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(71) Applicant: **OJI PAPER CO. LTD.**
1-1, Nishi-Shinjuku 2-chome Shinjuku-ku
Tokyo 163(JP)

(72) Inventor: **Kamiya, Masahiro**
2-5-13 Matsugaoka Nakano-ku
Tokyo 165(JP)
Inventor: **Yamana, Masahiro**
3-13-15 Shiroganedai Minato-ku
Tokyo 108(JP)
Inventor: **Sakata, Katsuhiko**
2-8-8 Chuodori
Nichinan-shi Miyazaki 887(JP)

(74) Representative: **Arthur, Bryan Edward et al**
Withers & Rogers 4 Dyer's Buildings Holborn
London EC1N 2JT(GB)

(54) **Support sheet for photographic printing paper.**

(57) The disclosed support sheet for photographic printing paper comprises a substrate sheet and front and back surface coating layers formed on the two surfaces of the substrate sheet and each composed of a thermoplastic, water-proof resinous material, and is characterized in that at least one of the front and back surface coating layers has a number of fine crater-shaped concavities adjoining each other through ridgeline-shaped convexities.

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SUPPORT SHEET FOR PHOTOGRAPHIC PRINTING PAPER

BACKGROUND OF THE INVENTION

1) Field of the Invention

The present invention relates to a support sheet for a photographic printing paper. More particularly, the present invention relates to a support sheet for a photographic printing paper having an improved applicability to a photographic emulsion-coating machine and automatic developing machine at a high speed.

2) Description of the Related Arts

Currently, a water-resistant resin-coated support sheet is generally used as the support sheet for a photographic printing paper, to cope with the high speed developing treatment required for photographic papers. This support sheet is prepared by the extrusion-lamination method in which a molten heat-resistant resin is coated on both surfaces of a substrate sheet, and then solidified by cooling. In general, the front surface, on which a photographic emulsion layer is to be formed, is coated with a resinous layer containing a white pigment, and the back surface is coated with a pigment-free resinous layer.

In the resin-coated support sheet, the surface opposite to the front surface, on which a photographic emulsion layer is to be formed, i.e., the back surface, is roughened to enhance a slipping property to the surface of the photographic emulsion layer when photographic papers are piled, or to improve the typewriter printability thereof.

The roughened back surface of the support sheet is formed in a manner such that, in a melt extrusion coating of the back surface of the substrate sheet with a resinous layer, a surface-roughened cooling roll surface is brought into contact with and pressed against the molten resinous layer to transfer the roughened surface pattern of the roll to the resinous layer. Optionally, a backcoat layer is further formed on the roughened back surface coating resinous layer. This back coat layer imparts an enhanced writing property, printability, and electroconductivity to the photographic paper.

Generally, the photographic paper is developed by using an automatic developing machine, and the treating speed is usually 20 to 60 m/min in a developing zone and 30 to 100 m/min in a subsequent cutting zone. During this automatic developing operation, the back surface of the photographic paper comes into contact with many fixed guides while the photographic paper is advancing, and causes white deposits to be formed on the guides. These deposits often are the cause of problems in the developing operation. If the treatment speed is as high as 50 m/min or more, the generation of these white deposits becomes conspicuous, and if the amount of the deposits becomes very large, it is necessary to stop and clean the machine. The removal of the deposits is not easy, and thus the productivity at the developing treatment is lowered, and therefore, there is a need to solve this problem.

In the production of a photographic paper sheet, not only a silver halide photographic emulsion layer but also a protecting layer, an undercoat layer or an intermediate layer, or a halation-preventing layer or an ultraviolet ray-absorbing layer is coated, each as a single layer or laminated multiple layers on the support sheet for a photographic paper.

In a color-photographic paper sheet, a blue-sensitive emulsion layer and an intermediate layer, a green-sensitive emulsion layer and an intermediate layer, and a red-sensitive emulsion layer and a protecting layer are coated in the form of laminated layers on a support sheet.

Recently, to reduce costs and enhance productivity, a method has been adopted in which many emulsion layers are simultaneously formed by one coating operation. For example, a simultaneous lamination of many emulsion layers is now possible by coating methods such as the slide hopper method and the curtain coating method.

