm or more, preferably 20 μm or more, more preferably 30 μm or more, and typically 100 μm or less, preferably 75 μm or less, more preferably 50 μm or less.

[0031] The shape of the wrapping paper for a non-combustion heating-type smoking article may be, for example, square or rectangular. When the wrapping paper is used for wrapping around shredded tobacco (for producing a tobacco rod), the length of one side may be, for example, about 15 to 70 mm, and the length of the other side may be 15 to 26.5 mm, preferably 24 mm

[0032] In the case of a wrapping paper, such as a tipping paper, for joining and wrapping around a tobacco rod and another member adjacent to the tobacco rod, the length of one side may be 20 to 60 mm, and the length of the other side may be 15 to 26.5 mm

[0033] Examples of the wrapping paper having the above-described characteristics include those composed mainly of pulp. The pulp may be made of wood pulp such as softwood pulp or hardwood pulp, or may be produced by mixing nonwood pulp commonly used for a wrapping paper for a smoking article, such as flax pulp, cannabis pulp, sisal pulp, and esparto.

[0034] Examples of types of pulp that can be used include chemical pulp, ground pulp, chemiground pulp, and thermomechanical pulp produced, for example, by kraft cooking, acidic·neutral·alkaline sulfite cooking, or soda chlorine cooking.

[0035] Using the above-described pulp, the texture is arranged to be uniform in a papermaking process using a Fourdrinier paper machine, a cylinder paper machine, a cylinder-tanmo complex paper machine, or the like, thereby producing the wrapping paper. If necessary, the above-described wet paper-strengthening agent may be added to impart water resistance to the wrapping paper, or a sizing agent may be added to adjust the state of printing on the wrapping paper. Furthermore, internal additives for papermaking such as aluminum sulfate, various anionic, cationic, nonionic, or amphoteric yield enhancers, freeness improvers, and paper-strengthening agents, and additives for paper manufacturing such as dyes, pH adjusters, antifoaming agented, pitch control agents, and slime control agents may be added.

[0036] In addition to the above-described pulp, the wrapping paper according to an embodiment of the present invention contains a loading material. The loading material content based on the total weight of the wrapping paper according to an embodiment of the present invention may be, for example, 10 wt% or more and less than 60 wt%, and is preferably 15 to 45 wt%.

[0037] In the wrapping paper according to an embodiment of the present invention, the loading material content is preferably 15 to 45 wt% in the preferred basis weight range (25 to 45 gsm).

[0038] Furthermore, when the basis weight is 25 gsm or more and 35 gsm or less, the loading material content is preferably 15 to 45 wt%, and when the basis weight is more than 35 gsm and 45 gsm or less, the loading material content is preferably 25 to 45 wt%.

[0039] As the loading material, calcium carbonate, titanium dioxide, kaolin, or the like can be used, and in terms of, for example, improvements in smoke taste and brightness, calcium carbonate is preferably used.

[0040] A paper containing such a loading material typically exhibits a white-based bright color and can permanently maintain whiteness. When such a loading material is contained in a large amount, the ISO brightness of the wrapping paper can be 83% or more.

[0041] The wrapping paper according to an embodiment of the present invention preferably has a tensile strength, as measured by the following measurement method, of at least 8 N/15 mm, from the practical viewpoint of use as a wrapping paper of a non-combustion heating-type smoking article.

[0042] This tensile strength can be increased by decreasing the loading material content. Specifically, the tensile strength can be increased by decreasing the loading material content to be lower than the above-described upper limit of the loading material content in each basis weight range.

<Method of measuring tensile strength>

[0043] The tensile strength is measured using a STROGRAPH E-L manufactured by Toyo Seiki Seisaku-Sho, Ltd. in accordance with P 8113: 2006 (ISO 1924-2: 1994), Paper and board-Determination of tensile properties-Part 2: Constant rate of elongation method.

[0044] The wrapping paper according to an embodiment of the present invention preferably has an opacity, as measured by the following measurement method, of 60% or more. The opacity can be increased by increasing the loading material content in the wrapping paper. Specifically, the opacity can be increased by increasing the loading material content to be higher than the above-described lower limit of the loading material content in each basis weight range.

<Method of measuring opacity>

[0045] The opacity is a value measured in accordance with ISO 2471 using a brightness and opacity meter (manufacturer: MURAKAMI COLOR RESEARCH LABORATORY, model number: WMS-1). The opacity is a value calculated by a formula: single-sheet luminous reflectance factor (R0)/intrinsic luminous reflectance factor ($R\infty$) $\times$ 100 (%). The intrinsic luminous reflectance factor ($R\infty$) in this formula is an intrinsic reflectance factor of brightness as measured using a prescribed reflectometer and light source under spectral conditions at an effective wavelength of 457 nm and a half-width of 44 nm.

[0046] To satisfy the above discriminant score, the wrapping paper according to an embodiment of the present invention preferably does not contain a combustion improver, which is included in conventional wrapping papers for tobacco rods. The wrapping paper according to an embodiment of the present invention may be used as a first wrapping paper or a second wrapping paper used for a non-combustion heating-type smoking article described below.

<Non-combustion heating-type smoking article>

[0047] A non-combustion heating-type smoking article according to an embodiment of the present invention may have, for example, a configuration illustrated in Fig. 1.

[0048] A non-combustion heating-type smoking article 10 in Fig. 1 includes a filler 11, a tobacco rod portion formed of a first wrapping paper 12 wrapping around the filler 11, and a mouthpiece portion 16 constituting an end portion opposite to the tobacco rod portion. The tobacco rod portion and the mouthpiece portion are joined together with a second wrapping paper 13 (tipping paper in Fig. 1) that is the same as or different from the wrapping paper wrapping around the filler. In an embodiment of the present invention, the first wrapping paper and the second wrapping paper will not be burned down by heating if they are each composed of a single sheet alone. When the first wrapping paper and the second wrapping paper are each composed of a single sheet alone, the cost can be reduced.

[0049] At least one of the first wrapping paper and the second wrapping paper is the wrapping paper according to an embodiment of the present invention described above. It is preferred that at least the first wrapping paper be the wrapping paper according to an embodiment of the present invention. It is also preferred that both the first wrapping paper 12 and the second wrapping paper be the wrapping paper according to an embodiment of the present invention described above.

[0050] In the aspect shown in Fig. 1, the mouthpiece portion 16 includes a paper tube portion 14 and a filter portion 15. The tipping paper 13 serves as the second wrapping paper for joining them together. Although the mouthpiece portion 16 is composed of two segments in Fig. 1, the mouthpiece portion 16 may be composed of a single segment or three or more segments. Each segment constituting the mouthpiece portion may be configured so as to include both the paper tube portion and the filter portion or may be composed of only one of them.

[0051] Fig. 2 shows an embodiment in which the mouthpiece portion 16 is composed of three segments. The embodiment of Fig. 2 includes a hollow segment portion 17 disposed between the paper tube portion 14 and the filter portion 15 in Fig. 1. The hollow segment portion 17 is composed of a packed bed having one or more hollow channels and a plug wrapper covering the packed bed. The packed bed can be, for example, a rod having an inner diameter ϕ of 4.5 to 1.0 mm, the rod being densely packed with cellulose acetate fibers and cured with a plasticizer containing triacetin added in an amount of 6 to 20 wt% based on the weight of cellulose acetate. Since the packed bed has a high fiber packing density, air and aerosols flow only through the channel portion and hardly flow through the packed bed during suction. In a non-combustion heating-type smoking article, when it is desired to minimize the reduction of aerosol components due to filtration at the filter portion 15, shortening the length of the filter portion 15 and substituting the hollow segment portion 17 is effective in increasing the amount of delivered aerosol components. Since the packed bed inside the hollow segment portion 17 is a fiber packed bed, the feel from outside during use is closer to the feel at the filter portion than to the feel at the paper tube portion 14, and thus users are less likely to experience a feeling of strangeness.

