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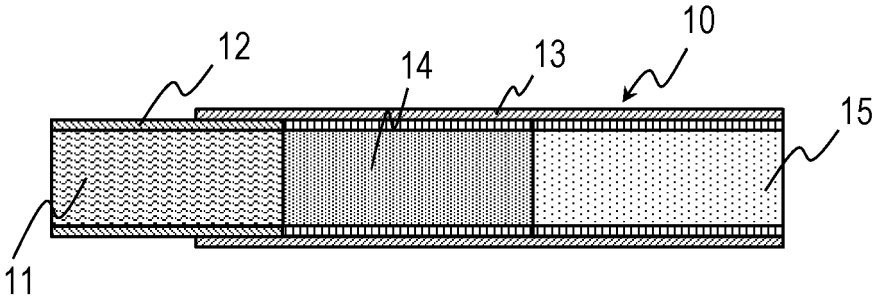
(54) **ROLLING PAPER FOR NON-COMBUSTION HEATING-TYPE SMOKING ARTICLE, NON-COMBUSTION HEATING-TYPE SMOKING ARTICLE, AND ELECTRIC HEATING-TYPE SMOKING SYSTEM**

(57) Provided is a wrapping paper for a non-combustion heating-type smoking article, the wrapping paper having a colored part in which a discriminant score, which is obtained by through substitution performed in formula (1) by using color difference values in a CIELab color system between before and after the wrapping paper is heated at 230° C for 3 minutes, exhibits a numerical value lower than 0.62. Formula (1): discriminant score (y) = $-0.18 \times \Delta L^* + 0.08 \times \Delta a^* + 0.13 \times \Delta b^* - 2.36$ (In formula (1), the color difference values in a 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. ΔL^* represents the difference in lightness L* between before and after heating the wrapping paper; Δa^* represents the difference in chromaticity a* between before and after heating the wrapping paper; and Δb^* represents the difference in chromaticity b* between before and after heating the wrapping 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.

[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 using a wrapping paper having a colored part having a discolored region in a specific range after heating to make 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] That is, the present inventors have found that the problem of unpleasant discoloration described above can be solved by using a paper having a region where the color difference before and after heating is small. 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 colored part that exhibits a specific numerical value when values of L*, a*, and b* before and after heating are substituted in the mathematical formula, the problem of unpleasant discoloration peculiar to non-combustion heating-type smoking articles can be solved.

[0009] 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).

[0010] Thus, the present invention is as follows.

[1] A wrapping paper for a non-combustion heating-type smoking article, the wrapping paper including a colored part having a discriminant score of lower than 0.62, 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).

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

(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 colored part is colored by printing.

[3] The wrapping paper for a non-combustion heating-type smoking article according to [1] or [2], wherein the wrapping paper contains pulp as a principal component and is formed of a mixed pulp of bleached pulp and unbleached pulp.

[4] The wrapping paper for a non-combustion heating-type smoking article according to [1] or [2], wherein the wrapping paper is formed of a sheet tobacco.

[5] The wrapping paper for a non-combustion heating-type smoking article according to any one of [1] to [4], wherein the colored part has a pre-heating L* value of 90 or less.

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

[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

[0011] 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

[0012]

[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 one aspect of an electric heating-type smoking system.

[Fig. 3A] Fig. 3A is a graph showing the relationship between ΔL^* values before and after heating and appearance impressions of paper samples.

[Fig. 3B] Fig. 3B is a graph showing the relationship between Δa^* values before and after heating and the appearance impressions of the paper samples.

[Fig. 3C] Fig. 3C is a graph showing the relationship between Δb^* values before and after heating and the appearance impressions of the paper samples.

[Fig. 4] Fig. 4 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. 5] Fig. 5 is a graph showing the relationship between the Δa^* values and the Δb^* values of the paper samples before and after heating.

Description of Embodiments

[0013] 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>

[0014] 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.

[0015] The wrapping paper according to an embodiment of the present invention has a colored part having a value of y (discriminant score) of smaller than 0.62, 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).

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

[0016] As long as the wrapping paper according to an embodiment of the present invention has a colored part having a discriminant score, as determined by substituting values of AL*, 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.

[0017] The above colored part 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).

[0018] The above colored part, when having a lower pre-heating L* value (when being darker and having a deeper color), tends to have a better appearance after heating. In a wrapping paper in one embodiment, the pre-heating L* value of the colored part may be 90 or less.

[0019] 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.