Furthermore, it is important that the coating of the emulsions be carried out at a high speed, to increase productivity, and various methods of achieving this have been investigated.

In each of these methods, in the photographic paper sheet produced by using the above-mentioned support sheet for a photographic paper, a photographic emulsion layer having a smooth and high gloss surface, a low gloss surface, a silk-like surface or a fine-grained surface is formed in accordance with the surface conditions of the front surface coating layer of the support sheet.

Since the front surface of the support sheet for photographic paper is usually hydrophobic, as is well-known in the art, to firmly coat the front surface with a hydrophilic photographic emulsion layer, the front surface of the support sheet, on which the photographic emulsion layer is to be formed, is rendered hydrophilic by applying a corona discharge treatment, a flame treatment or a cold plasma treatment.

Where a support sheet for photographic paper having a smooth and glossy surface is coated with a photographic emulsion, the emulsion is generally applied at a speed of 100 to 200 m/min, but where a support sheet for photographic paper has a roughened surface, such as a silk-like surface, a low gloss surface or a fine-gained surface, if the emulsion-coating speed is higher than 100 m/min, sometimes disadvantages such as mottling of the emulsion layers (hereinafter referred to as "emulsion layer mottling") and a repelling of the emulsion occur.

When the photographic paper sheet having the above-mentioned disadvantages such as emulsion layer mottle and emulsion-repelling is subjected to photographic printing and developing operations, the resultant photographic print has an uneven color density and mottling occurs in a color print, and thus the photographic paper sheet is evaluated as having a very poor quality.

Accordingly, a strong demand has arisen for a new type of support sheet for photographic paper, which sheet has a front surface capable of being evenly coated with a photographic emulsion at a high speed and high productivity without mottling or repelling of the photographic emulsion.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a support sheet for photographic printing paper, which support sheet can be evenly coated with a photographic emulsion at a high speed without a mottling or repelling of the photographic emulsion, and is useful for producing photographic printing paper able to be developed by an automatic developing machine at a high speed without forming white deposits.

The above-mentioned object can be attained by the support sheet of the present invention for photographic printing paper, which comprises

a substrate sheet;

a front surface coating layer formed on the front surface of the substrate sheet (to be coated with a photographic emulsion) and comprising a water-proof, thermoplastic resinous material; and

a back surface coating layer formed on the back surface of the substrate sheet and comprising a water-proof, thermoplastic resinous material,

at least one of the front and back surface coating layers having a number of fine crater-shaped concavities adjacent to each other through ridgeline-shaped convexities.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an explanatory cross-sectional view of a roughened surface pattern formed on a peripheral surface of a cooling roll by a mechanical surface-roughening method;

Fig. 2 is an explanatory cross-sectional view of a roughened surface pattern formed by plating the roughened surface of the cooling roll shown in Fig. 1 with a metal; and,

Fig. 3 is an explanatory cross-sectional view of a roughened surface pattern of a resinous coating layer of a support sheet, transferred from by the roughened surface of the cooling roll shown in Fig. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The inventors of the present invention analyzed the white deposits produced in an automatic developing machine to clarify the cause of this formation of white deposits, and as a result found that, even in a support sheet having a backcoat layer, the white deposits contain not only the backcoat composition but also a large amount of the back surface coating layer-forming resin material (for example, polyethylene). That is, the white deposits are formed in such a manner that, when the back surface is in frictional contact with the fixed members of the developing machine at a high speed, protruding portions of the backcoat layers are peeled and the resin material of the coating layer is softened by frictional heat and protruding portions of the coating layer are removed, and the removed portions of the backcoat layer and the coating layer are fusion-bonded to one another. The inventors investigated this problem, and as a result found that, when the back surface resinous coating layer has a roughened surface pattern in which many fine crater shaped concavities are located adjacent to each other through ridgeline shaped convexities, the production of white deposits is reduced.

Also the inventors of the present invention carried out research into conditions which allow a high-speed coating of a photographic emulsion on a front surface of a support sheet without causing such disadvantages as emulsion layer mottle and repelling of the emulsion, and as a result found that, when the front surface of the support sheet has many smooth and round fine crater-shaped concavities adjoining one another through ridgeline-shaped convexities, the emulsion-coating speed can be greatly increased.

