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(54) BASE PAPER FOR TRANSLUCENT PAPER, TRANSLUCENT PAPER, AND METHOD FOR MANUFACTURING TRANSLUCENT PAPER

(57) The present invention aims to provide base paper used in translucent paper which is obtained by impregnation with a resin which makes a translucent region, translucent paper using a base paper, and a method for producing translucent paper. Base paper for translucent paper in which a region impregnated with a material which makes a translucent region becomes translucent, wherein the base paper for translucent paper mainly contains a softwood chemical pulp and a hardwood chemical pulp; wherein a ratio of the softwood chemical pulp to the hardwood chemical pulp is in a range from 75:25 to 51:49; wherein a basis weight is in a range from 40 to 100 g/m^2, and wherein an air permeability is in a range from 10 to 40 seconds.

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Description

TECHNICAL FIELD

[0001] The present invention relates to base paper for translucent paper, translucent paper, and a method for manufacturing translucent paper. More specifically, the present invention relates to translucent paper that can be used for packaging paper, printing paper, publishing paper, information paper, and the like, and has a partial or entire region made translucent, base paper used in the translucent paper, and a method for manufacturing translucent paper.

BACKGROUND ART

[0002] Paper packages such as envelopes and product packages may have a window through which an addressee and contents can be seen from the outside. A transparent resin film or glassine paper may be attached to the window. From the viewpoint of recycling resources, it is preferable to use glassine paper.

[0003] Glassine paper is translucent paper obtained by finely beating pulp to produce paper and subjecting the produced paper to a high-pressure calendaring process, and is known in the art. Glassine paper is not strong enough to be used as a package such as an envelope, so its applications are limited, such as being attached only to the window of an envelope. As a method for producing translucent paper to replace glassine paper, a method of impregnating spaces between the fibers of paper with a resin which makes a translucent region has been proposed (for example, Patent Documents 1 to 4). By impregnating the spaces between the cellulose fibers of paper with a resin which makes a translucent region, the transparency of the translucent region impregnated with the resin which makes a translucent region can be increased. Since translucent paper has superior strength to glassine paper, the translucent paper can also be used as a package such as an envelope.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0004]

Patent document 1: Japanese Unexamined Patent Application, First Publication No. Sho 61-132698
Patent document 2: Japanese Unexamined Patent Application, First Publication No. Sho 61-132699
Patent document 3: Japanese Unexamined Patent Application, First Publication No. 2018-9047
Patent document 4: Japanese Unexamined Patent Application, First Publication No. 2021-91481

SUMMARY OF INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005] However, it was found that sufficient quality cannot be achieved by merely impregnating with a resin which makes a translucent region, and that base paper used affects the quality. The present invention provides base paper used in translucent paper which is obtained by impregnation with a resin which makes a translucent region, translucent paper using base paper, and a method for producing translucent paper.

MEANS FOR SOLVING THE PROBLEM

[0006] In order to solve the above problems, the present invention has the following configurations.

[1] Base paper for translucent paper in which a region impregnated with a material which makes a translucent region becomes translucent,

wherein the base paper for translucent paper mainly contains a softwood chemical pulp and a hardwood chemical pulp;
wherein a ratio of the softwood chemical pulp to the hardwood chemical pulp is in a range from 75:25 to 51:49;
wherein a basis weight is in a range from 40 to 100 g/m^2, and
wherein an air permeability is in a range from 10 to 40 seconds.

[2] The base paper for translucent paper according to [1],

wherein the basis weight is in a range from 40 to 75 g/m^2.
[3] The base paper for translucent paper according to [1] or [2],

wherein a Canadian Standard Freeness of the softwood chemical pulp is in a range from 400 to 700 mL, and
wherein a Canadian Standard Freeness of the hardwood chemical pulp is in a range from 350 to 650 mL.

[4] The base paper for translucent paper according to [1] or [2],
wherein a Parker Print Surf smoothness of at least one surface thereof is 5 μm or less.
[5] Translucent paper having a translucent region in which a material which makes a translucent region is impregnated in at least a part of base paper for translucent paper,

wherein the base paper mainly contains a softwood chemical pulp and a hardwood chemical pulp;
wherein a ratio of the softwood chemical pulp to the hardwood chemical pulp is in a range from 80:20 to 51:49;
wherein a basis weight of the base paper is in a range from 40 to 100 g/m^2; and
wherein an air permeability of the base paper is in a range from 10 to 40 seconds.

[6] The translucent paper according to [5],
wherein a density of the translucent region is in a range from 0.7 to 2.5 g/cm^3.
[7] The translucent paper according to [5] or [6],
wherein the basis weight of the base paper for translucent paper is in a range from 40 to 75 g/m^2.
[8] The translucent paper according to [5] or [6],

wherein a luminous transmittance (T50) of the translucent region under measurement condition 1 below is 20% or more,
[measurement condition 1]
a luminous transmittance measuring device with a gap of at least 50 mm between a light-projecting part and a light-receiving part is used, the translucent region of the translucent paper is used as a sample, and the luminous transmittance (T50) of the translucent region of the translucent paper is measured by placing the sample such that one side of the sample is in contact with the light-projecting part.

[9] The translucent paper according to [5] or [6],

wherein the translucent region has a luminous transmittance ratio of 44 or more under the following measurement condition 2,
[measurement condition 2]
a luminous transmittance measuring device with a gap of at least 50 mm between a light-projecting part and a light-receiving part is used, the translucent region of the translucent paper is used as a sample, a luminous transmittance (T50) of the translucent region of the translucent paper is measured by placing the sample such that one side of the sample is in contact with the light-projecting part, a luminous transmittance (T0) of the translucent region of the translucent paper is measured by placing the sample such that the other side of the sample is in contact with the light-receiving part, and a luminous transmittance ratio is calculated using the following formula 1:
Formula 1: luminous transmittance ratio = (T50 / T0) x 100

[10] A method for producing translucent paper, including:

impregnating and coating at least a part of base paper for translucent paper with a material which makes a translucent region,
wherein the base paper mainly contains a softwood chemical pulp and a hardwood chemical pulp, a ratio of the softwood chemical pulp to the hardwood chemical pulp is in a range from 80:20 to 51:49, a basis weight of the base paper is in a range from 40 to 100 g/m^2, and an air permeability of the base paper is in a range from 10 to 40 seconds.

[11] The method for producing translucent paper according to [10],
wherein a basis weight of the base paper for a translucency is in a range from 40 to 75 g/m^2.
[12] The method for producing translucent paper according to [10] or [11],
wherein a Parker Print Surf smoothness of one side of the base paper for translucent paper is 5 μm or less, and the other side is impregnated with a material which makes a translucent region.
[13] The method for producing translucent paper according to [10] or [11],

wherein a Canadian Standard Freeness of the softwood chemical pulp is in a range from 400 to 700 mL; and
wherein a Canadian Standard Freeness of the hardwood chemical pulp is in a range from 350 to 650 mL.

EFFECTS OF THE INVENTION

[0007] According to the present invention, it is possible to provide base paper for translucent paper, which can provide translucent paper with excellent transparency, visibility, and recycling suitability by impregnating with a resin which makes a translucent region, translucent paper with excellent transparency, visibility, and recycling suitability by impregnating with a resin which makes a translucent region, and a method for manufacturing translucent paper.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

[FIG.1] FIG. 1 is a plan view showing an embodiment of translucent paper.
[FIG. 2] FIG. 2 is a diagram showing an I-I cross section of the translucent paper shown in FIG. 1.
[FIG. 3] FIG. 3 is a diagram showing an I-I cross section of another embodiment of translucent paper shown in FIG. 1.
[FIG. 4] FIG. 4 is an explanatory diagram schematically showing that a transparent resin film has excellent visibility.
[FIG. 5] FIG. 5 is an explanatory diagram schematically showing that the visibility of conventional translucent paper, and the like is insufficient.
[FIG. 6] FIG. 6 is an explanatory diagram schematically showing a method for measuring a luminous transmittance.
[FIG. 7] FIG. 7 is an explanatory diagram schematically showing a method for measuring a luminous transmittance ratio.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

(Base paper for translucent paper)

[0009] The base paper for translucent paper of the present invention becomes translucent paper in which an impregnated region is translucent by impregnating it with a material which makes a translucent region. The material which makes a translucent region may be impregnated in the entire region of the base paper for translucent paper when viewed in a plane, or in a partial region. There is no particular limit to the shape or number of regions. In the region impregnated with the material which makes a translucent region, the material which makes a translucent region penetrates in the thickness direction of the base paper for translucent paper, and the material which makes a translucent region fills as many gaps inside the paper as possible, making the paper translucent.

[0010] Note that "translucent" refers to the opacity of the paper after processing being lower than the opacity of the paper before processing, and although there is no particular limit, "translucent" refers to a region after processing with an opacity of 4 to 25%.

[0011] The base paper for translucent paper is paper of which the main components region is softwood chemical pulp and hardwood chemical pulp. Examples of the softwood chemical pulp include unbleached softwood kraft pulp (NUKP), bleached softwood kraft pulp (NBKP), semi-bleached softwood kraft pulp (NSBKP), unbleached softwood sulfite pulp (NUSP), bleached softwood sulfite pulp (NBSP), and semi-bleached softwood sulfite pulp (NSBSP).

[0012] Examples of the hardwood chemical pulp include unbleached hardwood kraft pulp (LUKP), bleached hardwood kraft pulp (LBKP), semi-bleached hardwood kraft pulp (LSBKP), unbleached hardwood sulfite pulp (LUSP), bleached hardwood sulfite pulp (LBSP), and semi-bleached hardwood sulfite pulp (LSBSP).