[0020] 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 colored part of a sample paper. The measurement is performed at randomly selected points in the colored 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 colored part where such a letter or logo is not present. The values of L*, a*, and b* can be measured by using a spectrophotometer.

[0021] 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.

[0022] To obtain a paper having a colored part having a discriminant score, as determined by the above formula (1), of smaller than 0.62 (also referred to as a paper having the above-described characteristics), any known method can be used.

[0023] For example, a wrapping paper having a colored part that exhibits a desired hue may be obtained by printing a conventionally used wrapping paper as described above or any other appropriate paper. That is, the colored part present on the wrapping paper according to an embodiment of the present invention may be provided by printing. When the colored part is provided on the wrapping paper by printing, the above-described characteristics can be easily imparted to the wrapping paper.

[0024] Examples of the method of printing include, but are not limited to, gravure printing and offset printing. By printing, the L* value of the colored part can be changed, for example, to 90 or less.

[0025] The printing may be performed throughout the paper used as a base paper, or in the surface of the base paper, at least a portion to be heated with the electric heating-type device described later may be printed as a colored part. The printed surface serving as a colored part can be used as a target for a discriminant analysis by the above formula (1). However, 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.

[0026] In the surface of the wrapping paper, at least a portion to be heated (portion subjected to heating with an electric heating-type device) is preferably a colored part having a discriminant score, as determined by the above formula (1), of smaller than 0.62. 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.

[0027] The colored part having a discriminant score, as determined by the above formula (1), of smaller than 0.62 may be provided by changing the composition of raw materials of the wrapping paper described later. Specifically, for example, the content of a loading material described later may be adjusted, shredded tobacco may be added to pulp, or unbleached pulp may be incorporated in an increased amount.

[0028] The basis weight of a base paper of the wrapping paper according to an embodiment of the present invention is, for example, typically 20 g/m^2 or more, preferably 35 g/m^2 or more, more preferably 40 g/m^2 or more. The basis

weight is typically 65 g/m^2 or less, preferably 50 g/m^2 or less.

[0029] 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.

[0030] The shape of the wrapping paper for a non-combustion-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

[0031] 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

[0032] 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.

[0033] 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.

[0034] The pulp may be formed of, for example, a mixed pulp of bleached pulp and unbleached pulp.

[0035] When the pulp is formed only of bleached pulp, a paper colored by printing can also be used.

[0036] Spruce, which is softwood, and poplar, which is hardwood, are provided as bleached pulp, and pine is provided as unbleached pulp. The bleached pulp and the unbleached pulp at a desired ratio are placed in a pulper, and these pulps were disintegrated. Subsequently, the disintegrated pulps are transferred to a refiner and beaten in the refiner. Calcium carbonate serving as a loading material and a flocculant serving as a production aid are separately provided, and these are mixed with the beaten pulp. Alternatively, the bleached pulp and the unbleached pulp may each independently be disintegrated using different pulpers and beaten in different refiners, and the beaten bleached pulp, the beaten unbleached pulp, a loading material, and a production aid may be mixed together in a mixing box.

[0037] Next, in a papermaking process using a Fourdrinier paper machine, a cylinder paper machine, a cylinder-tanmo complex paper machine, or the like, the texture of the mixed pulp was arranged to be uniform, thereby producing a 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.

[0038] When bleached pulp and unbleached pulp are used as a mixture, the proportion of the unbleached pulp in the wrapping paper is, for example, preferably 1 wt% or more and 90 wt% or less, more preferably 5 wt% or more and less than 86 wt%, still more preferably 5 wt% or more and 60 wt% or less.

[0039] In addition to the above-described pulps, the wrapping paper according to an embodiment of the present invention may contain a loading material. The content of the loading material may be, for example, 30 wt% or more and less than 60 wt% based on the total weight of the wrapping paper according to an embodiment of the present invention.

[0040] As the loading material, calcium carbonate, titanium dioxide, kaolin, or the like can be used, and in terms of, for example, smoke taste, calcium carbonate is preferably used.

[0041] A paper containing such a loading material typically exhibits a white-based bright color. For such a paper to have a discriminant score, as determined by the above formula (1), of smaller than 0.62, for example, a dye for decreasing lightness, such as a black-based, brown-based, dark-red-based, dark-green-based, or dark-blue-based dye, and/or a dye may be added. It is more preferable to use a pigment that is less likely to discolor upon heating.