It is known that a roughened surface is given to the resinous coating layer on the front or back surface of a support sheet for photographic paper, but the conventional roughened surface pattern has irregular mountain-valley type undulations.

In the support sheet of the present invention, at least one of the front and back surface resinous coating layers has a number of fine crater-shaped concavities adjacent to each other through ridgeline-shaped convexities.

The specific roughened surface of the front surface resinous coating layer of the support sheet of the present invention effectively enables an even and smooth coating of the photographic emulsion on the front surface resinous coating layer without mottling and repelling of the resultant emulsion layers.

The reasons for the above-mentioned effect have not been completely elucidated, but the following mechanism can be considered relevant thereto.

In the irregular mountain-valley type roughened surface, air is retained in the valley portions (concavities), and when the emulsion is coated on the roughened surface at a high coating speed, the air in the valley portions on the roughened surface is not fully displaced by the emulsion, with the result that the emulsion layer mottle occurs, or air on the roughened surface is inflated at the drying step, and the repelling of the emulsion is probably caused by this inflation of air. In contrast, if an emulsion layer is formed on the surface of the resinous coating layer having many smooth and round fine crater shaped concavities adjoining one another, by a high-speed coating method, the air in the craters on the roughened surface is easily and satisfactorily displaced by the emulsion, and accordingly, it is considered that the emulsion layer mottle or the repelling of the emulsion can be controlled.

Also, the specific roughened surface of the back surface resinous coating layer of the support sheet of the present invention effectively prevents or restricts the production of white deposits in the developing operation of the resultant photographic paper sheet by an automatic developing machine.

The reason why the production of white deposits is prevented or restricted by the specific roughened surface of the back surface resinous coating layer on the photographic paper sheet obtained by using the support sheet of the present invention has not been completely elucidated, but it is considered that this is probably due to the phenomenon that only the tops of the ridgeline-shaped convexities formed between every two adjoining fine crater-shaped concavities on the back surface of the photographic paper sheet come into contact with the surfaces of fixed guides in the developing machine, and since the frictional resistance therebetween is low, less heat is generated.

In the support sheet of the present invention, the crater-shaped concavities formed on the resinous coating layer preferably have an average depth of 3 to 17 µm, more preferably 4 to 15 µm, in terms of the ten point average surface roughness R_Z, determined in accordance with Japanese Industrial Standard (JIS) B 0601.

If the average depth of the crater-shaped concavities on the front surface is less than 3 µm, the above-mentioned advantages of the roughened surface disappear when the roughened front surface is coated with the photographic emulsion. Also, if the average depth is more than 17 µm, when the emulsion is applied to the roughened surface, the mottling and repelling of the emulsion layer often occur. If the average depth of the crater-shaped concavities on the back surface is less than 3 µm, the back surface of the resultant photographic paper sheet is in too close a contact with the photographic emulsion layer surface of the next photographic paper sheet on which the above-mentioned sheet is superimposed, and the slipping property of the back surface to the next sheet photographic emulsion layer surface becomes unsatisfactory. Also, if the average depth of the crater-shaped concavities or the average height of the ridgeline-shaped convexities in the back surface coating layer is more than 17 µm, the ridgeline-shaped convexities may scratch the photographic emulsion layer on which the back surface coating layer is superimposed.

The crater-shaped concavities preferably have an average diameter of 5 to 30 µm, more preferably 10 to 20 µm. If the average diameter of the crater-shaped concavities in the front surface coating layer is less than 5 µm, the above-mentioned disadvantages of the roughened surface disappear when the roughened front surface is coated with the photographic emulsion.

When the average diameter of the crater-shaped concavities in the front surface coating layer is more than 30 µm, and the resultant front surface is coated with the photographic emulsion, the resultant photographic emulsion layer surface is mottled and irregularly patterned.

In the roughened back surface coating layer, when the average diameter of the crater-shaped concavities is less than 5 µm, the slipping property of the resultant roughened back surface of the photographic paper sheet to the adjacent photographic emulsion layer of another photographic paper sheet on which the above-mentioned sheet is superimposed is poor, and thus the operability of the photographic paper sheets in the automatic developing machine becomes poor. When the average diameter of the crater-shaped concavities is more than 30 µm in the roughened back surface coating layer, the photographic emulsion layer of the photographic paper sheet is scratched by the resultant roughened back surface of another photographic paper sheet on which the above-mentioned sheet is superimposed and thus the gloss of the front surface of the resultant photographic paper sheet is reduced.