[0052] In the embodiments shown in Figs. 1 and 2, the longitudinal length of the non-combustion heating-type smoking article 10 is preferably 40 mm to 90 mm, more preferably 50 mm to 75 mm, still more preferably 50 mm to 60 mm The circumference of the non-combustion heating-type smoking article is preferably 15 mm to 25 mm, more preferably 17

mm to 24 mm, still more preferably 20 mm to 22 mm In the embodiment shown in Fig. 2, the length of the tobacco rod portion may be 20 mm, the length of the paper tube portion may be 20 mm, the length of the hollow segment portion may be 8 mm, and the length of the filter portion may be 7 mm, but these segment lengths can each be changed as appropriate according to, for example, production suitability and required quality.

[0053] As a vapor generated upon heating of the tobacco rod and containing an aerosol-source material and a tobacco flavor component passes through the paper tube portion 14, the vapor comes into contact with the air in the paper tube to be cooled and liquefied, thus forming an aerosol.

[0054] The non-combustion heating-type smoking article 10 may have perforations (not illustrated) for taking in outside air in the paper tube portion 14 and part of the second wrapping paper 13 (tipping paper) that surrounds the paper tube portion 14. The presence of such perforations allows air to flow from outside into the paper tube portion 14 during use, and as a result, a vapor generated upon heating of the tobacco rod and containing an aerosol-source material and a tobacco flavor component comes into contact with the air from outside to be cooled and liquefied, thus further ensuring the generation of an aerosol.

[0055] The paper tube portion 14 may be, for example, a thick paper processed into cylindrical form.

[0056] The filter portion 15 may be made, for example, by using acetate tow as a material. The single yarn fineness and the total fineness of the acetate tow are not particularly limited.

[0057] Although the filter portion 15 is composed of a single segment in Fig. 1, it may be composed of a plurality of segments. When the filter portion 15 is composed of a plurality of segments, for example, a configuration may be employed in which a hollow segment is disposed on the upstream side and a segment on the downstream side (user's suction end side) has a suction section filled with acetate tow. Such a configuration can prevent unwanted loss of a generated aerosol and can also improve the appearance of the non-combustion heating-type smoking article.

[0058] In the production of the filter, adjustment of airflow resistance and addition of additives (e.g., known absorbents, flavors, and flavor retention materials) can be appropriately designed.

[0059] The material of the second wrapping paper 13 (tipping paper) is not particularly limited, and the wrapping paper according to an embodiment of the present invention may be used for a part or the whole. The second wrapping paper 13 may be fixed, for example, using a vinyl acetate adhesive after wrapping around the tobacco rod, the paper tube portion 14, and the filter portion 15 described above.

[0060] The tobacco rod contains shredded tobacco as the filler 11. The material of the shredded tobacco is not particularly limited, and a known material such as a lamina or a midrib can be used. In the case of a tobacco rod having a circumference of 22 mm and a length of 20 mm, the range of the filler content in the tobacco rod may be 200 to 400 mg/rod, and is preferably 250 to 320 mg/rod. The water content of the filler may be 10 to 15 wt%, and is preferably 11 to 13 wt%. Such a water content suppresses the occurrence of a stain on the wrapping paper and improves the machinability during the production of the tobacco rod.

[0061] The shredded tobacco used as the filler may have any size and may be prepared by any method. For example, shredded tobacco obtained by shredding dried tobacco leaves to a width of 0.8 to 1.2 mm may be used.

[0062] Alternatively, shredded tobacco obtained by pulverizing and uniformizing dried tobacco leaves so as to have an average particle size of about 20 to 200 μm, processing the resultant into a sheet, and shredding the sheet to a width 0.8 to 1.2 mm may be used.

[0063] Alternatively, the above sheet may be subjected to gathering without being shredded and used as the filler.

[0064] The filler contains an aerosol-source material that generates aerosol smoke. The type of the aerosol-source material is not particularly limited, and extracts from various natural products and/or components thereof can be selected depending on the intended use. Examples of the aerosol-source material include glycerol, propylene glycol, triacetin, 1,3-butanediol, and mixtures thereof.

[0065] The content of the aerosol-source material in the filler is not particularly limited, and to sufficiently generate an aerosol and impart a good smoke taste, the content is typically 5 wt% or more, preferably 10 wt% or more, and typically 50 wt% or less, preferably 20 wt% or less.

[0066] The filler may contain a flavor. The type of the flavor is not particularly limited, and to impart a good smoke taste, acetanisole, acetophenone, acetylpyrazine, 2-acetylthiazole, alfalfa extract, amyl alcohol, amyl butyrate, trans-anethole, star anise oil, apple juice, Peru balsam oil, beeswax absolute, benzaldehyde, benzoin resinoid, benzyl alcohol, benzyl benzoate, benzyl phenylacetate, benzyl propionate, 2,3-butanedione, 2-butanol, butyl butyrate, butyric acid, caramel, cardamom oil, carob absolute, β-carotene, carrot juice, L-carvone, β-caryophyllene, cassia bark oil, cedarwood oil, celery seed oil, chamomile oil, cinnamic aldehyde, cinnamic acid, cinnamyl alcohol, cinnamyl cinnamate, citronella oil, DL-citronellol, clary sage extract, cocoa, coffee, cognac oil, coriander oil, cuminaldehyde, davana oil, δ-decalactone, γ-decalactone, decanoic acid, dill herb oil, 3,4-dimethyl-1,2-cyclopentanedione, 4,5-dimethyl-3-hydroxy-2,5-dihydrofuran-2-one, 3,7-dimethyl-6-octenoic acid, 2,3-dimethylpyrazine, 2,5-dimethylpyrazine, 2,6-dimethylpyrazine, ethyl 2-methylbutyrate, ethyl acetate, ethyl butyrate, ethyl hexanoate, ethyl isovalerate, ethyl lactate, ethyl laurate, ethyl levulinate, ethyl maltol, ethyl octanoate, ethyl oleate, ethyl palmitate, ethyl phenylacetate, ethyl propionate, ethyl stearate, ethyl valerate, ethyl vanillin, ethyl vanillin glucoside, 2-ethyl-3,(5 or 6)-dimethylpyrazine, 5-ethyl-3-hydroxy-4-methyl-

2(5H)-furanone, 2-ethyl-3-methylpyrazine, eucalyptol, fenugreek absolute, genet absolute, gentian root infusion, geraniol, geranyl acetate, grape juice, guaiacol, guava extract, γ-heptalactone, γ-hexalactone, hexanoic acid, cis-3-hexen-1-ol, hexyl acetate, hexyl alcohol, hexyl phenylacetate, honey, 4-hydroxy-3-pentenoic acid lactone, 4-hydroxy-4-(3-hydroxy-1-butenyl)-3,5,5-trimethyl-2-cyclohexen-1-one, 4-(para-hydroxyphenyl)-2-butanone, sodium 4-hydroxyundecanoate, immortelle absolute, β-ionone, isoamyl acetate, isoamyl butyrate, isoamyl phenylacetate, isobutyl acetate, isobutyl phenylacetate, jasmine absolute, kola nut tincture, labdanum oil, terpeneless lemon oil, glycyrrhiza extract, linalool, linalyl acetate, lovage root oil, maltol, maple syrup, menthol, menthone, L-menthyl acetate, para-methoxybenzaldehyde, methyl-2-pyrrolyl ketone, methyl anthranilate, methyl phenylacetate, methyl salicylate, 4'-methylacetophenone, methylcyclopentenolone, 3-methylvaleric acid, mimosa absolute, molasses, myristic acid, nerol, nerolidol, γ-nonalactone, nutmeg oil, δ-octalactone, octanal, octanoic acid, orange flower oil, orange oil, orris root oil, palmitin acid, ω-pentadecalactone, peppermint oil, petitgrain Paraguay oil, phenethyl alcohol, phenethyl phenylacetate, phenylacetic acid, piperonal, plum extract, propenyl guaethol, propyl acetate, 3-propylidene phthalide, prune juice, pyruvic acid, raisin extract, rose oil, rum, sage oil, sandalwood oil, spearmint oil, styrax absolute, marigold oil, tea distillate, α-terpineol, terpinyl acetate, 5,6,7,8-tetrahydroquinoxaline, 1,5,5,9-tetramethyl-13-oxacyclo(8.3.0.0(4.9))tridecane, 2,3,5,6-tetramethylpyrazine, thyme oil, tomato extract, 2-tridecanone, triethyl citrate, 4-(2,6,6-trimethyl-1-cyclohexenyl)2-buten-4-one, 2,6,6-trimethyl-2-cyclohexene-1,4-dione, 4-(2,6,6-trimethyl-1,3-cyclohexadienyl)2-buten-4-one, 2,3,5-trimethylpyrazine, γ-undecalactone, γ-valerolactone, vanilla extract, vanillin, veratraldehyde, and violet leaf absolute may be used. Menthol is particularly preferred. These flavors may be used alone or in combination of two or more.