[0042] The wrapping paper formed of a mixed pulp typically has a color attributed to unbleached pulp. The above-described printing may be performed on the wrapping paper formed of a mixed pulp to further impart a color.

[0043] A sheet tobacco formed of regenerated tobacco may be used as the wrapping paper according to an embodiment of the present invention.

[0044] Examples of the sheet tobacco include a papermaking sheet tobacco obtained by a papermaking process and a slurry sheet tobacco obtained by drying a slurry

[0045] A typical process for producing a papermaking sheet tobacco may include a step of subjecting natural tobacco materials (e.g., leaves, shreds, midribs, stems, and roots) to an extraction operation using an extraction solvent such as water, a step of separating the extract obtained by the extraction operation and the residue from each other, a step of subjecting the residue to papermaking to produce a regenerated tobacco web, and a step of adding back the extract optionally subjected to a fractionation operation onto the regenerated web. Such a production process is described, for

example, in International Publication No. 2004/098323 as a wet papermaking process.

[0046] A slurry sheet tobacco can be produced, for example, by a method described in Japanese Unexamined Patent Application Publication No. 11-266851. A raw material slurry contains a wood pulp mixed and defibrated in water, tobacco powder, and a binder. The raw material slurry is extruded from a slurry feeder to the nip between a belt conveyor and a roller and stretched into a sheet form on the belt conveyor. The raw material slurry in the sheet form on the belt conveyor is then conveyed to a drying furnace and dried while passing through the inside of the drying furnace to form a sheet tobacco.

[0047] When a sheet tobacco is used as the wrapping paper according to an embodiment of the present invention, the basis weight thereof is, for example, in the range of 30 to 80 g/m^2, and the air permeability thereof is, for example, 0 to 60.0 CU (CORESTA Unit).

[0048] Another method for producing a sheet tobacco is a dry papermaking process described, for example, in Japanese Unexamined Patent Application Publication No. 61-52269, and the sheet tobacco obtained by this method is formed of a wood pulp fiber, an adhesive, and a tobacco stem portion.

[0049] The sheet tobacco typically has a color attributed to tobacco materials, and may be colored by adding a dye or a pigment and further performing printing.

[0050] The wrapping paper according to an embodiment of the present invention may, but not necessarily, contain a combustion improver contained in a conventional wrapping paper for a tobacco rod. 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 the non-combustion heating-type smoking article described below.

<Non-combustion heating-type smoking article>

[0051] 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.

[0052] 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.

[0053] 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.

[0054] 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.

[0055] 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 aerosol.

[0056] 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 aerosol.

[0057] The paper tube portion 14 may be, for example, a thick paper processed into cylindrical form.

[0058] 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.

[0059] 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 generated aerosol and can also improve the appearance of the non-combustion heating-type smoking article.

[0060] 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.

[0061] 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.

[0062] 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 content of the filler in the tobacco rod may be 200 to 400 mg/rod, preferably 250 to 320 mg/rod. The water content of the filler may be 10 to 15 wt%, 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.

[0063] 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.

[0064] 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.

[0065] Alternatively, the above sheet may be subjected to gathering without being shredded and used as the filler.

[0066] The filler contains an aerosol-source material that generates aerosol. 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.

[0067] The content of the aerosol-source material in the filler is not particularly limited, and to sufficiently generate 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.

[0068] 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)-fumnone, 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.

[0069] 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.

[0070] The filling 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 filling 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.

[0071] 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.

[0072] 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.

[0073] 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 aerosol.

<Electric heating-type smoking system>

[0074] One aspect of an electric heating-type smoking system is illustrated in Fig. 2. 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.

[0075] 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.

[0076] 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. 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.

[0077] 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.

[0078] As a result of being heated by the heater 24, the tobacco rod is heated approximately to 150°C to 250°C.

[0079] 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.

[0080] 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-type smoking article 10 to reach inside the oral cavity of a user.

EXAMPLES

[0081] The present invention will be described in more detail 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>

[0082] 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.

[0083] The details thereof are shown in Table 1 below.

[Table 1]

No.	Name	Feature
1	standard cigarette wrapping paper	28 gsm (bleached pulp + $CaCO_3$)
2	printed paper	gravure printed, pale yellow
3	printed paper	gravure printed, gray
4	printed paper	gravure printed, pale green
5	standard cigarette tipping paper	37 gsm (bleached pulp + $CaCO_3$)
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
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>

[0084] 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 3 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 1 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>

[0085] 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.