The substrate sheet usable for the support sheet of the present invention usually consists of a paper sheet. This paper sheet is formed from a pulp material comprising as a main component, a natural pulp, and optionally, a synthetic pulp or a synthetic fibers. If necessary, an additive comprising at least one member selected from a sizing agent, a strengthening agent, a fluorescent brightening agent, and an antistatic agent may be internally added to the pulp material or coated on the paper sheet for the support sheet.

In the support sheet of the present invention, the back or front surface coating layer is formed from a thermoplastic, water-proof resinous material. There is no restriction on the type of the resinous material, but preferably the thermoplastic resinous material comprises a polyolefin resin, more preferably a polyethylene resin.

The thermoplastic resin coating layer can be easily surface-roughened by contact with a roughened peripheral surface of a cooling roller when the thermoplastic resin is extrusion coated onto a surface of a substrate sheet and while the coated thermoplastic resin layer on the substrate sheet surface remains soft. The roughened surface of the present invention having a number of crater-shaped concavities surrounded by a number of ridgeline-shaped convexities is preferably formed by the following methods, but the roughened surface-forming methods are not limited to those methods.

For example, a low gloss roughened surface can be formed on the thermoplastic resin coating layer by the following method.

Referring to Fig. 1, a smooth peripheral surface of a steel roller plated or not plated with copper, is mechanically roughened by applying a sand-blasting treatment or a liquid honing treatment thereto to provide a number of fine convexities 1 and concavities 2 on the peripheral surface.

The surface roughness of the resultant roughened surface of the steel roller is preferably controlled to, for example, 3 to 17 µm, more preferably 4 to 15 µm, determined by the ten point average surface roughness (R_Z) method, JIS B 0601.

After the peripheral surface of the steel roller is roughened to a predetermined surface roughness, the resultant roughened surface is plated with a metal to form a plating layer 3 as shown in Fig. 2, to cover the convexities 1 and the concavities 2 on the roller surface, and a number of hemisphere-shaped convexities 4 adjoining each other through narrow concavities 5 are formed in the plating layer.

The metal to be plated is not limited to a specific group of metals, but in view of the plating operability, hardness, and wear-resistance, the plating metal is preferably a chromium material, more preferably a hard chromium material. Usually, the plating layer has a thickness of 10 to 60 µm, more preferably 10 to 50 µm.

The resultant surface-roughened roller is used as a cooling roller for the coating layer applied on the substrate sheet and comprising the thermoplastic resin.

When a thermoplastic resin is melt-extrusion coated on a surface of a substrate sheet, the roughened peripheral surface of the cooling roller is pressed against the thermoplastic resin coating layer to transfer the roughened surface pattern of the cooling roller surface to the surface of the thermoplastic resin coating layer, to form a number of crater-shaped concavities 6 adjoining each other at ridgeline (or narrow spin)-shaped convexities 7 as shown in Fig. 3. Note, of course the concavities and convexities on the cooling roller surface are inverse to the convexities and concavities on the coating layer surface.

If the thickness of the plating metal layer on the cooling roller surface is less than 10 µm, it is difficult to form hemispherical convexities having smooth and round surfaces around the convexities formed on the cooling roller surface by the mechanical surface roughening methods. Also, the resultant support sheet has an unsatisfactorily roughened coating layer surface, and is not suitable for a photographic emulsion-coating procedure at a high speed or for a developing procedure at a high speed.

If the thickness of the plating metal layer is more than 60 µm, the resultant plated roller surface exhibits an unsatisfactory surface roughness, i.e., the resultant convexities on the cooling roller surface have a low height, and thus the resultant crater-shaped concavities on the coating layer have an excessively small depth.

This excessively small depth of the crater-shaped concavities on the coating layer results in a poor gloss and feel of the photographic emulsion layer or in a poor processability of the resultant photographic paper sheet in the automatic developing machine.