[0067] The content of the flavor in the filler is not particularly limited. To impart a good smoke taste, the content is typically 10,000 ppm or more, preferably 20,000 ppm or more, more preferably 25,000 ppm or more, and typically 50,000 ppm or less, preferably 40,000 ppm or less, more preferably 33,000 ppm or less.

[0068] The filler density of the filler is not particularly limited. To secure the performance of the non-combustion heating-type smoking article and impart a good smoke taste, the filler density is typically 250 mg/cm^3 or more, preferably 320 mg/cm^3 or more, and typically 520 mg/cm^3 or less, preferably 420 mg/cm^3 or less.

[0069] In producing the non-combustion heating-type smoking article according to an embodiment of the present invention, the wrapping paper according to an embodiment of the present invention described above can be used. Specifically, a filler containing shredded tobacco and an aerosol-source material is formed, and the formed filler is wrapped using the wrapping paper according to an embodiment of the present invention, whereby a tobacco rod can be obtained. Furthermore, the tobacco rod and a member constituting a mouthpiece portion are wrapped with a tipping paper (or the wrapping paper according to an embodiment of the present invention), whereby a non-combustion heating-type smoking article can be obtained. In the wrapping, a known winding device can be used.

[0070] By using the wrapping paper according to an embodiment of the present invention as a wrapping paper for a tobacco rod and/or as a tipping paper in producing a non-combustion heating-type smoking article, a non-combustion heating-type smoking article whose appearance impression will not be impaired after use (after heating) can be provided.

[0071] The non-combustion heating-type smoking article 10, which is one embodiment of the present invention, includes a tobacco rod including the filler 11 and the wrapping paper 12 (the wrapping paper according to an embodiment of the present invention), the paper tube portion 14, the filter portion 15, and the second wrapping paper 13 for joining them together. The non-combustion heating-type smoking article 10 may have perforations (not illustrated) for taking in outside air in the paper tube portion 14 and part of the second wrapping paper 13 that surrounds the paper tube portion 14. The presence of such perforations allows air to flow from outside into the paper tube portion 14 during use, and as a result, a vapor generated upon heating of the tobacco rod and containing an aerosol-source material and a tobacco flavor component comes into contact with the air from outside to be cooled and liquefied, thus further ensuring the generation of an aerosol.

<Electric heating-type smoking system>

[0072] One aspect of an electric heating-type smoking system is illustrated in Fig. 3. An electric heating-type smoking system 30 is used in a manner that the non-combustion heating-type smoking article 10 described above is fitted so as to be in contact with a heat-transfer member 25 in contact with a heater 24 disposed inside an electric heating-type device 20.

[0073] The electric heating-type device 20 includes a battery unit 21 and a control unit 22 inside a body 23 made of, for example, a resin.

[0074] As described above, the non-combustion heating-type smoking article includes a filler 11, a tobacco rod portion formed of a first wrapping paper 12 wrapping around the filler 11, and a mouthpiece portion 16 constituting an end portion opposite to the tobacco rod portion. The tobacco rod portion and the mouthpiece portion are joined together with a second wrapping paper that is the same as or different from the wrapping paper wrapping around the filler. The mouthpiece portion 16 of the non-combustion heating-type smoking article may be composed of the paper tube portion 14 and the filter portion 15, as shown in Fig. 1, or may include, between the paper tube portion 14 and the filter portion 15, a hollow

segment including a packed bed 17, as shown in Fig. 2.

[0075] When the non-combustion heating-type smoking article is fitted into the electric heating-type device, a part of an outer peripheral surface formed of an outer peripheral surface of the tobacco rod and the second wrapping paper (the tipping paper 13) that connects the tobacco rod and the paper tube portion 14 comes into contact with the heat-transfer member 25 inside the electric heating-type device 20.

[0076] The heater 24 inside the electric heating-type device 20 generates heat under the control of the control unit 22. The heat is transferred through the heat-transfer member 25 to the tobacco rod of the non-combustion heating-type smoking article, and as a result, both the aerosol-source material and the flavor component contained in the filler 11 in the tobacco rod are volatilized.

[0077] As a result of being heated by the heater 24, the tobacco rod is heated to approximately 150°C to 250°C.

[0078] In the above measurement of L*, a*, and b*, the temperature at which and the time for which the wrapping paper is heated are set to 230°C and 3 minutes, which is based on the assumption that the electric heating-type smoking system according to an embodiment of the present invention is used.

[0079] The vapor generated upon heating and containing the aerosol-source material and the flavor component is aerosolized inside the paper tube portion 14 by the above-described mechanism, and passes through the filter portion 15 of the non-combustion heating-type smoking article 10 to reach inside the oral cavity of a user.

EXAMPLES

[0080] The present invention will be described more specifically with reference to examples, but the present invention is not limited to the description of the following examples without departing from the spirit thereof.

<Provision of paper samples before and after heating>

[0081] Papers having various values of lightness L*, chromaticity a*, and chromaticity b* in the CIELab color system were provided. As colored papers, for example, gravure printed papers, mixed papers of white standard pulp incorporated with unbleached pulp, and tobacco sheets incorporated with fine tobacco leaves were provided. As paper samples not colored at all, a standard base tipping paper and a standard wrapping paper made of 100% virgin pulp, each serving as a reference, were provided. A total of 26 types of paper were provided.

[0082] The details thereof are shown in Table 1 below.

[Table 1]

No.	Name	Feature
1	standard cigarette wrapping paper	28 gsm (bleached pulp + CaCO3)
2	printed paper	gravure printed, pale yellow
3	printed paper	gravure printed, gray
4	printed paper	gravure printed, pale green
5	standard tipping paper for cigarette	37 gsm (bleached pulp + CaCO3)
6	printed paper	gravure printed, pale red
7	printed paper	gravure printed, pale blue
8	printed paper	pale violet gravure printed paper
9	sheet tobacco wrapping paper	papermaking sheet (60% tobacco leaves blended), brown
10	sheet tobacco wrapping paper	papermaking sheet (70% tobacco leaves blended), brown
11	printed paper	gravure printed, yellow
12	printed paper	gravure printed, pale brown
13	printed paper	gravure printed, cork color
14	unbleached blended paper	29% unbleached blended
15	unbleached blended paper	13% unbleached blended

(continued)

No.	Name	Feature
16	unbleached blended paper	41% unbleached blended
17	unbleached blended paper	containing unbleached (41%) and calcium carbonate
18	printed paper	gravure printed, green
19	unbleached blended paper	containing unbleached (29%) and calcium carbonate
20	unbleached blended paper	containing unbleached (16%) and calcium carbonate
21	printed paper	gravure printed, brown
22	printed paper	gravure printed, red
23	printed paper	gravure printed, black
24	sheet tobacco wrapping paper	papermaking sheet (60% tobacco leaves (containing black pigment)), dark brown
25	printed paper	gravure printed, violet
26	printed paper	gravure printed, ultramarine blue
* "Unbleached" means "unbleached pulp".		

<Heating conditions>

[0083] A muffle furnace (product name: Muffle Furnace FO410 model, manufactured by Yamato Scientific Co., Ltd.) was adjusted to 230°C in advance. A door was opened; a paper sample on home-use aluminum foil (material: aluminum foil, thickness: 11 μm) was placed in the muffle furnace; and the door was closed. This operation was performed quickly (within three seconds) to minimize the decrease of the temperature in the muffle furnace. Under the heating conditions in this example (preset muffle furnace temperature: 230°C, paper sample heating time: 3 minutes), the actual temperature of the paper reached about 230°C, which was the same as the preset muffle furnace temperature, in one minute at the latest after the door was closed. This was confirmed using a discoloration temperature test paper (THERMO LABEL 5E-170/THERMO LABEL 5E-210 (manufactured by NiGK Corporation)).