[0086] The measurement was performed repeatedly 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.

[0087] 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 Z8781-4 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>

[0088] 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 $\times$, and when the number was less than 11, the appearance impression of the sample was evaluated as O. The results thereof were used for analysis.

<Analysis>

[0089] There was no relationship between ΔL*, Δa*, and Δb* values before and after heating and the superiority and inferiority in appearance impression (Figs. 3A to 3C).

[0090] 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*a*b* 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: $\times$ (bad)
Discriminant score of less than 0.62: O (good)

[0091] Formula (1) means that the appearance impression after heating is almost determined by ΔL*a*b*, which is 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.
The results are summarized in Fig. 4.

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

(1) Forward-backward stepwise P-value: inclusion, 0.2; removal, 0.2

(2) Analysis is performed excluding linearly combined variables.

[0093] Fig. 5 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 have relatively large L* values before heating and small a* and b* values, that is, are bright and have 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 " O" 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 O 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 before heating and large a* and b* values, 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 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.

Reference Signs List

[0101]

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
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 colored part having a discriminant score of lower than 0.62, the discriminant score being obtained by substituting color differences in the CIELab color system between before and after heating at an article temperature of 230°C for 3 minutes into formula (1):

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

(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 colored part is colored by printing.

3. The wrapping paper for a non-combustion heating-type smoking article according to Claim 1 or 2, wherein the wrapping paper contains pulp as a principal component and is formed of a mixed pulp of bleached pulp and unbleached pulp.

4. The wrapping paper for a non-combustion heating-type smoking article according to Claim 1 or 2, wherein the wrapping paper is formed of a sheet tobacco.

5. The wrapping paper for a non-combustion heating-type smoking article according to any one of Claims 1 to 4, wherein the colored part has a pre-heating L* value of 90 or less.