In the plating procedure for the mechanically surface-roughened cooling roller, there is no specific restriction on the plating conditions, but the temperature of the plating bath and the plating electric current density and other plating conditions should be controlled to obtain a predetermined thickness of the plating metal layer.

To form a silk-like roughened surface on the front surface coating layer, an iron core roller is optionally plated with copper and is subjected to a embossing treatment using an embossing roller having, for example, a hexagonal pattern, the embossed surface is subject to a mechanical roughened treatment to form very fine convexities and concavities on the embossed surface, and the roughened surface is then plated. Where a satin gloss is demanded for the front surface of the photographic paper sheet, the roughness of the cooling roller surface is preferably 4 to 18 μm in terms of R_Z. The plating is preferably carried out with chromium, more preferably hard chromium. Also, preferably the thickness of the plating layer is 10 to 60 μm. When this surface-roughened cooling roller is used, the resultant front surface coating layer of the support sheet has a silk-like roughened surface.

In the support sheet of the present invention, the front surface coating layer is optionally coated with a sub-coat layer comprising a hydrophilic polymeric binder, to enhance an adhesive force of the support sheet to the photographic emulsion layer. Also, the back surface coating layer is optionally coated with a back-coat layer comprising a hydrophilic polymeric binder and a pigment, to enhance the writing property, typewriting property and antistatic property of the back surface of the resultant photographic paper sheet.

EXAMPLES

The present invention will now be further explained with reference to the following specific examples, which are only representative and do not limit the scope of present invention in any way.

Example 1 and Comparative Example 1

In Example 1, a substrate sheet consisting of a paper sheet having a weight of 170 g/m^2 was activated by a corona discharge treatment and then coated on the front surface thereof, on which a photographic emulsion layer was to be formed, with a resin composition consisting of 64 parts by weight of a low density polyethylene resin having a density of 0.92, 25 parts by weight of high-density polyethylene having a density of 0.96, 10 parts by weight of anatase type titanium dioxide powder, and 1 part by weight of an additive comprising a pigment and an antioxidant, by a melt-extrusion laminating method, to form a front surface coating layer having a thickness of 30 μm. Also, the back surface of the substrate sheet was activated by a corona discharge treatment and then coated, by the same method as mentioned above, with a resin composition consisting of 50 parts by weight of low-density polyethylene having a density of 0.92 and 50 parts by weight of high-density polyethylene having a density of 0.96, to form a back surface coating layer having a thickness of 30 μm.

When the melt-extrusion coating was carried out on the back surface of the substrate sheet, a cooling roller having a roughened surface on which many hemispherical convexities having an average diameter of 13 μm were formed was used and thus, on the roughened surface of the back surface coating layer formed by using this cooling roll, many fine crater-shaped concavities adjoining one another through ridgeline-shaped convexities were formed. The average diameter of the craters was 13 μm, and the 10-point average roughness of the roughened surface of the back surface coating layer was 6.0 μm.

The front surface coating layer on the substrate sheet was activated by a corona discharge treatment and then coated with a gelatin solution containing a curing agent, instead of a photographic emulsion, and dried to form a gelatine layer having a thickness of 80 μm after drying.

The resultant gelatin layer-coated substrate sheet was slittered and rolled at a width of 10 cm, and continuously fed from the roll into a cutter of a color printer at the forwarding speed as shown in Table 1. After 200 meters of the sheet had passed through the cutter, it was determined whether or not white deposits were produced on the peripheral surfaces of fixed guides in the cutter.

The results of this determination are shown in Table 1.

In Comparative Example 1, the same procedures as in Example were carried out except that the peripheral surface of the cooling roller had a number of groove-shaped concavities spaced from each other, and exhibited a ten point average surface roughness (R_Z) of 8.4 μm, and the resultant back surface coating layer had an irregular mountain-valley type roughened surface.

The results of the determination are shown in Table 1.

Table 1

Item		Formation of white deposits			
		Forwarding speed (m/min)			
Example No.	Roughened surface pattern of back surface coating layer	20	40	60	80
Example 1	Crater-ridgeline type	None	None	None	None
Comparative Example 1	Irregular mountain-valley type	$(^*)_1$ Slight	$(^*)_1$ Slight	$(^*)_2$ Remarkable	$(^*)_2$ Remarkable
Note:					

$(^*)_1$ ... A certain amount of white deposits was formed, but no cleaning operation for the guide members was necessary.