<Color difference measurement>

[0084] The hue of each sample before and after heating was measured using a spectrophotometer (manufactured by X-Rite Inc., product name: SpectroEye). The measurement was performed under the conditions of a D65 light source, no light source filter, and a viewing angle of 2°, with a sample placed on a paper having an ISO brightness of 92%, and a measurement unit of the spectrophotometer held against the sample.

[0085] The measurement was repeatedly performed at five points, and its average value was used for analysis. L*, a*, and b* were the measurements without any correction, and ΔL*, Δa*, and Δb* were each determined by subtracting a value before discoloration by heating from a value after discoloration by heating.

[0086] Various evaluation and classification systems are used for evaluation of color tones. The CIELab color system is a color system defined by CIE (International Commission on Illumination) and forms the basis of JIS Z 8781-4 and ISO 11664-4. The CIELab color system is a convenient classification system that closely resembles the human sense, that is very commonly used, and that can convert a color tone into three-dimensional numerical values. L* is an axis representing lightness, a* is an axis representing blue to yellow, and b* is an axis representing blue-green to red-violet. Larger values of L* indicate higher lightness, and values of a* and b* closer to 0 indicate lower saturation. For example, L*, a*, b* = 100, 0, 0 means white, and 0, 0, 0 means black.

<Sensory evaluation>

[0087] Paper samples before and after heating were shown to 20 panelists one by one, and unsightliness they received from the color tone of the samples was inquired. Among the 20 panelists, when the number of panelists who answered unsightly and unpleasant was 11 or more, the appearance impression of the sample was evaluated as ×, and when the number was less than 11, the appearance impression of the sample was evaluated as ○. The results thereof were used for analysis.

<Analysis>

[0088] There was no relationship between ΔL*, Δa*, and Δb* values before and after heating and the superiority and inferiority in appearance impression (Figs. 4A to 4C).

[0089] Since whether the color tone of a paper after heating was good or bad could not be estimated from the simple graphs showing differences in values of hue alone, performance of a discriminant analysis using color difference data was considered, and the discriminant analysis was performed to know the relationship among multiple factors. As a result, a function given below that uses ΔL*, Δa*, and Δb* values as parameters and by which the appearance impression can be determined at a high rate, i.e., a discrimination rate of 96.2%, was obtained. The P-value of the discriminant is smaller than 0.001 and statistically highly significant, and it is generally said that a discrimination rate of higher than 75% can be used for estimation, and thus the discrimination rate of 96.2% means an almost completely estimable level.

$$\text{Discriminant score } y = -0.18 \times \Delta L^* + 0.08 \times \Delta a^* + 0.13 \times \Delta b^* - 2.36 \qquad (1)$$

Discriminant score of 0.62 or more: × (bad)
Discriminant score of less than 0.62: ○ (good)

[0090] Formula (1) means that the appearance impression after heating is almost determined by ΔL*, Δa*, and Δb*, which indicate a color difference between a paper sample before heating and a paper sample after heating. For example, as the value of ΔL* decreases and the values of Δa* and Δb* increases, the discriminant score increases, which means that the post-heating impression of the paper is located in a worse direction.

[0091] The results are summarized in Fig. 5.

[0092] The discriminant analysis was performed using a 2-group discriminant analysis of multivariate analysis of Excel Statistics Ver. 2.15 available from BellCurve under the following conditions.

(1) Forward-backward stepwise P-value: inclusion, 0.2; exclusion, 0.2
(2) Analysis is performed excluding linearly combined variables.

[0093] Fig. 6 shows, for more detailed explanation, the relationship between Δa* and Δb* of the paper samples investigated here.

[0094] Since a three-dimensional illustration cannot be presented, the values of ΔL* are binarized by -10 for convenience, and samples having values smaller than -10 (discolored dark) are indicated by black circles or bold crosses.

[0095] Samples that gave bad appearance impressions in the evaluation are indicated by "×" and located at points where values of Δa* and Δb* are both large. This means that upon heating, the color has greatly changed toward red-violet, yellow, or a combination thereof, that is, brown, and many of these samples have relatively small ΔL* values. That is, these samples are samples that visually come closer to what is called a pale scorch color to a deep scorch color, and it can be intuitively understood that these samples give bad appearance impressions.

[0096] Many of these samples had relatively large L* values before heating and small a* and b* values, that is, were bright and had low saturation. Such a sample having a bright and pale hue is likely to undergo a noticeable change to brown upon heating, which leads to a bad appearance impression.

[0097] By contrast, samples of "○" that gave good appearance impressions are located at points where values of Δa* and Δb* are both small. This means that upon heating, the color has greatly changed toward blue, green, or a combination thereof, that is, blue-green. Some are evaluated as ○ despite having relatively low ΔL* values, that is, having low lightness and being dark. Many of these samples, in contrast to the samples of ×, have relatively small L* values and large a* and b* values before heating, that is, are dark and have high saturation. Such a sample having a deep hue is less likely to undergo a noticeable change upon heating, which leads to a good appearance impression.

[0098] An overview of the plot shows that plots of Δa* and Δb* are distributed over wide ranges of ±20 and ±30, respectively, and thus this experiment is not partial but covers samples that undergo various hue changes.

[0099] In the present invention, the degree of change in color of a paper before and after heating was focused, and its region was quantified to successfully define an effective range.

[0100] Basically, it is imagined that defining a region simply by a hue before heating is convenient for such parameterization, but by the statistical approach used here, a useful mathematical formula could not be obtained only from values of L*, a*, and b*, which are not color differences, of a paper before heating. This is probably because color components, such as a pigment and a dye, contained in a color exhibit different pyrolysis behavior, and thus the degree of discoloration after heating varies depending on the color component. Therefore, the concept of the present invention by which an appearance impression can be accurately estimated not by the color of the original paper alone but by the degree of discoloration is reasonable.

[0101] The above test results show that a paper having a discriminant score of less than 0.62 is not discolored much

before and after heating and does not give an unpleasant impression to an observer.

[0102] Based on the above, wrapping papers having compositions of Experimental Examples 1 to 18 shown in Table 2 below were further prepared. Specifically, in Experimental Examples 1 to 18, the basis weight and the loading material content were varied as shown in Table 1. In these Experimental Examples, (wood pulp) was used as pulp, and calcium carbonate (manufactured by Shiraishi Kogyo Kaisha, Ltd.) was used as the loading material. Papermaking was performed by hand using a method in accordance with JIS P-8222 "Pulps-Preparation of laboratory sheets for physical testing". In addition, a standard wrapping paper for a cigarette was provided. The wrapping papers of Experimental Examples 1 to 18 did not contain a combustion improver, whereas the standard wrapping paper for a cigarette contained 1.0 wt% of a combustion improver (sodium citrate).

[0103] For each of these wrapping papers, L*, a*, and b* values measured before heating were respectively subtracted from L*, a*, and b* values measured after heating was performed at 230 °C for 3 minutes to determine Δ values, and the values were substituted into the above formula for calculating a discriminant score to determine the discriminant score. The way of heating was the same as that of the above Samples 1 to 26.

[0104] For these wrapping papers, the ISO brightness was measured before heating. Furthermore, the tensile strength was measured using a STROGRAPH E-L manufactured by Toyo Seiki Seisaku-Sho, Ltd. as a measuring apparatus in accordance with P 8113: 2006 (ISO 1924-2: 1994) described above. The results are shown in Table 2.