[0013] Among these, a combination of bleached softwood kraft pulp (NBKP) and bleached hardwood kraft pulp (LBKP) is preferable.

[0014] In the base paper for translucent paper of the present invention, the blending ratio of the softwood chemical pulp to the hardwood chemical pulp is 80:20 to 51:49. A preferable blending ratio is 75:25 to 55:45, and a more preferable blending ratio is 70:30 to 60:40. By specifying the ratio of the softwood chemical pulp to the hardwood chemical pulp, it is possible to obtain translucent paper with a good balance between transparency and recyclability.

[0015] Since the softwood chemical pulp has a longer and thicker fiber structure than the hardwood chemical pulp, blending a large amount of the softwood chemical pulp results in base paper with a high porosity, which can efficiently impregnate the material which makes a translucent region. On the other hand, the hardwood chemical pulp has a thin and short fiber structure, which improves the texture of the paper. Therefore, by using the blending ratio above, the porosity of the base paper and the texture of the translucent paper can be compatible. In addition, since the hardwood chemical pulp has a thin and short fiber structure, it is easily covered by the resin contained in the material which makes a translucent region, so it is preferable to adjust the blending amount of the hardwood chemical pulp in consideration of the ease of

defibration when recycling it as waste paper.

[0016] The Canadian Standard Freeness of the softwood chemical pulp is preferably 400 to 700 mlCSF. The Canadian Standard Freeness is more preferably 420 to 650 mlCSF, and even more preferably 450 to 600 mlCSF. When the Canadian Standard Freeness of the softwood chemical pulp is equal to or greater than the lower limit of the range above, the gaps in the base paper for translucent paper can be maintained, and the impregnation of the material which makes a translucent region is excellent. When the Canadian Standard Freeness of the softwood chemical pulp is equal to or less than the upper limit of the range above, the texture of the base paper for translucent paper can be improved, and translucent paper having a translucent region with excellent transparency and visibility can be easily obtained.

[0017] The Canadian Standard Freeness of the hardwood chemical pulp is preferably 350 to 650 ml CSF. The Canadian Standard Freeness is more preferably 370 to 630 ml CSF, and even more preferably 400 to 600 ml CSF. When the Canadian Standard Freeness of the hardwood chemical pulp is equal to or greater than the lower limit of the range above, the strength of the base paper for translucent paper can be increased. When the Canadian Standard Freeness of the hardwood chemical pulp is equal to or less than the upper limit of the range above, the texture of the base paper for translucent paper can be improved, and it is easy to obtain translucent paper having a translucent region with excellent transparency and visibility.

[0018] In addition, it is preferable that the Canadian Standard Freeness of the softwood chemical pulp be higher than that of the hardwood chemical pulp, since the strength and transparency of the paper are excellent. The Canadian Standard Freeness of pulp is measured according to JIS P8121-2:2012. In glassine paper, which is generally known as translucent paper, a chemical pulp with a high degree of beating, for example, a chemical pulp with a Canadian Standard Freeness of 250 ml CSF or less, is used. However, since the pulp fibers with a high degree of beating are ground and cut, they are difficult to apply to applications such as packaging bags that require strength, even if they are used for transparent windows of envelopes, for example.

[0019] Pulps other than the softwood chemical pulp and the hardwood chemical pulp can be used in combination as long as the effects of the present invention are not impaired. Examples of the pulp include mechanical pulp, thermomechanical pulp, deinked pulp, nonwood pulp, and synthetic pulp.

[0020] The basis weight of the base paper for translucent paper is 40 to 100 g/m^2. The basis weight is preferably 40 to 80 g/m^2, more preferably 40 to 75 g/m^2, more preferably 43 to 70 g/m^2, and even more preferably 45 to 65 g/m^2.

[0021] When the basis weight of the base paper for translucent paper is equal to or greater than the lower limit of the range above, the base paper has sufficient strength, making the translucent paper suitable for applications such as packaging paper and printing paper. When the basis weight of the base paper for translucent paper is equal to or lower than the upper limit of the range above, the transparency of the translucent paper can be increased. Basis weight is measured in accordance with JIS P8 124.

[0022] **In** the present invention, the air permeability of the base paper for translucent paper is 10 to 40 seconds. The air permeability is preferably 12 to 35 seconds, and more preferably 15 to 33 seconds. When the air permeability of the base paper is equal to or greater than the lower limit of the range above, the base paper has sufficient strength, and the translucent paper is suitable for applications such as packaging paper and printing paper. When the air permeability of the base paper is equal to or lower than the upper limit of the range above, the permeability of the material which makes a translucent region is excellent, and the transparency of the translucent paper can be increased. The air permeability is measured according to the Oken air permeability method in accordance with J. TAPPI-5-2:2000.

[0023] The density of the base paper for translucent paper is preferably 0.5 to 0.85 g/cm^3, and more preferably 0.6 to 0.8 g/cm^3. When the density of the base paper is equal to or greater than the lower limit of the range above, the base paper has sufficient strength, and the translucent paper is suitable for applications such as packaging paper and printing paper. When the density of the base paper is equal to or less than the upper limit of the range above, the permeability of the material which makes a translucent region is excellent, and the transparency of the translucent paper can be increased. The density is measured according to JIS P8118.

[0024] The porosity of the base paper for translucent paper is preferably 30 to 80%, more preferably 40 to 70%, and even more preferably 50 to 70%. When the porosity of the base paper for translucent paper is equal to or greater than the lower limit of the range above, the transparency of the translucent region is easily increased. When the porosity of the base paper for translucent paper is equal to or less than the upper limit of the range above, the physical strength of the translucent paper is less likely to decrease. The porosity of the paper substrate is calculated by dividing the density measured according to JIS P8118 by the true density of cellulose, which is 1.50.

[0025] The Parker Print Surf smoothness of at least one surface of the base paper for translucent paper is preferably 7 μm or less, and more preferably 5 μm or less. There is no particular limit to the lower limit. The smaller the value, the smoother the paper. The Parker Print Surf smoothness can evaluate the smoothness of fine details, and the smaller this value, the more the light scattering on the paper surface can be reduced, so that the visibility through the translucent region can be improved. The Parker Print Surf smoothness is the Parker Print Surf smoothness (soft backing/clamp pressure 500 kPa) obtained in accordance with ISO 8791-4:1992.

[0026] In addition to pulp, the base paper for translucent paper can be appropriately blended with known papermaking

auxiliaries such as paper strengthening agents, sizing agents, fillers, colorants, and the like. Since the blending of fillers works to increase the concealing properties of the paper, it is preferable to limit the blending to a range that does not impair transparency and visibility, and it is more preferable that the base paper for translucent paper not contain fillers.

[0027] The method for producing the base paper for translucent paper is not particularly limited. For example, the method may include a step of beating pulp, which is a raw material for the base paper for translucent paper, a step of papermaking using a pulp slurry containing the beaten pulp, and a step of drying the wet sheet obtained by papermaking.

[0028] In the beating step, it is preferable to beat the raw pulp so that the pulp has the Canadian Standard Freeness above. There are no particular limitations on the beating machine. Examples of the beating machine include known beating machines such as a double disc refiner.

[0029] There are no particular limitations on the papermaking machine used for papermaking. Examples of the papermaking machine include a Fourdrinier papermaking machine, a Short Drain papermaking machine, and a Cylinder papermaking machine.

[0030] There are no particular limitations on the drying step. For example, a dryer attached to the papermaking machine can be used.

[0031] The base paper for translucent paper may be subjected to a smoothing treatment. By performing the smoothing treatment, the scattering of light on the base paper surface can be reduced, so that the visibility through the translucent region can be improved. Examples of the smoothing treatment include a tight press, a machine calendar, a gloss calendar, a soft nip calendar, and a super calendar. However, since these devices increase the density of the base paper, it is necessary to be careful not to increase the density too much by lowering the linear pressure. On the other hand, the transfer method in which the base paper is attached to a smooth surface while it is still wet and then dried to transfer the smooth surface is preferable because the density of the base paper does not increase. For example, techniques such as a Yankee cylinder, a cast drum, and a film transfer can be used. Among them, a Yankee dryer using a Yankee cylinder is preferable because it is attached to a papermaking machine and has excellent productivity.

(Translucent Paper)

[0032] The translucent paper of the present invention is paper in which the base paper for translucent paper is impregnated with a material which makes a translucent region, making the impregnated region translucent. The translucent paper 1A shown in FIG. 1 and FIG. 2 has base paper 2 for translucent paper and a translucent region 4 in which the material which makes a translucent region 3 is impregnated in the base paper for translucent paper 2. The translucent paper 1B shown in FIG. 1 and FIG. 3 has the base paper 2 for translucent paper, the translucent region 4 in which the material which makes a translucent region 3 is impregnated in the base paper 2 for translucent paper, and a coating layer 5 that covers the translucent region 4. As shown in FIG. 1, the translucent region 4 is formed in a partial region of the base paper 2 for translucent paper when viewed in plan view. For example, when the translucent paper 1A is used as a package, the contents can be seen from the outside of the package through the translucent region 4, or through the translucent region 4 and the coating layer 5.