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

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

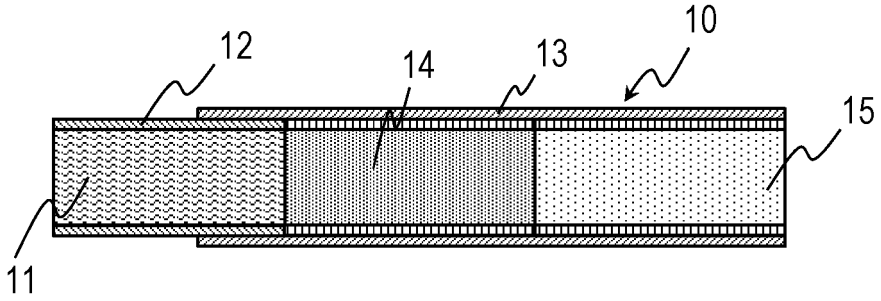


FIG. 2

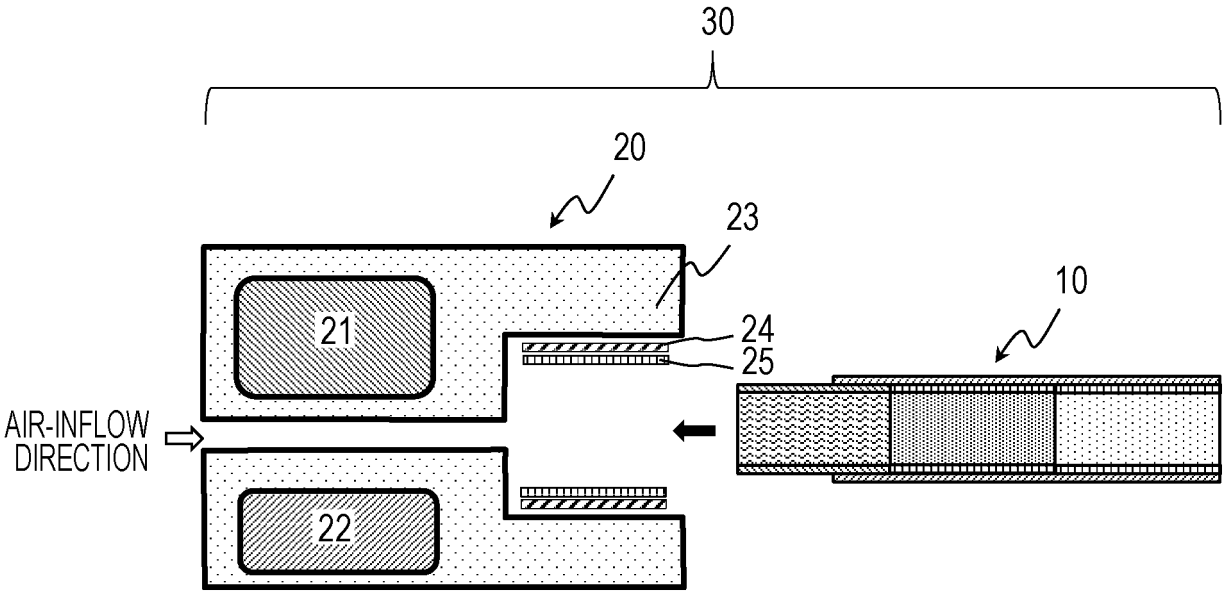


FIG. 3A

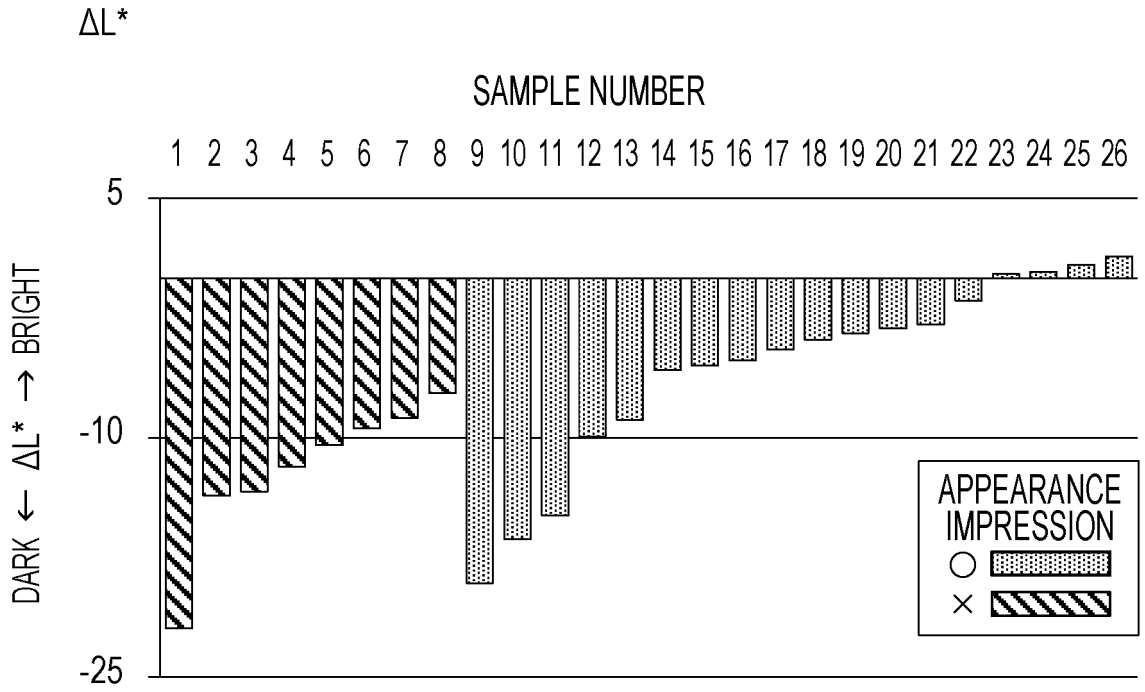

ΔL*
SAMPLE NUMBER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
5
-10
-25
DARK ← ΔL* → BRIGHT
APPEARANCE IMPRESSION
○
×