[Table 2]

Experimental Example	Basis weight (gsm)	Loading material (wt%)	Δ values of L, a*, and b*			Discriminant score	Brightness [%]	Tensile strength [N/15 mm]	Opacity [%]
			I ΔL*	I Δa*	Δb*				
Experimental Example 1	25	0	-6.1	-0.2	19.3	1.23	80.3	30.6	48.4
Experimental Example 2		15	-4.6	0.3	12.3	0.08	83.4	19.7	77.4
Experimental Example 3		25	-4.3	0.1	12.0	-0.01	87.0	12.8	73.0
Experimental Example 4		35	-3.2	0.1	8.9	-0.62	89.1	7.8	75.3
Experimental Example 5		45	-3.3	0.0	8.3	-0.68	89.5	4.5	76.0
Experimental Example 6		60	-2.1	-0.2	5.3	-1.30	89.3	1.8	70.2
Experimental Example 7	35	0	-7.5	0.6	21.9	1.89	82.1	43.1	56.1
Experimental Example 8		15	-6.0	1.1	13.7	0.57	87.6	27.3	78.9
Experimental Example 9		25	-5.0	0.5	12.8	0.26	88.2	20.2	79.3
Experimental Example 10		35	-4.5	0.6	10.8	-0.10	89.7	14.7	77.3
Experimental Example 11		45	-4.0	0.4	9.3	-0.39	90.8	9.0	83.2
Experimental Example 12		60	-2.7	0.3	6.4	-1.01	88.6	4.5	82.0
Experimental Example 13	45	0	-8.4	1.0	22.4	2.14	81.1	62.7	60.8
Experimental Example 14		15	-6.5	1.2	14.9	0.83	86.7	41.4	78.0
Experimental Example 15		25	-6.2	1.0	13.7	0.61	87.5	32.8	80.8
Experimental Example 16		35	-4.8	0.6	11.3	0.03	89.0	21.4	82.6
Experimental Example 17		45	-4.3	0.5	9.9	-0.26	89.9	14.4	82.9
Experimental Example 18		60	-2.9	0.3	7.2	-0.88	87.8	6.6	86.2
Standard wrapping paper for cigarette	28	30	-19.9	5.4	12.5	3.27	88.0	15.3	76.0

[0105] The results in Table 2 show that the wrapping papers of Experimental Examples 1, 7, and 13 having an ISO brightness before heating of less than 83% had a discriminant score of more than 0.62 and a bad appearance impression after heating. By contrast, for the wrapping papers having an ISO brightness before heating of 83% or more and a desired basis weight and loading material content, their appearance impression after heating was not impaired even if the papers had a white color, in other words, a high L* value before heating and their appearance impression after heating was thought to be likely to worsen. The standard wrapping paper for a cigarette containing a combustion improver had a discriminant score of more than 0.62 and a bad appearance impression after heating. For every basis weight, the wrapping papers tended to have a low tensile strength when the loading material content was more than 45 wt%. The wrapping papers having an excessively high loading material content are poor in high-speed machinability of a tobacco rod.

[0106] Next, based on the results in Table 2, a graph with loading material content plotted on the horizontal axis and discriminant score plotted on the vertical axis for each basis weight was made (Fig. 7). The results in Fig. 7 show that as the basis weight decreases, or the loading material content increases, the discriminant score tends to decrease.

[0107] Next, for the results in Table 2, the relationship between the loading material content and basis weight and the discriminant score is summarized in Table 3 below for the purpose of clarity.

[Table 3]

Loading material (calcium carbonate) content (wt%)	Basis weight (25 gsm)	Basis weight (35 gsm)	Basis weight (45 gsm)	Standard wrapping paper for cigarette
0	1.23	1.89	2.14	
15	0.08	0.57	0.83	
25	-0.01	0.26	0.61	3.27
35	-0.62	-0.10	0.03	3.27
45	-0.68	-0.39	-0.26	
60	-1.30	-1.01	-0.88	

[0108] From the descriptions in Fig. 7 and Table 3, it can be seen that when the basis weight of a wrapping paper is 25 gsm or more and 35 gsm or less, the loading material content is desirably 15 to 45 wt%, and when the basis weight is more than 35 gsm and 45 gsm or less, the loading material content is desirably 25 to 45 wt%, from the viewpoint of appearance impressions. When the loading material content is lower than the lower limit of each of the above basis weight ranges, the opacity tends to be low, and when the paper is used as a wrapping paper, the shredded tobacco contained therein may be seen therethrough. It can also be seen that even if the basis weight and the loading material content are within the above ranges, the wrapping paper containing a combustion improver are undesirable from the viewpoint of appearance impressions. Reference Signs List

[0109]

10 non-combustion heating-type smoking article

11 filler
12 first wrapping paper
13 second wrapping paper (tipping paper)
14 paper tube portion
15 filter portion
16 mouthpiece portion
17 hollow segment portion
20 electric heating-type device
21 battery unit
22 control unit
23 body
24 heater member
25 heat-transfer member
30 electric heating-type smoking system

Claims

1. A wrapping paper for a non-combustion heating-type smoking article, the wrapping paper comprising a white part that has a discriminant score of lower than 0.62 and an ISO brightness of 83% or more, the discriminant score being obtained by substituting color differences in the CIELab color system between before and after heating at 230 °C for 3 minutes into formula (1):
Discriminant score (y)

$$y = -0.18 \times \Delta L^* + 0.08 \times \Delta a^* + 0.13 \times \Delta b^* - 2.36 \qquad (1)$$

(in formula (1), the color differences in the CIELab color system between before and after heating are values obtained by subtracting pre-heating L*, a*, and b* values from post-heating L*, a*, and b* values, respectively; and ΔL^* represents a difference in lightness L* between before and after the wrapping paper is heated, Δa^* represents a difference in chromaticity a* between before and after the wrapping paper is heated, and Δb^* represents a difference in chromaticity b* before and after the wrapping paper is heated).

2. The wrapping paper for a non-combustion heating-type smoking article according to Claim 1, wherein the wrapping paper for a non-combustion heating-type smoking article contains a loading material with a loading material content of 15 to 45 wt% and has a basis weight of 25 to 45 gsm,
when the basis weight is 25 gsm or more and 35 gsm or less, the loading material content is 15 to 45 wt%, and
when the basis weight is more than 35 gsm and 45 gsm or less, the loading material content is 25 to 45 wt%.

3. The wrapping paper for a non-combustion heating-type smoking article according to Claim 1 or 2, the wrapping paper having a tensile strength of at least 8 N/15 mm

4. The wrapping paper for a non-combustion heating-type smoking article according to Claim 2 or 3, wherein the loading material is calcium carbonate, and the wrapping paper has an opacity of 60% or more.

5. The wrapping paper for a non-combustion heating-type smoking article according to any one of Claims 1 to 4, wherein the white part has a discriminant score of less than 0.

6. The wrapping paper for a non-combustion heating-type smoking article according to any one of Claims 1 to 5, wherein the wrapping paper does not contain a combustion improver.

7. A non-combustion heating-type smoking article comprising: a tobacco rod portion including a filler and a first wrapping paper wrapping around the filler, the filler containing shredded tobacco and an aerosol-source material; and a mouthpiece portion constituting an end portion opposite to the tobacco rod portion, the tobacco rod portion and the mouthpiece portion being joined together with a second wrapping paper that is the same as or different from the wrapping paper wrapping around the filler, wherein at least one of the first wrapping paper and the second wrapping paper is the wrapping paper according to any one of Claims 1 to 6.

8. An electric heating-type smoking system comprising: an electric heating-type device including a heater member, a heat-transfer member that transfers heat from the heater member, a battery unit that serves as a power source of the heater member, and a control unit for controlling the heater member; and the non-combustion heating-type smoking article according to Claim 7 configured to be fitted so as to be in contact with the heat-transfer member.