[0033] The material which makes a translucent region is not particularly limited as long as it is a material that makes the impregnated portion translucent by impregnating the base paper for translucent paper. For example, the material which makes a translucent region may be, for example, resins such as acrylic resin, polyethylene resin, polyester resin, urethane resin, nitrocellulose, shellac, rosin, and the like; vegetable oils such as paulownia oil, linseed oil, castor oil, hydrophilic castor oil, coconut oil, soybean oil, and commercially available salad oil; and waxes such as carnauba wax, palm wax, beeswax, spermaceti, and Japan wax. The material which makes a translucent region may be used alone or in combination of two or more.

[0034] Among them, a resin that is stable over time is preferable, and an acrylic resin is more preferable. Among acrylic resins, a UV-curable acrylic resin is particularly preferable because it has excellent surface coverage and the interface of the impregnated region of the material which makes a translucent region in a cross-sectional view is clear. Examples of UV-curable acrylic resins include those disclosed in paragraphs 0025 and 0026 of Japanese Patent Application, First Publication No. 2021-91481.

[0035] It is preferable to select a material which makes a translucent region from the examples above, which have a refractive index in the range of 1.4 to 1.6, preferably 1.45 to 1.58, more preferably 1.50 to 1.58, and even more preferably 1.52 to 1.58. This is because the refractive index of cellulose fibers is generally said to be in the range of 1.4 to 1.6. If the refractive index of the material which makes a translucent region is within the range above, the difference with the refractive index of cellulose fibers is small, making it easy to increase the transparency and visibility of the translucent region. The refractive index of the material which makes a translucent region is measured in accordance with JIS K 7142.

[0036] By impregnating base paper for translucent paper with a material which makes a translucent region, which has a refractive index close to that of cellulose fibers, and filling the gaps between the cellulose fibers inside the paper, the refraction of light caused by the material which makes a translucent region in the base paper for translucent paper can be reduced. This makes it easier to obtain a translucent region with excellent transparency and visibility. To adjust the

refractive index, a high refractive index material such as zirconium or titanium may be used as necessary.

[0037] Since the material which makes a translucent region is impregnated in the base paper for translucent paper, the material which makes a translucent region is preferably liquid at room temperature or in a heated state. Also, from the viewpoint of permeability, it is preferable that the material which makes a translucent region be soluble in a liquid medium such as an organic solvent at room temperature or in a heated state. In other words, it is preferable that the material which makes a translucent region be one which can be impregnated into the base paper for translucent paper as an impregnable liquid agent which makes a translucent region during manufacturing of the translucent paper.

[0038] In order to reduce diffuse reflection of light due to the unevenness of the surface of the translucent region of the translucent paper, a coating layer may be provided on at least a part of the surface of the translucent region. This coating layer can increase the smoothness of the surface of the translucent region, prevent diffuse reflection of light on the surface of the translucent region, and improve the visibility of the translucent region. Examples of the material of the coating layer include a material which makes a translucent region and OP varnish. Examples of the material which makes a translucent region include the same as those exemplified in the section on the translucent region. When the coating layer includes a material which makes a translucent region, the material which makes a translucent region in the coating layer and the material which makes a translucent region in the translucent region may be the same or different. In addition, the material of the coating layer may be used alone or in combination of two or more.

[0039] OP varnish is sometimes called overprint varnish. The components of OP varnish vary depending on the product, manufacturer, and the like, but OP varnish containing at least one selected from the group consisting of linseed oil, tung oil, and nitrocellulose is preferable. Commercially available OP varnishes include products from Toyo Ink Co., Ltd., T&K Toka Corporation, and Fuji Ink Mfg. Co., Ltd. OP varnish may be used alone, or two or more may be used in combination. Drying methods such as those based on oxidative polymerization or UV effects may be used.

[0040] It is preferable to select a material for the coating layer from among these, of which the refractive index is 1.4 to 1.6, preferably 1.45 to 1.60, more preferably 1.48 to 1.60, even more preferably 1.50 to 1.60, and particularly preferably 1.50 to 1.58. This is because the refractive index of the cellulose fibers is generally said to be in the range of 1.4 to 1.6. By making the refractive index of the coating layer close to that of the cellulose fibers, the refraction of light at the interface between the coating layer and the base paper for translucent paper can be reduced. This makes it easier to obtain a translucent region with excellent visibility. The refractive index of the coating layer is measured according to JIS K 714 2.

[0041] The opacity of the translucent region is preferably 4 to 25%, more preferably 4 to 20%, and even more preferably 4 to 15%. The opacity of the translucent region is measured according to JIS P 8138:1976. The smaller the opacity value, the more transparent the region.

[0042] The haze of the translucent region is preferably 80% or less. When the haze of the translucent region is 80% or less, the transparency of the translucent region is improved. The lower limit of the haze of the translucent region is not particularly limited, but is, for example, 10% or more, and preferably 20% or more. The haze of the translucent region is measured in accordance with JIS-K7136. The smaller the haze value, the less cloudy the region.

[0043] Conventionally, haze and opacity have been used to evaluate the visibility of translucent regions. However, according to the inventor's study, the numerical trends of haze and opacity often do not correspond to the superiority or inferiority of visibility by human eyes. For example, when the whiteness of a sample is high, the transmittance of visible light is high, but the visibility and visual appearance are not always satisfactory.

[0044] The reason the numerical trend of haze does not match the visibility is thought to be as follows.

[0045] Haze is calculated as the ratio of diffuse transmittance to the total light transmittance of light transmitted through a sample. The diffuse transmittance is the transmittance of diffuse light, which is obtained by excluding parallel components from the light rays that are transmitted through a sample when linear light is incident on the sample. On the other hand, as shown in FIGS. 4 and 5, the human eye preferentially recognizes light that travels in a straight line or light with a narrow diffusion angle, rather than diffuse light or scattered light with a wide diffusion angle.

[0046] In this way, when calculating haze, parallel components of light that are easily recognized by the human eye are excluded from the measurement target, and diffuse light that is difficult for the human eye to recognize is included in the measurement target to obtain diffuse transmittance. Since haze is calculated from such diffuse transmittance, it is not suitable for evaluating the human visual appearance or the visibility in the depth direction.

[0047] Similarly, opacity is calculated by including diffuse light that is difficult for the human eye to recognize the measurement target, so it is not suitable for evaluating the human visual appearance or the visibility in the depth direction.

[0048] After extensive research, the inventors came up with the idea of evaluating the visibility of a translucent region based on the degree of blurring of the contents seen through the translucent region. The degree of blurring is due to the diffusion pattern of light transmitted through the translucent region. In the case of a translucent region with a high degree of blurring, the transmitted light contains a relatively large amount of diffused light with a wide diffusion angle, which reduces the visibility of the contents. **In** contrast, in the case of a translucent region with a low degree of blurring, the transmitted light contains a relatively large amount of light that travels in a straight line or light that has a narrow diffusion angle, which improves the visibility of the contents.

[0049] The inventors devised a method and index for quantitatively evaluating the degree of blurring, and found that if the

index of the degree of blurring is equal to or greater than a specific value, the visibility of the contents seen through the translucent region is excellent.

[0050] The indexes are the luminous transmittance and the luminous transmittance ratio.

[Measurement of luminous transmittance]

[0051] To measure luminous transmittance, a luminous transmittance measuring device is used that has a light-projecting part that projects light from a light source onto a sample, a light-receiving part that receives the light that has passed through the sample, and a sensor that measures the received light, with a distance of 50 mm or more between the light-projecting part and the light-receiving part, and of which the light receiving sensitivity characteristics are nearly identical to that of photo vision-relative luminous efficiency when measured without a sample.

[0052] Many luminous transmittance measuring devices are commercially available for measuring eyeglass lenses, filter glass, transparent conductive film glass, and the like, and measurements can be made using a device that meets the above measurement conditions. In addition, any device that meets the above measurement conditions, such as a spectrophotometer, can be used as the luminous transmittance measuring device.

[Luminous transmittance (T50)]

[0053] In the present invention, it is preferable that the luminous transmittance (T50) under the following measurement condition 1 be 20% or more.

"Measurement condition 1"

[0054] A luminous transmittance measuring device with a gap of at least 50 mm between the light-projecting part and the light-receiving part is used, the translucent region of the paper is used as a sample, and the luminous transmittance (T50) of the translucent region of the translucent paper is measured by placing the sample such that one side of the sample is in contact with the light-projecting part.

[0055] FIG. 6 is an explanatory diagram explaining the measurement. The luminous transmittance (T50) can be measured by placing one surface S1 of the sample S in contact with the light-projecting part 101 of the luminous transmittance measuring device 100. **In** the present invention, TLV-304-LC, a luminous transmittance measuring device sold by Asahi Spectroscopy Co., Ltd., was used. This device has a distance of 51.5 mm between the light-projecting part and the light-receiving part. By making the luminous transmittance (T50) at a distance of at least 50 mm 20% or more, the paper has a transparent region with excellent visibility. The higher the value, the better the visibility. The luminous transmittance (T50) is preferably 23% or more.

[0056] The luminous transmittance (T50) is not measured immediately after the light passes through the sample, but is measured at a position 50 mm away, so light that is scattered before this position and does not reach the light-receiving part is excluded, and therefore it corresponds to visibility. Light does not scatter in air, so the cause of scattering is due to the state of the inside and surface of the sample.

[Luminous transmittance ratio]

[0057] In the present invention, it is preferable to have a translucent region with a luminous transmittance ratio of 44 or more under the measurement condition 2 below.