FIG. 3B

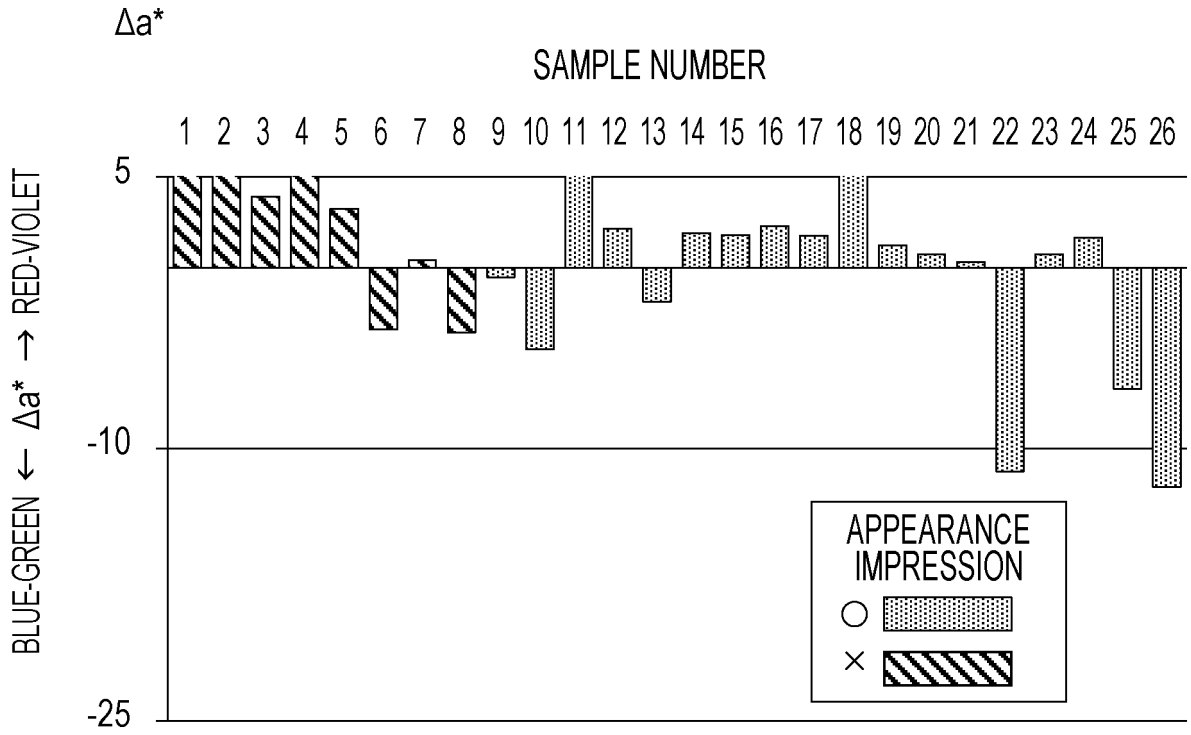

Δa*
SAMPLE NUMBER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
5
-10
-25
BLUE-GREEN ← Δa* → RED-VIOLET
APPEARANCE IMPRESSION
○
×