FIG. 1

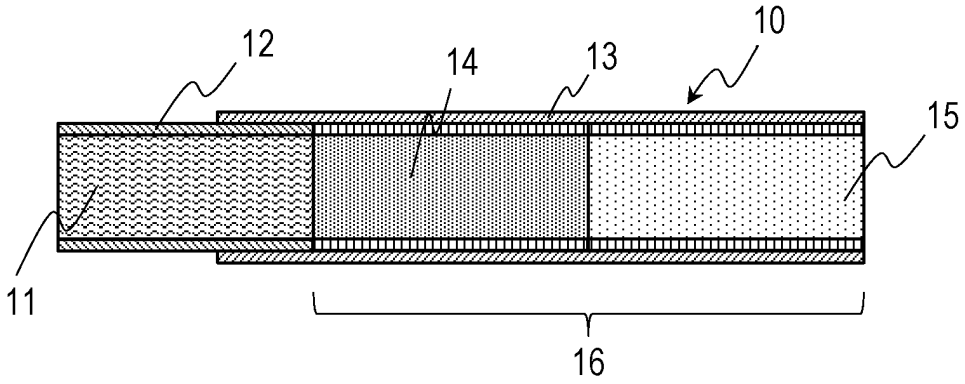


FIG. 2

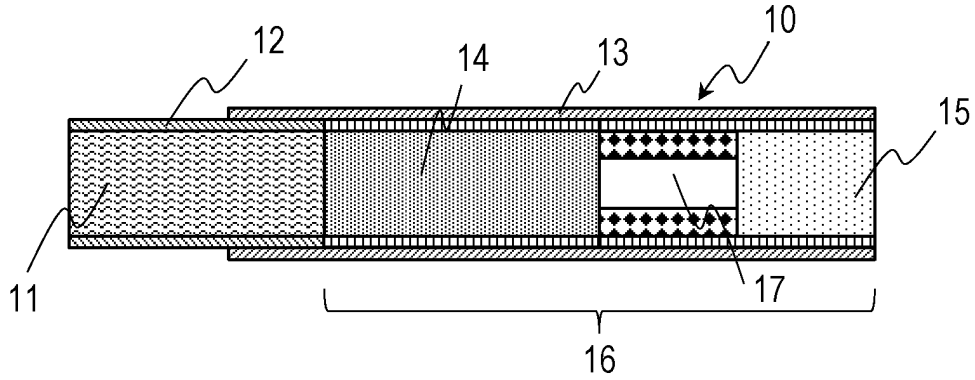


FIG. 3

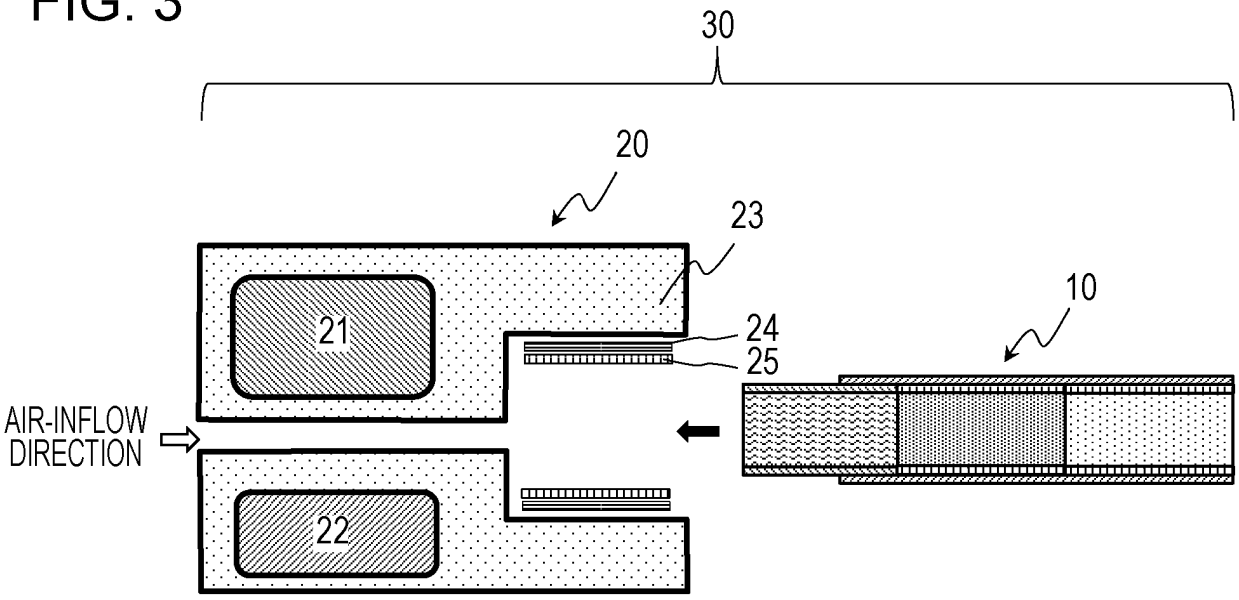


FIG. 4A

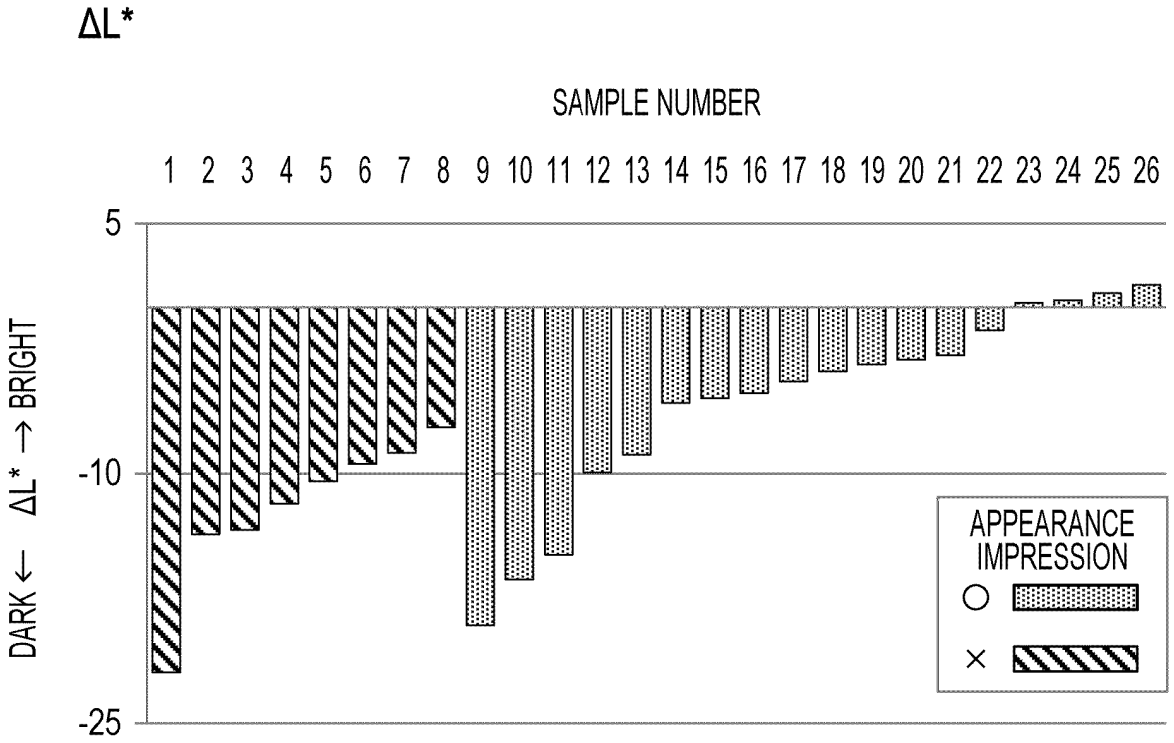

ΔL*
SAMPLE NUMBER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
5
-10
-25
DARK ← ΔL* → BRIGHT
APPEARANCE IMPRESSION
○
×