"Measurement condition 2"

[0058] Using a luminous transmittance measuring device with a gap of at least 50 mm between the light-projecting part and the light-receiving part, the translucent region of the paper is measured as a sample, and the luminous transmittance (T50) is measured when one side of the sample is placed in contact with the light-projecting part, and the luminous transmittance (T0) is measured when the other side of the sample is placed in contact with the light-receiving part, and the luminous transmittance ratio is calculated using the following formula.

$$\text{Formula 1: Luminous transmittance ratio} = (T50 / T0) \times 100$$

[0059] FIGS. 7(a) and (b) are explanatory diagrams explaining the measurement.

[0060] As shown in FIG. 7(a), the luminous transmittance (T50) can be measured by placing one surface S1 of a sample

S in contact with light-projecting part 101 of the luminous transmittance measuring device 100.

[0061] As shown in FIG. 7(b), the luminous transmittance (T0) can be measured by placing the other surface S2 of the sample S in contact with light-receiving part 102.

[0062] When measuring the luminous transmittance (T0), it is advisable to hold the sample down with a ring-shaped jig or the like to prevent it from bending due to its own weight.

[0063] In the present invention, TLV-304-LC, a luminous transmittance measuring device sold by Asahi Spectroscopy Co., Ltd., was used. This device has a distance of 51.5 mm between the light-projecting part and the light-receiving part. The luminous transmittance ratio = (T50 / T0) x 100 is calculated from the luminous transmittance (T50) and luminous transmittance (T0) of two points at least 50 mm apart. If this value is 44 or more, the paper has a transparent region with excellent visibility. The larger the value, the better the visibility. The luminous transmittance ratio is preferably 48 or more, and more preferably 50 or more.

[0064] The luminous transmittance ratio indicates the degree to which the luminous transmittance of light immediately after passing through the sample (T0) has decreased at a position 50 mm away (T50). (T50) corresponds to visibility because it excludes light that is scattered within 50 mm and does not reach the light-receiving part. Since light does not scatter in air, the cause of scattering is due to the state of the inside and surface of the sample.

[0065] Furthermore, it is more preferable that the range of both the luminous transmittance (T50) and the luminous transmittance ratio be satisfied.

[0066] In order to ensure that the luminous transmittance (T50) is 20% or more and the luminous transmittance ratio is 44 or more in the transparent region, it is advisable to control the refraction and scattering of light on the surface of the paper where the light is incident, inside the paper with light incident, and on the surface of the paper through which the light passes.

[0067] The density of the translucent region of the translucent paper is preferably 0.7 to 2.5 g/cm^3, more preferably 0.7 to 2.0 g/cm^3, and even more preferably 0.8 to 2.0 g/cm^3. When the density of the translucent region is equal to or greater than the lower limit of the range above, it is believed that the air spaces between the cellulose fibers are sufficiently eliminated by impregnation with the resin component. When the density of the translucent region is equal to or less than the upper limit of the range above, the processability of the translucent paper when made into packaging materials and the like is improved. The density of the translucent region is measured in accordance with JIS P 8118.

[0068] The translucent paper of the present invention can be recycled without separation. In general, paper recycling involves defibrating collected waste paper in a large disintegrator called a pulper when the paper/pulp concentration is about 1%, removing undispersed material in a coarse fiberizer with a diameter of about 9 mm, and then further dispersing and passing through a cleaner or a screen with a diameter of about 1.6 mm to remove fine undispersed material. If the resin is contained in excess, defibration-ability and dispersibility may deteriorate, clogging these screens, or undispersed material may generate dust during the papermaking process and contaminate the paper, causing problems with dust spots. For this reason, it is necessary to ensure that there are no undispersed materials such as fragments after re-defibration. In the translucent paper of the present invention, the base paper with a controlled pulp blend has an appropriate gap ratio, so that it is possible to simultaneously achieve improved transparency due to the material which makes a translucent region and suppress the decrease in recyclability due to the impregnation of the material which makes a translucent region.

(Method of manufacturing translucent paper)

[0069] The method of manufacturing translucent paper of the present invention is a method including: impregnating and coating at least a part of base paper for translucent paper with a material which makes a translucent region, wherein the base paper mainly contains a softwood chemical pulp and a hardwood chemical pulp, a ratio of the softwood chemical pulp to the hardwood chemical pulp is in a range from 80:20 to 51:49, a basis weight of the base paper is in a range from 40 to 100 g/m^2, and an air permeability of the base paper is in a range from 10 to 40 seconds.

[0070] As mentioned above, the base paper for translucent paper contains a lot of softwood chemical pulp and has a basis weight and air permeability within a specific range, which allows many gaps to be formed inside the paper and allows the gaps to be impregnated with a material which makes a translucent region, thereby increasing transparency. Impregnation of the material which makes a translucent region can be performed by impregnation-coating.

[0071] The material which makes a translucent region is impregnated by impregnation-coating the liquid material which makes a translucent region into the base paper for translucent paper. The impregnation-coating may be performed on either side of the base paper for translucent paper. When the Parker Print Surf smoothness of one side of the base paper for translucent paper is 5 μm or less, it is preferable to impregnate the other side with a material which makes a translucent region, since it penetrates efficiently. When the Parker Print Surf smoothness of both sides is 5 μm or less, it is preferable to impregnate the side with the larger value. The side with a smaller Parker Print Surf smoothness value has a higher smoothness, so the closer to the surface, the higher the density of the cellulose fibers. Therefore, the impregnation of the material which makes a translucent region is performed by impregnation-coating the side with a lower cellulose density. On

the other hand, a Parker Print Surf smoothness of 5 μm or less is preferable because it is smooth, light scattering on the paper surface can be suppressed, and visibility is excellent.

[0072] When the material which makes a translucent region is solid at room temperature, a liquid medium capable of dissolving the material which makes a translucent region is used to prepare the impregnation-coating solution. When the material which makes a translucent region is liquid at room temperature, the concentration of the material which makes a translucent region may be changed using a liquid medium, or the material which makes a translucent region may be used as it is as the impregnation-coating solution without using a liquid medium.

[0073] The liquid medium is not particularly limited. Either an aqueous solvent or an organic solvent can be used. If the liquid medium contains moisture, the base paper for translucent paper is likely to swell due to the moisture. In addition, the base paper for translucent paper is likely to shrink during subsequent drying. As a result, curling, bumps, and unevenness are likely to occur. Therefore, it is preferable that the liquid medium not contain moisture, and an organic solvent is more preferable.

[0074] The organic solvent may be a polar solvent or a non-polar solvent.

[0075] Examples of the polar solvents include alcohols, ethers, and esters.

[0076] Examples of alcohols include methanol, ethanol, n-propanol, isopropanol, n-butanol, n-pentanol, and n-hexanol.

[0077] Examples of the ethers include glycol ethers, such as ethylene glycol monomethyl ether, diethylene glycol monomethyl ether, triethylene glycol monomethyl ether, tetraethylene glycol monomethyl ether, ethylene glycol monoethyl ether, diethylene glycol monoethyl ether, triethylene glycol monoethyl ether, tetraethylene glycol monoethyl ether, ethylene glycol monopropyl ether, diethylene glycol monopropyl ether, triethylene glycol monopropyl ether, tetraethylene glycol monopropyl ether, ethylene glycol monoisopropyl ether, diethylene glycol monoisopropyl ether, triethylene glycol monoisopropyl ether, tetraethylene glycol monoisopropyl ether, ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, triethylene glycol monobutyl ether, tetraethylene glycol monobutyl ether, ethylene glycol monoisobutyl ether, diethylene glycol monoisobutyl ether, triethylene glycol monoisobutyl ether, tetraethylene glycol monoisobutyl ether, ethylene glycol mono-tert-butyl ether, diethylene glycol, mono-tert-butyl ether, triethylene glycol mono-tert-butyl ether, tetraethylene glycol mono-tert-butyl ether, propylene glycol monomethyl ether, dipropylene glycol monomethyl ether, tripropylene glycol monomethyl ether, propylene glycol monoethyl ether, dipropylene glycol monoethyl ether, tripropylene glycol monoethyl ether, tetrapropylene glycol monoethyl ether, propylene glycol monopropyl ether, dipropylene glycol monopropyl ether, tripropylene glycol monopropyl ether, propylene glycol monoisopropyl ether, dipropylene glycol monoisopropyl ether, tripropylene glycol monoisopropyl ether, dipropylene glycol monobutyl ether, tripropylene glycol monobutyl ether, propylene glycol monoisobutyl ether, dipropylene glycol monoisobutyl ether, tripropylene glycol monoisobutyl ether, propylene glycol monotert-butyl ether, dipropylene glycol mono-tert-butyl ether, and tripropylene glycol mono-tert-butyl ether.

[0078] Examples of the esters include diethylene glycol monoethyl ether acetate and diethylene glycol monobutyl ether acetate.

[0079] Examples of non-polar solvents include paraffinic hydrocarbons such as pentane, hexane, heptane, octane, nonane, decane, and dodecane; isoparaffinic hydrocarbons such as isohexane, isooctane, and isododecane; alkylnaphthenic hydrocarbons such as liquid paraffin; aromatic hydrocarbons such as benzene, toluene, xylene, alkylbenzene, and solvent naphtha, and silicone oil.

[0080] The impregnation-coating solution may further contain components other than the material which makes a translucent region and the liquid medium. Examples of the other components include basic substances such as ammonia, ethylenediamine, and triethylamine; viscosity modifiers such as glycerin and ethylene glycol; high refractive index substances such as zirconium and titanium; antifoaming agents; release agents; and colorants. However, the other components are not limited to these examples.