FIG. 3C

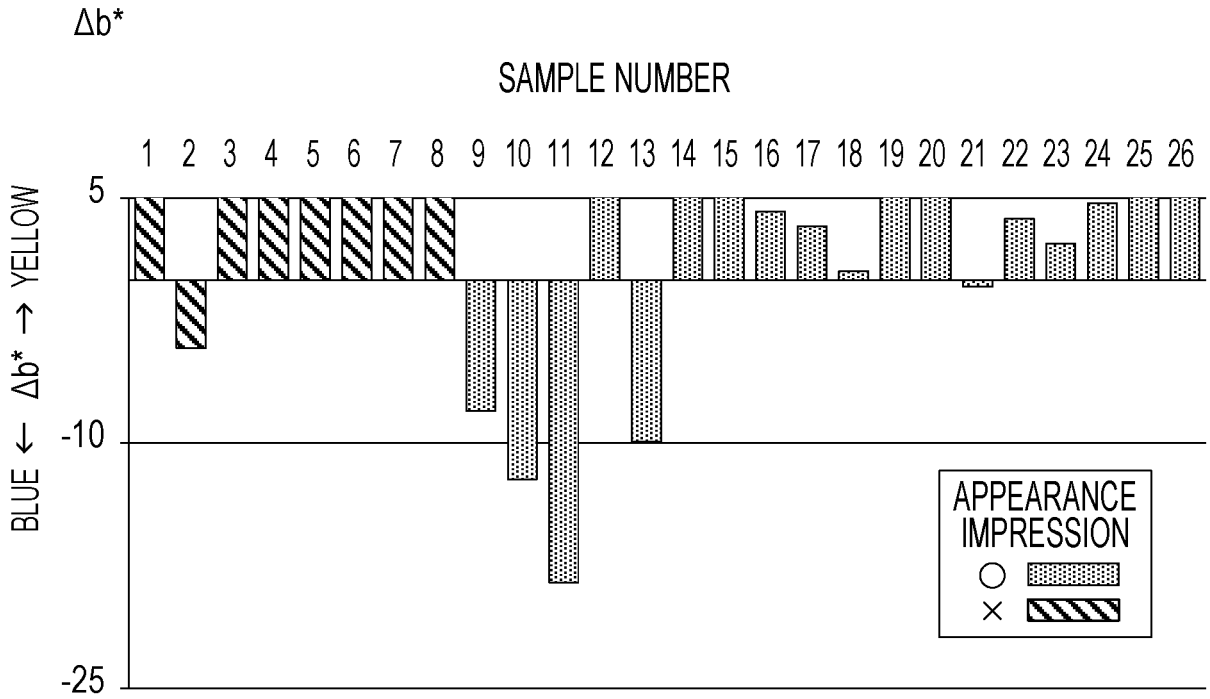

Δb*
SAMPLE NUMBER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
5
-10
-25
BLUE ← Δb* → YELLOW
APPEARANCE IMPRESSION
○
×

FIG. 4

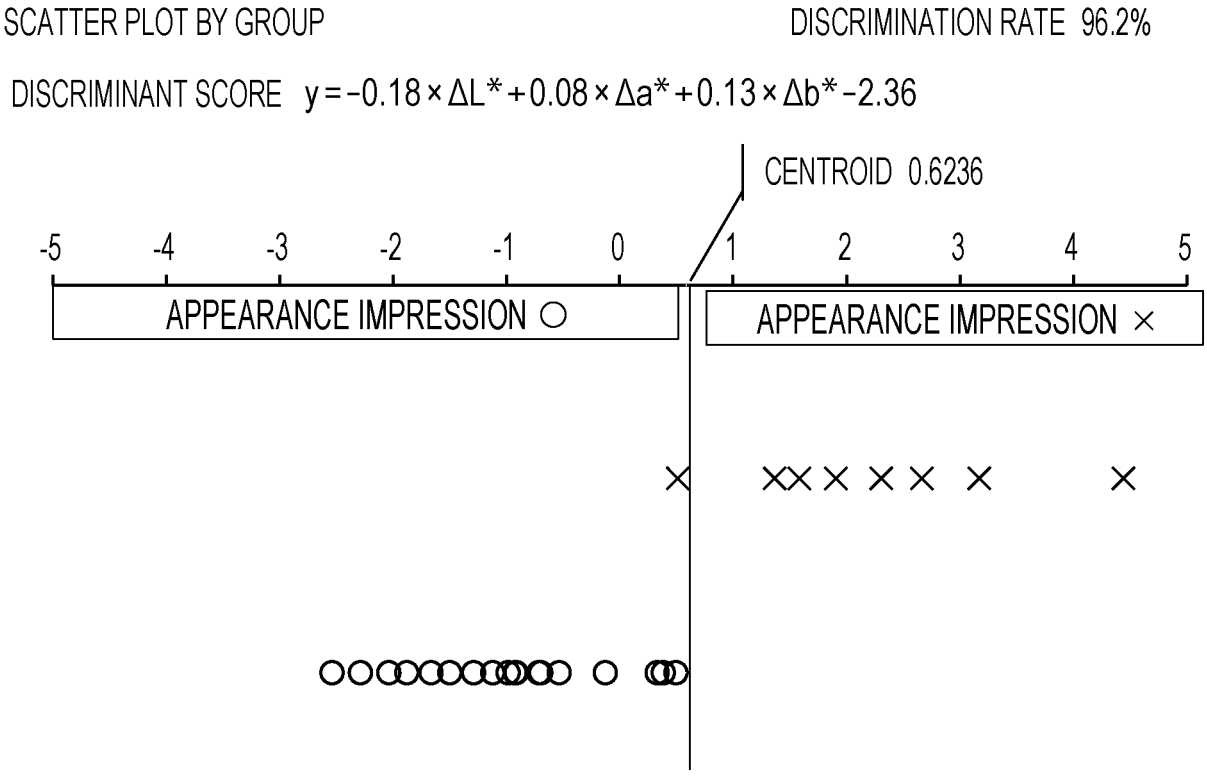
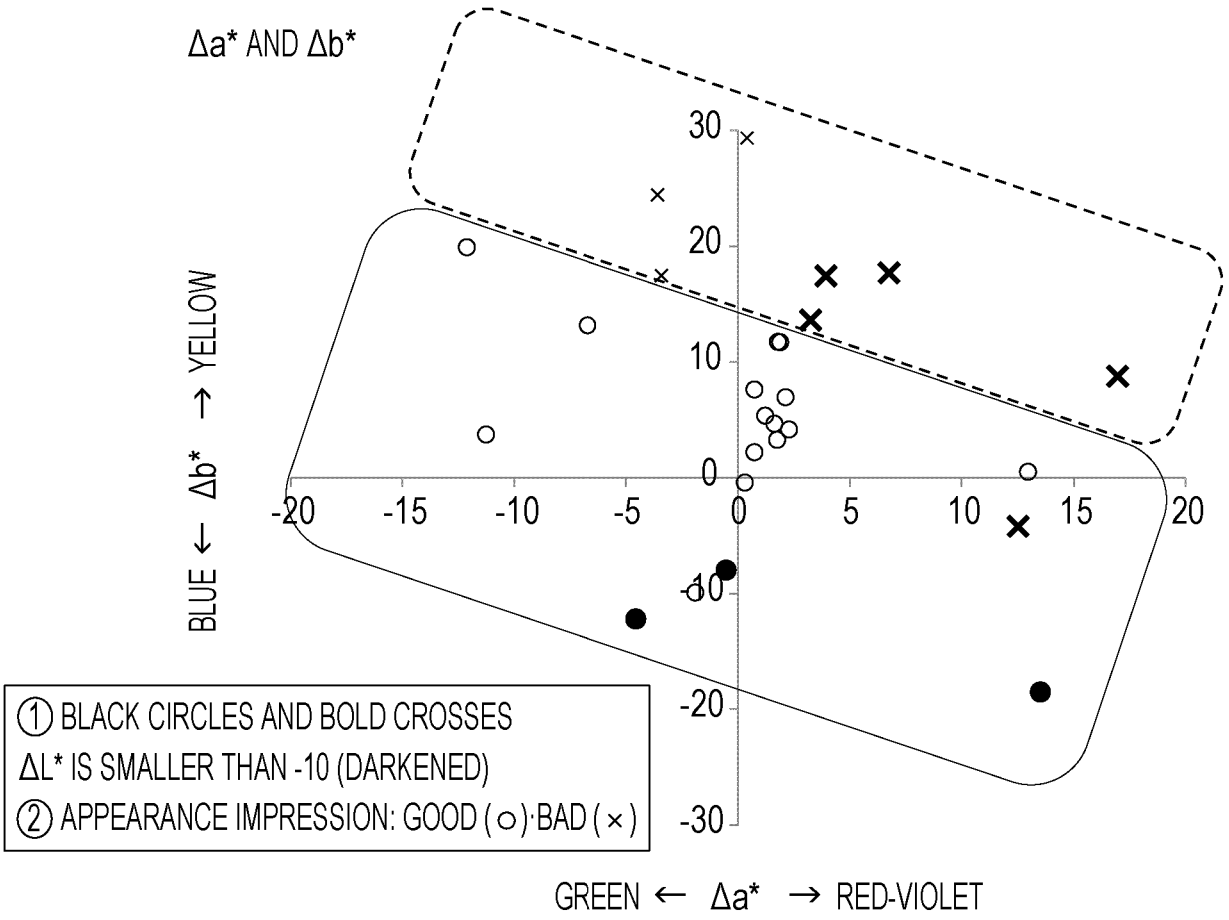