$(^*)_2$ ... A large amount of white deposits was found, and cleaning of the guide members was necessary.

Table 1 clearly shows that the specific roughened surface of the back surface coating layer of the present invention effectively prevents or restricts the production of the white deposits in the automatic developing machine, even at a very high speed of 80 m/min.

Examples 2 to 4 and Comparative Examples 2 to 4

In each of Examples 1 to 4 and Comparative Examples 2 to 4, a paper sheet having a weight of 170 g/m^2 was used as a substrate sheet. A front surface on which a photographic emulsion was to be coated, and a back surface opposite to the front surface, of the substrate sheet were activated by a corona discharge treatment.

The activated back surface of the substrate sheet was melt-extrusion coated with a mixture of high-density polyethylene (density = 0.94 g/cm^3, melt index MI = 8.0) and low-density polyethylene (density = 0.92 g/cm^3, MI = 4.6) in a mixing weight ratio of 1:1 at a resin temperature of 330°C to form a back surface coating layer having a thickness of 30 μm.

The activated front surface of the substrate sheet was melt-extrusion coated with a mixture of high-density polyethylene (density = 0.94 g/cm^3, MI = 8.0) and low-density polyethylene (density = 0.918 g/cm^3, MI = 7.0), each containing 10% of titanium dioxide (available under the trademark of A-220 from Ishihara Sangyo) in a mixing weight ratio of 1:3 at a resin temperature of 320°C to form a front surface coating layer having a thickness of 30 μm.

In the surface-coating procedures, a cooling roller having a roughened surface was used to surface roughen the front surface coating layer in the pattern as indicated in Table 2.

In Examples 2 to 4, the resultant roughened surface patterns were of the crater-ridgeline type. The front surface coating layer had a low gloss face having an R_Z of 5.2 μm, in Example 2 a fine grained face having an R_Z of 7.5 μm in Example 3, and a silk-like roughened face having an R_Z of 13.4 μm in Example 4.

In Comparative Examples 2 to 4, the resultant roughened surface patterns were of the mountain-valley type. The front surface coating layer had a low gloss face having an R_Z of 6.5 μm in Comparative Example 2, a fine grained face having an R_Z of 7.1 μm in Comparative Example 3, and a silk-like roughened face having an R_Z of 16.3 μm in Comparative Example 4.

Each of the resultant front surface coating layers was activated by a corona discharge treatment and a photographic emulsion was applied to the activated surface of the front surface coating layer, at the coating speeds as indicated in Table 2.

In the photographic emulsion-coating procedure, it was observed whether or not mottling and repelling of the emulsion were generated on the front surface coating layer.

The results of the observation are shown in Table 2.

Table 2

Item	Back surface coating layer		Photographic emulsion layer					
			Coating speed (m/min)				R_z	Glossness
Example No.	Type	Roughened surface pattern	100	120	140	180	1 µm	(%)
Example 2	Low gloss	Crater-ridgeline	(*) Good	Good	Good	Good	5.2	75.0
Comparative Example 2	"	Mountain-valley	Not good	Bad	Bad	Bad	6.5	72.5
Example 3	Fine grained	Crater-ridgeline	Good	Good	Good	Good	7.5	63.2
Comparative Example 3	"	Mountain-valley	Not good	Bad	Bad	Bad	7.1	65.7
Example 4	Silk-like roughened	Crater-ridgeline	Good	Good	Good	Good	13.4	38.5
Comparative Example 4	"	Mountain-valley	Not good	Bad	Bad	Bad	16.3	33.5

Note:

Good .... No mottling and repelling of emulsion found.

Not good ... Mottling and repelling of emulsion were found at the initial portion of the coated emulsion layer.

Bad ..... Mottling and repelling of emulsion were found over the entire coated emulsion layer.

Table 2 clearly shows that the specific roughened surfaces of the front surface coating layers are effective for enabling an even, smooth coating of the photographic emulsion thereon.