[0081] During impregnation-coating, a section may be formed in the base paper for translucent paper where the material which makes a translucent region does not reach a part of the surface opposite the impregnated surface. This is because the surface condition of the relatively smooth surface in this section can be maintained in the state that the material which makes a translucent region was in before impregnation-coating.

[0082] During impregnation-coating, the material which makes a translucent region may be impregnated from both sides of the base paper for translucent paper. This is to ensure that the material which makes a translucent region is sufficiently impregnated into the interior of the translucent paper and to reduce gaps where the material which makes a translucent region is not impregnated.

[0083] The coating amount of the impregnation-coating solution per unit area is preferably 10 to 70 g/m^2, more preferably 20 to 60 g/m^2, and even more preferably 30 to 60 g/m^2. When the coating amount of the impregnation-coating solution per unit area is equal to or greater than the lower limit of the range above, the transparency of the translucent region is easily increased. When the coating amount of the impregnation-coating solution per unit area is equal to or less than the upper limit of the range above, the recyclability can be increased.

[0084] The viscosity of the impregnation-coating solution is preferably 50 to 5000 mPa·s, more preferably 50 to 4000 mPa·s, and even more preferably 50 to 3000 mPa·s. When the viscosity is equal to or less than the upper limit of the range

above, the impregnation-coating solution penetrate into the base paper, and the transparency of the translucent region is easily increased. When the viscosity is equal to or greater than the lower limit of the range above, the boundary between the translucent region and the non-translucent region becomes clear. The viscosity is measured using a Brookfield viscometer at 30°C and 60 rpm.

[0085] The method of coating the impregnation-coating solution is not particularly limited. Examples of the method of coating the impregnation-coating solution include flexographic printing, inkjet printing, gravure printing, offset printing, gravure offset printing, silk screen printing, roll coating, bar coating, and blade coating.

[0086] By impregnating the base paper for translucent paper with an impregnation-coating solution containing a material which makes a translucent region, the gaps between the cellulose fibers in the translucent paper can be filled with the material which makes a translucent region. When an impregnation-coating solution containing a material which makes a translucent region with a refractive index in the range of 1.4 to 1.6 is used, the gaps in the translucent paper can be filled with a material which makes a translucent region whose refractive index is close to that of cellulose. This makes it possible to reduce the refraction of light caused by the gaps in the translucent paper.

[0087] The impregnation-coating of the base paper for translucent paper with the impregnation-coating solution may be carried out in one step or in multiple steps. When the impregnation-coating is carried out in multiple steps, the constituent components and composition of the material which makes a translucent region used in each step may be the same or different from each other.

[0088] When using an ultraviolet-curing type material which makes a translucent region, various light sources can be used, such as a high-pressure mercury lamp, a metal halide lamp, a xenon lamp, and an electrodeless discharge lamp. The integrated light amount is not particularly limited. It may be appropriately changed depending on the amount of the material which makes a translucent region used and the type of resin which makes a translucent region.

(Translucent region)

[0089] The translucent region is formed in a portion of the translucent paper when viewed in plan view. When the translucent paper is used as a package, the contents and address can be seen through the translucent region from outside the package.

[0090] There are no limitations on the shape and region ratio of the translucent region in plan view. These can be set or changed as appropriate depending on the application of the wrapping paper, packaging material, or printing paper. In another example, the translucent region may be the entire region of the translucent paper in the planar direction. There is no particular limitation on the number of translucent regions, and there may be one or more. In the case of translucent paper with multiple translucent regions, there are no particular limitations on the size or shape of each translucent region.

(Applications)

[0091] The translucent paper of the present invention, with a basis weight of 40 g/m^2 or more, offers unprecedented transparency and visibility, making it suitable for use in a variety of applications, including not only wrapping paper but also printing paper, book paper, copy paper, information paper, label paper, and the like, where images (letters, symbols, pictures, objects, and the like) on the opposite side of the paper can be seen through the paper base.

EXAMPLES

[0092] The present invention will be described in detail below with reference to examples, but the present invention is not limited to the following description.

(Preparation of chemical pulp)

[0093]

NBKP1: Softwood bleached kraft pulp beaten to a Canadian Standard Freeness of 550 mL

NBKP2: Softwood bleached kraft pulp beaten to a Canadian Standard Freeness of 350 mL

LBKP1: Hardwood bleached kraft pulp beaten to a Canadian Standard Freeness of 500 mL

LBKP2: Hardwood bleached kraft pulp beaten to a Canadian Standard Freeness of 300 mL

(Manufacturing device)

[0094]

M1: Fourdrinier papermaking machine with a Yankee dryer
M2: Fourdrinier papermaking machine with a multi-cylinder dryer
M3: Fourdrinier papermaking machine with a multi-cylinder dryer, followed by supercalendering.

(Manufacturing of base paper for translucent paper)

[0095] Base paper for translucent paper was manufactured using the chemical pulp blend and manufacturing device combination shown in Tables 1 and 2. The measured values of the basis weight, Oken air permeability (air permeability), and Parker Print Surf smoothness (smoothness) of the smooth surface of the obtained base paper for translucent paper are also listed.

[Table 1]

	Manufacturing example 1	Manufacturing example 2	Manufacturing example 3	Manufacturing example 4	Manufacturing example 5	Manufacturing example 6
NBKP1	60 parts	60 parts	60 parts	45 parts	70 parts	20 parts
NBKP2	0 parts	0 parts	0 parts	0 parts	0 parts	0 parts
LBKP1	40 parts	40 parts	40 parts	55 parts	30 parts	80 parts
LBLP2	0 parts	0 parts	0 parts	0 parts	0 parts	0 parts
Manufacturing device used	M1	M1	M1	M1	M1	M1
Weight (g/m^2)	50.3	60.6	70.4	80.2	50.5	50.4
Air permeability (second)	20	23	26	50	18	46
Smoothness (μm)	2.70	2.82	3.01	3.18	2.85	2.34

[Table 2]

	Manufacturing example 7	Manufacturing example 8	Manufacturing example 9	Manufacturing example 10	Manufacturing example 11
NBKP1	40 parts	60 parts	60 parts	60 parts	0 parts
NBKP2	0 parts	0 parts	0 parts	0 parts	55 parts
LBKP1	60 parts	40 parts	40 parts	0 parts	45 parts
LBLP2	0 parts	0 parts	0 parts	40 parts	0 parts
Manufacturing device used	M1	M2	M3	M1	M1
Weight (g/m^2)	50.8	69.8	69.8	50.4	50.7
Air permeability (second)	25	17	60	24	35
Smoothness (μm)	2.66	8.18	1.94	2.34	2.15

(Preparation of impregnation-coating solution)

[0096] Impregnation-coating solution 1: An acrylic paraffin solvent (product name: Clariten DC, manufactured by Yamato Chemical Industry Co., Ltd.) was prepared as the material which makes a translucent region. The refractive index

of the material which makes a translucent region was 1.50. The refractive index was measured using an Appe type refractive index measuring device manufactured by Atago Co., Ltd.

[0097] An aromatic paraffin solvent (product name: Clariten S, manufactured by Yamato Chemical Industry Co., Ltd.) was prepared as the solvent.

[0098] The material which makes a translucent region and the solvent were mixed to prepare an impregnation-coating solution with a concentration of the material which makes a translucent region of 75% by mass. The viscosity of the impregnation-coating solution at 30°C and 60 rpm was 1800 mPa·s.

[0099] Impregnation-coating solution 2: 40% shellac (manufactured by Koyo Chemical Co., Ltd.) was diluted with anhydrous ethanol from Kenei Pharmaceutical Co., Ltd. to prepare alcoholic dilution of shellac with a solid shellac content of 25.0% by mass. The refractive index was 1.46. The refractive index was measured using an Appe type refractometer from Atago Co., Ltd. Sumifix HF Navy 2G gran solution (indigo blue) manufactured by Sumika Chemtex Co., Ltd. was added dropwise to the total mass of the diluted solution at 0.2% by mass, and dispersed using a rotating and revolving mixer Awatori Rentaro ARE310 manufactured by Thinky Co., Ltd. to prepare impregnation-coating solution. The viscosity of the impregnation-coating solution at 30°C and 60 rpm was 1200 mPa·s.

(Manufacturing of translucent paper)

Examples 1 to 7 and Comparative Examples 1 to 4

[0100] Using a Matsuo Sangyo micrometer adjustable applicator, the impregnation-coating solution 1 was coated and impregnated to the surface opposite the highly smooth surface of the base paper of translucent paper obtained in Manufacturing examples 1 to 11, and the surface was dried at 100°C for 5 minutes using a HEATTECH hot air circulation dryer. The base paper for translucent paper, the type of impregnation-coating solution, and the amount of impregnation are shown in Tables 3 and 4.

Example 8

[0101] The impregnation-coating solution 2 was impregnation-coated on the surface opposite to the highly smooth surface of the base paper for translucent paper obtained in Manufacturing Example 1 using a Hand K Rocks engraving roll (specifications 100/18) manufactured by Laurent Co., Ltd. Specifically, the impregnation-coating solution 2 was repeatedly coated by the rubber roll transfer method so that the amount of shellac was 18 g/m^2, and then dried at room temperature to obtain translucent paper.

(Evaluation)

[0102] The translucent papers obtained in Examples 1 to 8 and Comparative Examples 1 to 4, and a transparent polyester resin film (Toyobo Co., Ltd. product "Cosmoshine A4160") as Reference Example 1 were prepared. The evaluation results are shown in Tables 3 and 4.