SCATTER PLOT BY GROUP
DISCRIMINATION RATE 96.2%
DISCRIMINANT SCORE y = −0.18 × ΔL* + 0.08 × Δa* + 0.13 × Δb* − 2.36
CENTROID 0.6236
-5 -4 -3 -2 -1 0 1 2 3 4 5
APPEARANCE IMPRESSION ○
APPEARANCE IMPRESSION ×

FIG. 5


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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/020556

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.
A	JP 2013-523094 A (PHILIP MORRIS PRODUCTS S.A.) 17 June 2013, & US 2013/0146075 A1 & WO 2011/117750 A2 & CN 102821625 A & KR 10-2013-0007621 A	1-8
A	JP 2016-538850 A (PHILIP MORRIS PRODUCTS S.A.) 15 December 2016, & US 2016/0309782 A1 & WO 2015/082651 A1 & CN 105764367 A & KR 10-2016-0096076 A	1-8
A	JP 2016-527893 A (PHILIP MORRIS PRODUCTS S.A.) 15 September 2016, & US 2016/0135495 A1 & WO 2015/022319 A1 & CN 105451581 A & KR 10-2016-0041896 A	1-8

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

* Special categories of cited documents:
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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
20.08.2018	28.08.2018
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REFERENCES CITED IN THE DESCRIPTION

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