Claims

1. A support sheet for photographic printing paper comprising:
a substrate sheet;
a front surface coating layer formed on the front surface of the substrate sheet to be coated with a photographic emulsion and comprising a water-proof, thermoplastic resinous material; and
a back surface coating layer formed on the back surface of the substrate sheet and comprising a water-proof, thermoplastic resinous material,
at least one member of the front and back surface coating layers having a number of fine crater-shaped concavities adjacent to each other through ridgeline-shaped convexities.

2. The support sheet as claimed in claim 1, wherein the crater-shaped concavities have an average diameter of from 5 to 30 μm.

3. The support sheet as claimed in claim 1, wherein the crater-shaped concavities have an average depth of from 3 to 17 μm, in terms of the ten point average surface roughness, determined in accordance with JIS B 0601.

4. The support sheet as claimed in claim 1, wherein the substrate sheet consists of a paper sheet.

5. The support sheet as claimed in claim 1, wherein the water-proof, thermoplastic resinous material comprises, as a principal component, a polyolefin resin.

6. The support sheet as claimed in claim 1, wherein the front surface coating layer has a silk-like roughened surface thereof.

Fig. 1

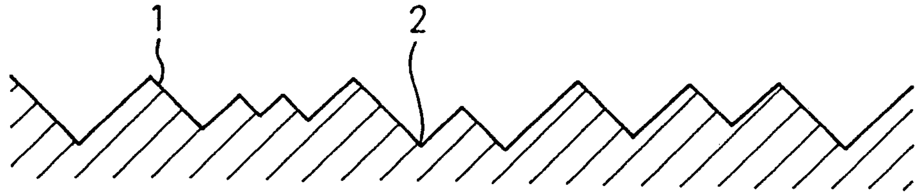


Fig. 2

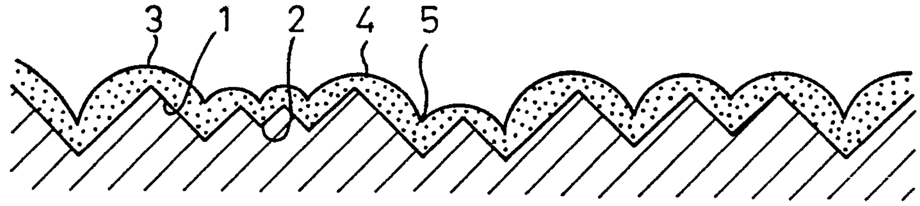
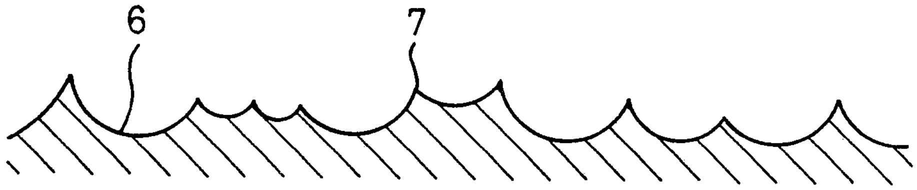


Fig. 3



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 31 2311

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X,Y	US-A-3 300 286 (T.E. NALBAND et al) * Column 2, line 58 - column 3, line 26, especially column 3, line 4; Figure 5 * ---	1-6	G 03 C 1/79
Y	GB-A-1 466 030 (FUJI PHOTO FILM CO) * Page 1, column 2, lines 69-85; Page 2, column 1, line 29 - Page 2, column 2, line 88; Example 3; Claims; Figures 1,2-4 * ---	1-6	
A	PATENT ABSTRACTS OF JAPAN, vol 10, no 97 (P-446)[2154] 15 April 1986; & JP-A-60 230 137 (MITSUBISHI SEISHI KK) 15 November 1985 * Abstract * ---	1-6	
A	RESEARCH DISCLOSURE no 163, November 1977, page 78, abstract no. 16386, Industrial Opportunities, Havant, Hampshire; "Textured photographic resin coated papers" * Whole disclosure * ---	1-6	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	RESEARCH DISCLOSURE, no 197, September 1980, page 385, abstract no 19745, Industrial opportunities, Havant, Hampshire; "Textured resin coated photographic papers" * Whole disclosure * -----	1-6	G 03 C G 03 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-01-1990	BOLGER W.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)