[Luminous transmittance (T50)]

[0103] The luminous transmittance (T50) was measured using the TLV-304-LC luminous transmittance measuring device manufactured by Asahi Spectroscopy Co., Ltd., as shown in FIG. 6.

[Luminous transmittance ratio]

[0104] The luminous transmittance (T50) and luminous transmittance (T0) were measured using the TLV-304-LC luminous transmittance measuring device manufactured by Asahi Spectroscopy Corporation as shown in FIG. 7, and the luminous transmittance ratio was calculated using the following formula.

$$\text{Formula 1: Luminous transmittance ratio} = (T50 / T0) \times 100$$

[Haze and opacity]

[0105] Haze was measured using the "HZ-V3" (manufactured by Suga Test Instruments) in accordance with JIS-K7136.

[0106] Opacity was measured using the "SC-WT" (manufactured by Suga Test Instruments) in accordance with JIS P8149.

[Evaluation of visibility in the depth direction]

[0107] An A4 printout of a 10.5 point Word document was placed on a level stand, and the wrapping paper of each example was placed 5.0 cm above it. Furthermore, the visibility of the characters on the printout when viewed through the translucent region of the wrapping paper from a position 30 cm above the wrapping paper was evaluated based on the following criteria:

A: No characters are missing and they are clearly recognizable
B: A few characters are missing, but the characters are clearly recognizable
C: Some characters are missing, but the characters are recognizable
D: Characters are missing in multiple places, making them difficult to read
E: Characters are missing in many places, making them extremely difficult to recognize as characters

[Recyclability]

[0108] To evaluate recyclability, the following re-defibration evaluation was performed. The translucent paper obtained was torn by hand into 10 mm squares to prepare a solution with a concentration of 3%. 500 ml of the solution was stirred for 30 seconds in a household mixer, Tescom TM856-W mixer, and then sieved through HOGA 12 mesh sieve.

◎: Sieved
◦: Pieces that could not be sieved but had a dried weight of 0.5g or less
×: Pieces that could not be sieved and had a dried weight of over 0.5g

[Table 3]

	Example 1	Example 2	Example 3	Comp. Example 1	Example 4	Comp. Example 2	Comp. Example 3
Base paper used	Manufacturing example 1	Manufacturing example 2	Manufacturing example 3	Manufacturing example 4	Manufacturing example 5	Manufacturing example 6	Manufacturing example 7
Impregnation-coating solution	Solution 1	Solution 1	Solution 1	Solution 1	Solution 1	Solution 1	Solution 1
Basic weight of base paper (g/m^2)	50.3	60.6	70.4	80.2	50.5	50.4	50.8
Impregnation amount (g/m^2)	33.3	39.8	42.2	45.0	34.9	40.3	39.0
Luminous transmittance (T50)	28.1	26.7	16.7	13.2	29.7	22.1	24.3
Luminous transmittance (T0)	54.3	53.9	36.7	33.9	55.0	52.9	56.5
Luminous transmittance ratio	51.7	49.5	45.5	38.9	53.0	41.8	43.0
Opacity	17.5	18.0	19.2	22.3	17.0	18.3	20.0
Haze	74.7	76.9	79.9	83.2	66.8	77.6	79.0
Visibility	B	C	C	E	B	D	D
Recyclability	○	○	○	○	○	×	×

[Table 4]

	Example 5	Comp. Example 4	Example 6	Example 7	Example 8	Reference Example
Base paper used	Manufacturing example 8	Manufacturing example 9	Manufacturing example 10	Manufacturing example 11	Manufacturing example 1	Film
Impregnation-coating solution	Solution 1	Solution 1	Solution 1	Solution 1	Solution 2	-
Weight of base paper (g/m^2)	69.8	69.8	50.4	50.7	50.3	21.0
Impregnation amount (g/m^2)	41.5	25.8	33.2	29.8	33.5	-
Luminous transmittance (T50)	15.9	13.2	27.2	28.6	24.5	88.2
Luminous transmittance (T0)	35.0	32.2	53.9	55.0	52.1	95.5
Luminous transmittance ratio	45.4	41.0	50.4	52.0	47.0	92.4
Opacity	18.3	21.2	18.3	18.2	19.9	0.6
Haze	75.8	81.1	74.2	75.2	77.6	1.0
Visibility	C	D	B	B	C	A
Recyclability	○	○	○	○	○	×

[0109] The wrapping paper of the examples had excellent visibility in the depth direction. In contrast, the wrapping paper of the Comparative Examples, which had a translucent region in which the luminous transmittance (T50) and the luminous transmittance ratio did not meet the specified requirements, had poor visibility evaluation results. In addition, the numerical trends of the luminous transmittance (T50) and the luminous transmittance ratio were roughly consistent with the trends of superiority and inferiority of visibility by human visual inspection.

INDUSTRIAL APPLICABILITY

[0110] According to the present invention, translucent paper is provided that has excellent visibility when viewed through a translucent region.

EXPLANATION OF SYMBOLS

[0111]

1 (1A, 1B)	translucent paper
2	base paper for translucent paper
3	material which makes a translucent region
4	translucent region
5	coating layer
10	package
11	object image
12	visual image
F	resin film
100	luminous transmittance measuring device

101	light-projecting part
102	light-receiving part
S	sample
S1	one side of sample
S2	other side of sample

Claims

1. Base paper for translucent paper in which a region impregnated with a material which makes a translucent region becomes translucent,

wherein the base paper for translucent paper mainly contains a softwood chemical pulp and a hardwood chemical pulp;
wherein a ratio of the softwood chemical pulp to the hardwood chemical pulp is in a range from 75:25 to 51:49;
wherein a basis weight is in a range from 40 to 100 g/m^2, and
wherein an air permeability is in a range from 10 to 40 seconds.

2. The base paper for translucent paper according to Claim 1,
wherein the basis weight is in a range from 40 to 75 g/m^2.

3. The base paper for translucent paper according to Claim 1 or 2,

wherein a Canadian Standard Freeness of the softwood chemical pulp is in a range from 400 to 700 mL, and
wherein a Canadian Standard Freeness of the hardwood chemical pulp is in a range from 350 to 650 mL.

4. The base paper for translucent paper according to Claim 1 or 2,
wherein a Parker Print Surf smoothness of at least one surface thereof is 5 μm or less.

5. Translucent paper having a translucent region in which a material which makes a translucent region is impregnated in at least a part of base paper for translucent paper,

wherein the base paper mainly contains a softwood chemical pulp and a hardwood chemical pulp;
wherein a ratio of the softwood chemical pulp to the hardwood chemical pulp is in a range from 80:20 to 51:49;
wherein a basis weight of the base paper is in a range from 40 to 100 g/m^2; and
wherein an air permeability of the base paper is in a range from 10 to 40 seconds.

6. The translucent paper according to Claim 5,
wherein a density of the translucent region is in a range from 0.7 to 2.5 g/cm^3.

7. The translucent paper according to Claim 5 or 6,
wherein the basis weight of the base paper for translucent paper is in a range from 40 to 75 g/m^2.

8. The translucent paper according to Claim 5 or 6,

wherein a luminous transmittance (T50) of the translucent region under measurement condition 1 below is 20% or more,
[measurement condition 1]
a luminous transmittance measuring device with a gap of at least 50 mm between a light-projecting part and a light-receiving part is used, the translucent region of the translucent paper is used as a sample, and the luminous transmittance (T50) of the translucent region of the translucent paper is measured by placing the sample such that one side of the sample is in contact with the light-projecting part.

9. The translucent paper according to Claim 5 or 6,

wherein the translucent region has a luminous transmittance ratio of 44 or more under the following measurement condition 2,
[measurement condition 2]
a luminous transmittance measuring device with a gap of at least 50 mm between a light-projecting part and a

light-receiving part is used, the translucent region of the translucent paper is used as a sample, a luminous transmittance (T50) of the translucent region of the translucent paper is measured by placing the sample such that one side of the sample is in contact with the light-projecting part, a luminous transmittance (T0) of the translucent region of the translucent paper is measured by placing the sample such that the other side of the sample is in contact with the light-receiving part, and a luminous transmittance ratio is calculated using the following formula 1:

$$\text{Formula 1: luminous transmittance ratio} = (T50 / T0) \times 100$$

10. A method for producing translucent paper, including:

impregnating and coating at least a part of base paper for translucent paper with a material which makes a translucent region,
wherein the base paper mainly contains a softwood chemical pulp and a hardwood chemical pulp, a ratio of the softwood chemical pulp to the hardwood chemical pulp is in a range from 80:20 to 51:49, a basis weight of the base paper is in a range from 40 to 100 g/m^2, and an air permeability of the base paper is in a range from 10 to 40 seconds.

11. The method for producing translucent paper according to Claim 10,
wherein a basis weight of the base paper for a translucency is in a range from 40 to 75 g/m^2.

12. The method for producing translucent paper according to Claim 10 or 11,
wherein a Parker Print Surf smoothness of one side of the base paper for translucent paper is 5 μm or less, and the other side is impregnated with a material which makes a translucent region.

13. The method for producing translucent paper according to Claim 10 or 11,

wherein a Canadian Standard Freeness of the softwood chemical pulp is in a range from 400 to 700 mL; and
wherein a Canadian Standard Freeness of the hardwood chemical pulp is in a range from 350 to 650 mL.