FIG. 4B

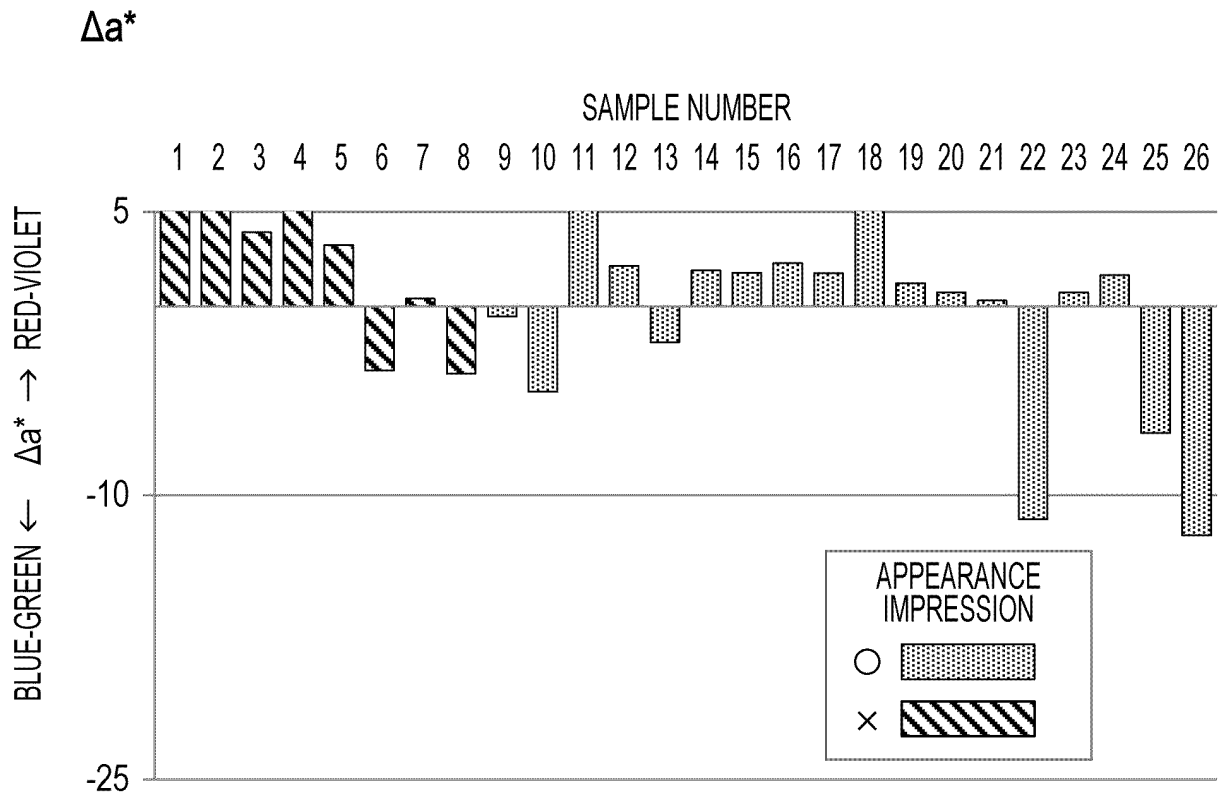

Δa*
SAMPLE NUMBER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
5
-10
-25
BLUE-GREEN ← Δa* → RED-VIOLET
APPEARANCE IMPRESSION
○
×

FIG. 4C

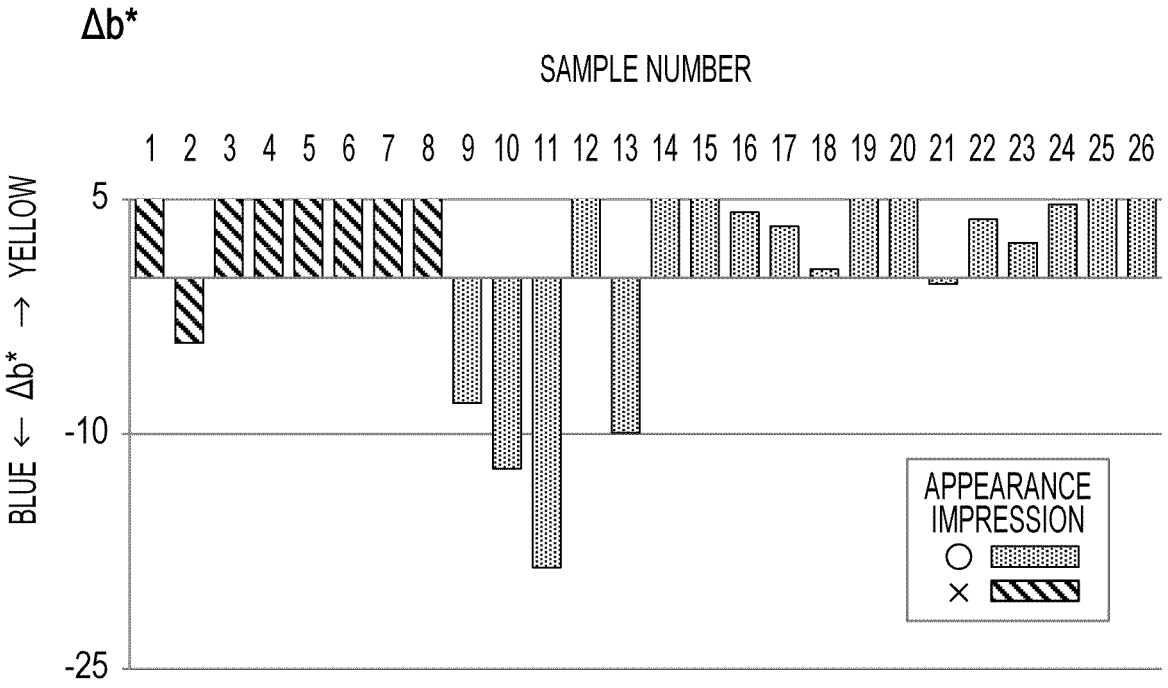

Δb*
SAMPLE NUMBER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
5
-10
-25
BLUE ← Δb* → YELLOW
APPEARANCE IMPRESSION
○
×

FIG. 5

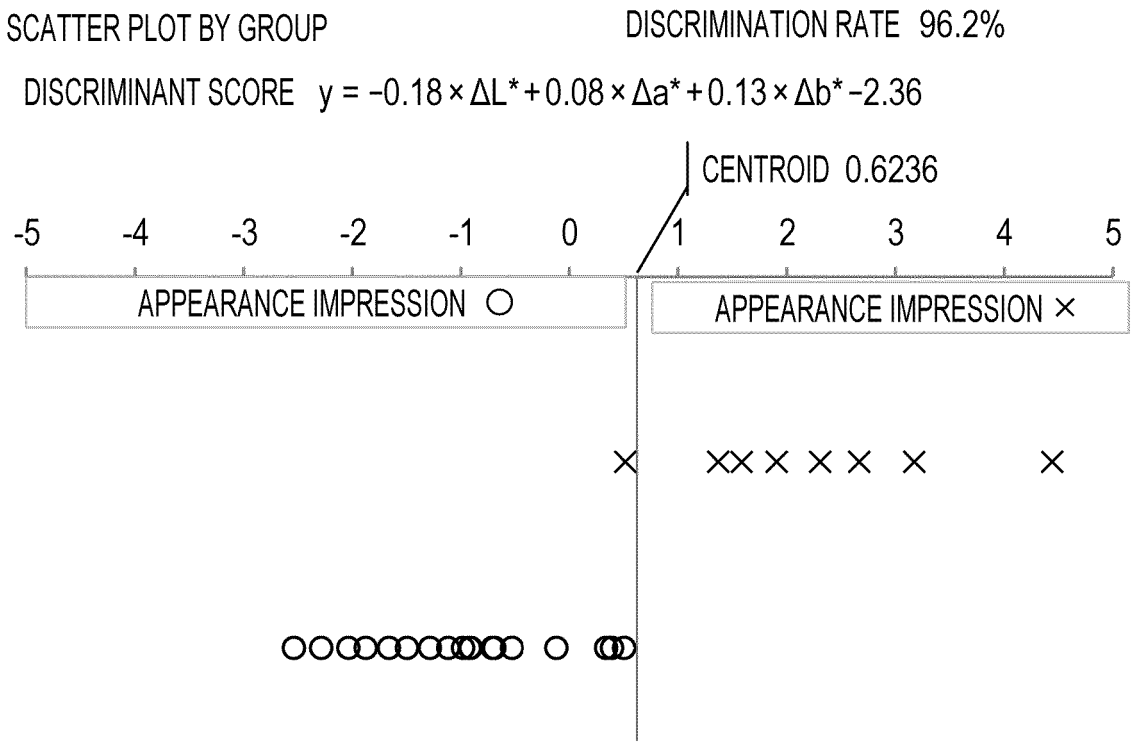

SCATTER PLOT BY GROUP
DISCRIMINATION RATE 96.2%
DISCRIMINANT SCORE y = −0.18 × ΔL* + 0.08 × Δa* + 0.13 × Δb* −2.36
CENTROID 0.6236
-5 -4 -3 -2 -1 0 1 2 3 4 5
APPEARANCE IMPRESSION ○
APPEARANCE IMPRESSION ×