FIG. 1

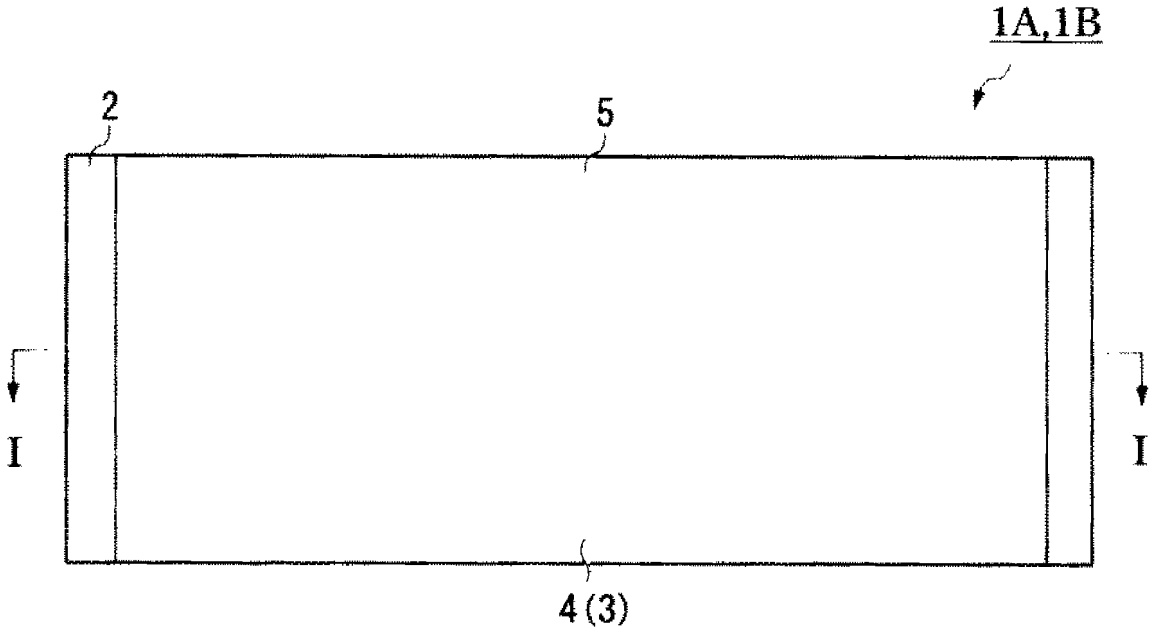


FIG. 2

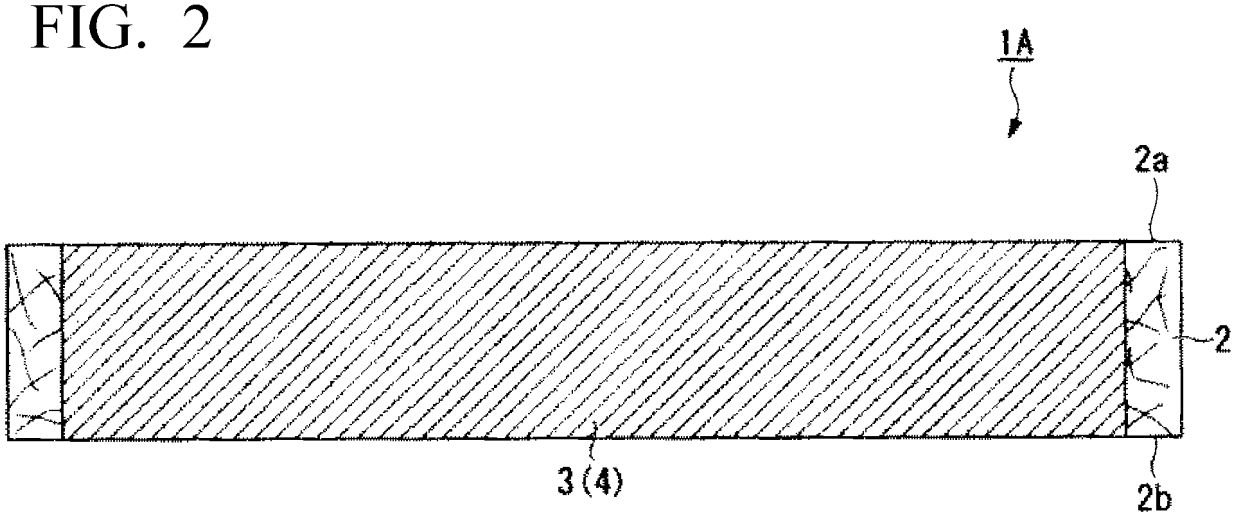


FIG. 3

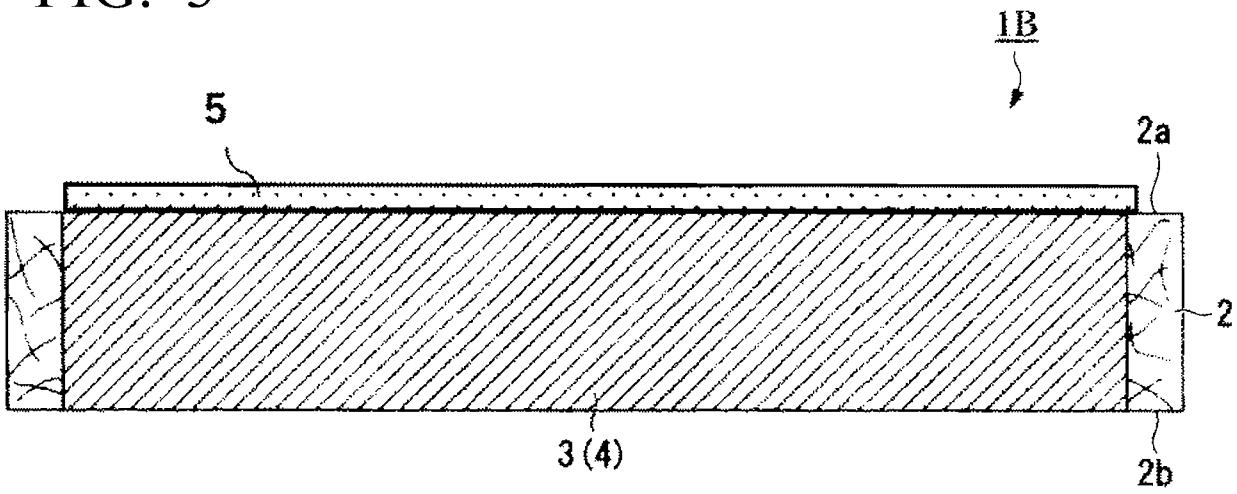


FIG. 4

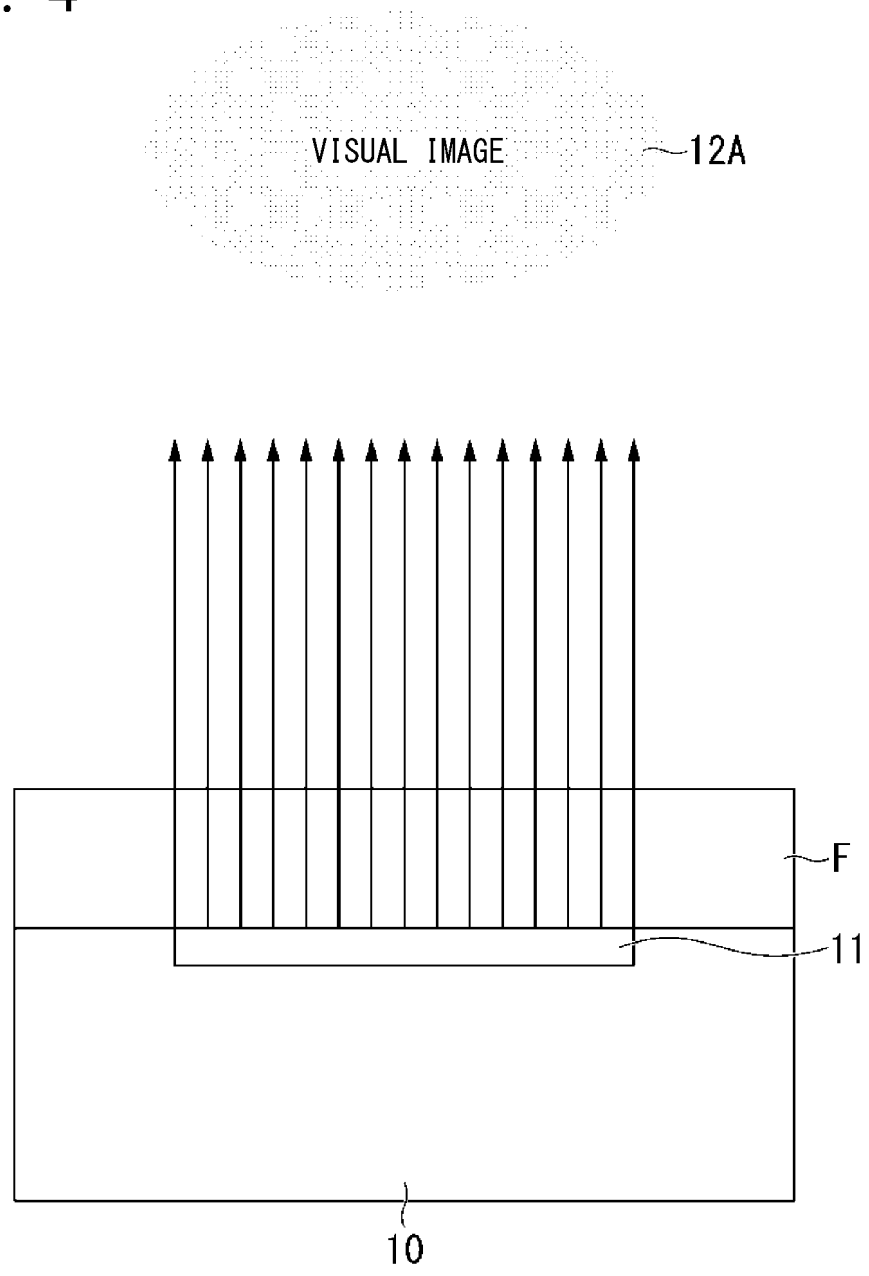


FIG. 5

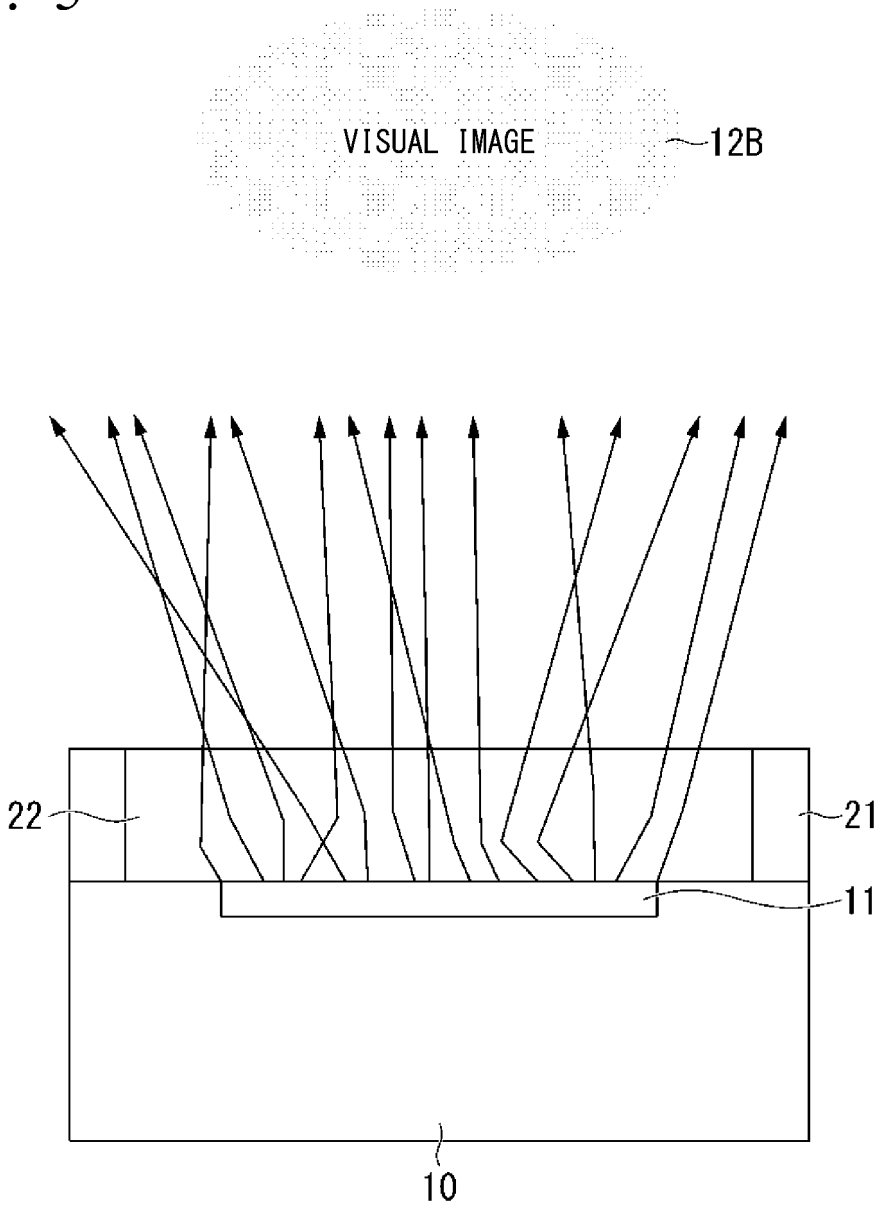


FIG. 6

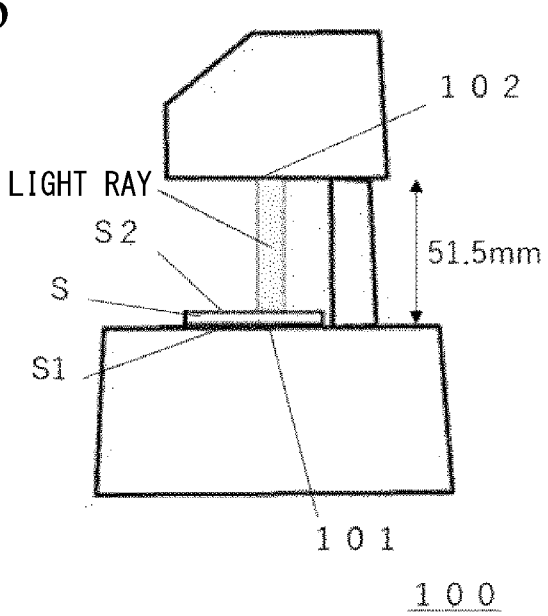
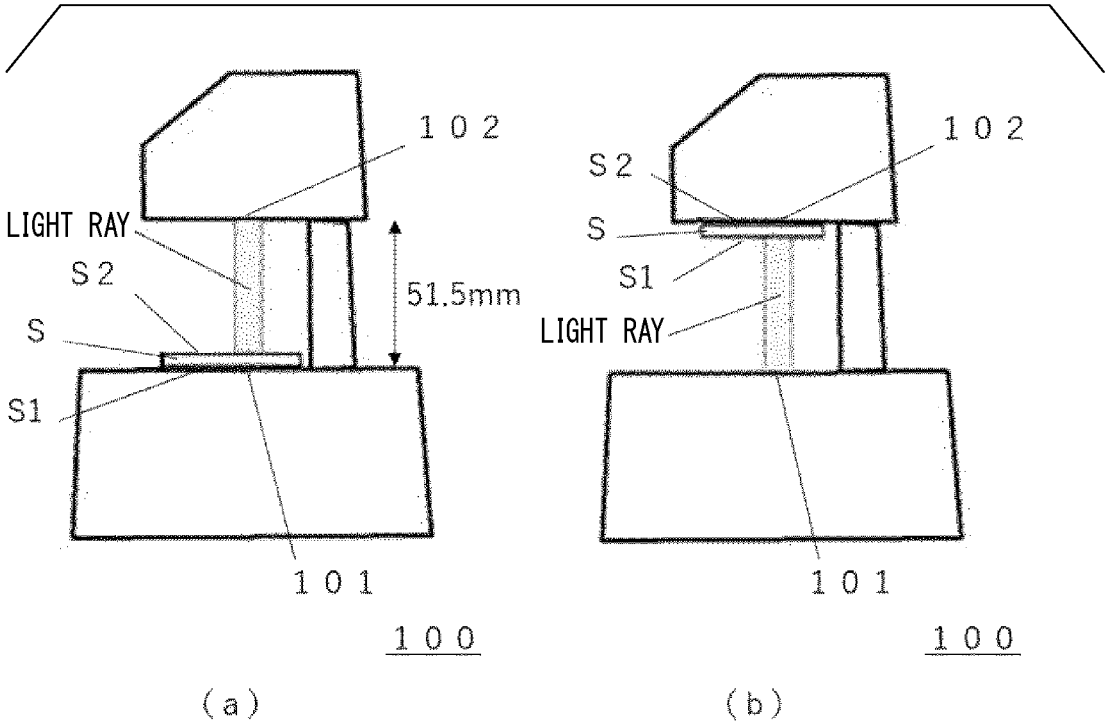

102
LIGHT RAY
S2
S
S1
51.5mm
101
100

FIG. 7


102
LIGHT RAY
S2
S
S1
51.5mm
101
100
(a)
102
S2
S
S1
LIGHT RAY
101
100
(b)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2023/027606

A. CLASSIFICATION OF SUBJECT MATTER

D21H 27/06(2006.01)i; ***D21H 11/02***(2006.01)i; ***D21H 21/26***(2006.01)i
FI: D21H27/06; D21H21/26; D21H11/02

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)

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 1971-2023
Registered utility model specifications of Japan 1996-2023
Published registered utility model applications of Japan 1994-2023

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 02-6682 A (HONSHU PAPER CO., LTD.) 10 January 1990 (1990-01-10)	1-13
A	JP 54-18914 A (MITSUBISHI PAPER MILLS LTD.) 13 February 1979 (1979-02-13)	1-13
A	CN 111235952 A (JIANG, Aihua) 05 June 2020 (2020-06-05)	1-13
A	JP 61-47354 A (JUJO PAPER CO., LTD.) 07 March 1986 (1986-03-07)	1-13
A	JP 2022-62334 A (OJI HOLDINGS CORP.) 20 April 2022 (2022-04-20)	1-13

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

* Special categories of cited documents:
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"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
10 October 2023	**24 October 2023**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2023/027606

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 02-6682 A	10 January 1990	(Family: none)	
JP 54-18914 A	13 February 1979	(Family: none)	
CN 111235952 A	05 June 2020	(Family: none)	
JP 61-47354 A	07 March 1986	(Family: none)	
JP 2022-62334 A	20 April 2022	(Family: none)	

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REFERENCES CITED IN THE DESCRIPTION

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- JP SHO61132699 A **[0004]**
- JP 2018009047 A **[0004]**
- JP 2021091481 A **[0004] [0034]**