FIG. 6

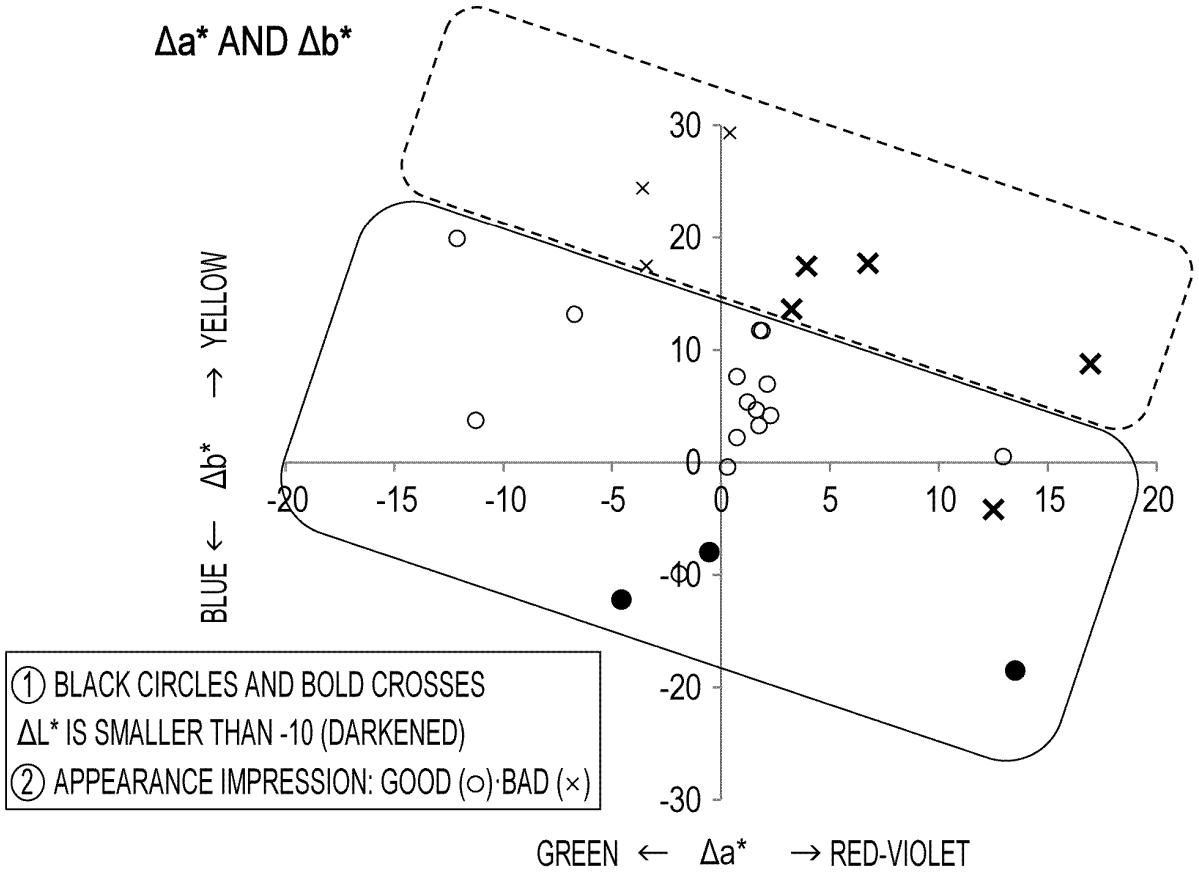
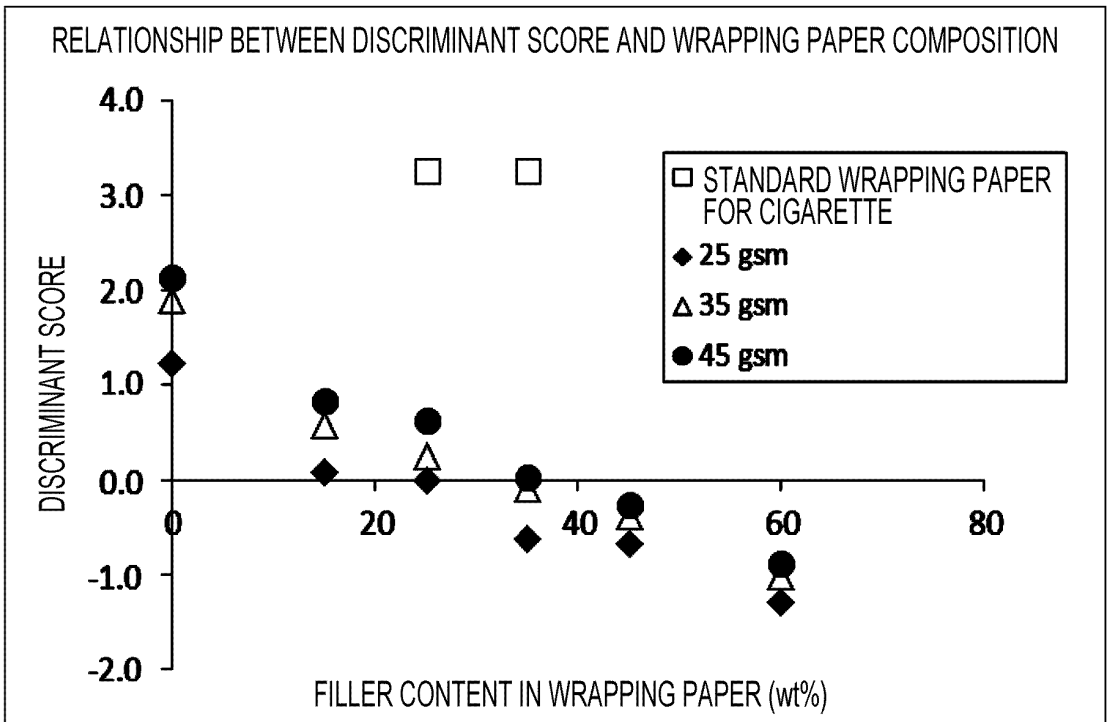

Δa* AND Δb*
30
20
10
0
-10
-20
-30
-20
-15
-10
-5
0
5
10
15
20
BLUE ← Δb* → YELLOW
GREEN ← Δa* → RED-VIOLET
① BLACK CIRCLES AND BOLD CROSSES
ΔL* IS SMALLER THAN -10 (DARKENED)
② APPEARANCE IMPRESSION: GOOD (○)·BAD (×)

FIG. 7


RELATIONSHIP BETWEEN DISCRIMINANT SCORE AND WRAPPING PAPER COMPOSITION
DISCRIMINANT SCORE
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
0
20
40
60
80
FILLER CONTENT IN WRAPPING PAPER (wt%)
STANDARD WRAPPING PAPER FOR CIGARETTE
25 gsm
35 gsm
45 gsm

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/028489

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. D21H27/00(2006.01)i, A24D1/02(2006.01)i, 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)
Int. Cl. A24D1/00-3/18, A24F47/00, D21B1/00-1/38, D21C1/00-11/14, D21D1/00-99/00, D21F1/00-13/12, D21G1/00-9/00, D21H11/00-27/42, D21J1/00-7/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
JSTPlus/JMEDPlus/JST7580 (JDreamIII)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	CN 106368069 A (CHINA TOBACCO MAUDUIT(JIANGMEN)PAPER IND, CO., LTD.) 01 February 2017, claims 1-11, paragraphs [0023], [0024], [0057]-[0059] (Family: none)	1-6 7, 8
Y	JP 2013-523094 A (PHILIP MORRIS PRODUCTS S.A.) 17 June 2013, claims, fig. 2 & WO 2011/117750 A2, claims, fig. 2 & US 2013/0146075 A1	7, 8
A	US 2007/0251658 A1 (GEDEVANISHVILI, Shalva) 01 November 2007 (Family: none)	1-8
A	CN 106480773 A (CHINA TOBACCO MAUDUIT(JIANGMEN)PAPER INDUSTRY, CO., LTD.) 08 March 2017 (Family: none)	1-8

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

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"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
17.10.2018	30.10.2018
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)