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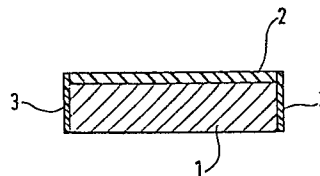
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(54) Light-sensitive lithographic printing plate precursor.

(57) The printing plate precursor is an aluminium support (1) with a hydrophilic surface and a photosensitive layer (2) formed thereon. The cut edges of the aluminium support are treated with a desensitizing solution, which is an aqueous solution containing a hydrophilic organic polymeric compound such as gum arabic, to form a layer (3) of the polymeric compound on the cut edges. The printing plate obtained from this precursor provides printed matter free of scumming at the parts corresponding to the edges of the plate.



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LIGHT-SENSITIVE LITHOGRAPHIC PRINTING PLATE PRECURSOR

FIELD OF THE INVENTION

The present invention relates to a light-sensitive lithographic printing plate precursor. More particularly, it relates to a light-sensitive lithographic printing plate precursor that provides a lithographic printing plate which does not cause scumming with the edges thereof.

BACKGROUND OF THE INVENTION

The light-sensitive lithographic printing plate precursor formed on an aluminum support is being sold under the name of presensitized plate (abbreviated as PS plate). It is now in general use. The PS plates are produced by treating aluminum supports in the form of web or sheet, applying a sensitizing solution, drying, and cutting to size. The treatment include graining, anodizing, and chemical treatment, which are used individually or in combination with one another.

The plate obtained by subjecting a PS plate to exposure and development is satisfactory for printing on a sheet-fed press in which the plate is larger than the printing paper and the edges of the plate are not used for printing. However, it often deteriorates printed matter due to stains induced by ink which attaches to the edges of the plate when the plate is smaller than

the printing paper as in newspaper printing in which printing is made continuously on a web with a rotary press and the edges of the plate are also involved in printing.

5 There is disclosed in Japanese Patent Publication No. 46754/1982 a method for preventing the scumming caused by the edges of the plate. According to this method, the angle at the edge of the aluminium support is rounded off with a file or knife. This method,
10 however, is not suitable for treating a large number of plates, because plates have to be treated one by one.

SUMMARY OF THE INVENTION

As the result of extensive research, the present inventors have found that it is possible to provide
15 improved PS plates for lithographic printing which do not cause scumming at the parts corresponding to the edges thereof, and which are suitable for mass production, by previously desensitizing the edges of the aluminium support of a PS plate.

BRIEF DESCRIPTION OF THE DRAWING

20 Fig. 1 is a schematic sectional view of a PS plate treated in accordance with this invention, in which there are

shown an aluminum support at 1, a sensitizing layer at 2, and a coating film of hydrophilic polymeric compound at 3.

DETAILED DESCRIPTION OF THE INVENTION

According to this invention, PS plates can be
5 produced by merely applying a desensitizing solution to the cut ends of piled PS plates which have been cut into the same size. This method is more suitable to mass production than the conventional method by which the angle of the edge of the aluminum support is rounded off individually.
10 The desensitizing solution may be applied by a known method, e.g., by using a brush, sponge, roller, or spray. In addition, the desensitizing solution may be applied to one cut end if only one edge of the plate is involved in printing; but a desensitizing solution should preferably
15 be applied to two cut ends opposite to each other, more preferably to all four cut ends, in anticipation of various printing modes.

The desensitizing solution to be applied to the cut ends of PS plates according to this invention is
20 a known desensitizing solution for aluminum-supported lithographic printing plates. The preferred one is an aqueous solution containing a hydrophilic organic polymeric compound. Examples of the hydrophilic organic polymeric compound include gum arabic, dextrin, alginate (e.g.,
25 sodium alginate), water-soluble cellulose (e.g., carboxy-

methyleellulose, hydroxyethylcellulose, and hydroxy-propylmethyleellulose), polyvinyl alcohol, polyvinyl pyrrolidone, polyacrylamide, water-soluble copolymer containing acrylamide units, polyacrylic acid, copolymer
5 containing acrylic acid units, polymethacrylic acid, copolymer containing methacrylic acid units, copolymer of vinyl methyl ether and maleic anhydride, copolymer of vinyl acetate and maleic anhydride, and phosphoric acid modified starch. Preferable among them is gum
10 arabic because of its high desensitizing action.

They may be used in combination with one another, as occasion demands. They should be used in concentration of about 5 to 40 wt%, preferably 8 to 30 wt% based on the total weight of the desensitizing solution.

15 The desensitizing solution used in this invention, which is an aqueous solution of hydrophilic organic polymeric compound, should preferably be previously incorporated with a metal salt of a strong acid which enhances the desensitizing action. Examples of such a salt
20 include sodium salt, potassium salt, magnesium salt, calcium salt, and zinc salt of nitric acid; sodium salt, potassium salt, magnesium salt, calcium salt, and zinc salt of sulfuric acid; sodium salt, potassium salt, magnesium salt, calcium salt, and zinc salt of chromic
25 acid; and sodium fluoride and potassium fluoride.

They may be used in combination with one another.

They should be used in an amount of about 0.01 to 5 wt% based on the total weight of the desensitizing solution.

When the hydrophilic polymeric compound contained
5 in the desensitizing solution used in this invention is gum arabic, the pH of the solution should be adjusted to the acid range, preferably 1 to 5, particularly 2 to 4.5, by adding an acid. Therefore, to the aqueous solution which is not acidic, acid should be added. Examples of
10 acids to be added for pH adjustment include mineral acids such as phosphoric acid, sulfuric acid, and nitric acid, and organic acids such as citric acid, tannic acid, malic acid, glacial acetic acid, lactic acid, oxalic acid, p-toluene sulfonic acid, and organic phosphonic acid.
15 Preferable among them is phosphoric acid because not only does it function as a pH adjusting agent, but it also enhances the desensitizing action. The acid should be used in an amount of 0.01 to 8 wt%, preferably 0.1 to 5 wt%, based on the total weight of the desensitizing
20 solution.

The desensitizing solution used in this invention should preferably be incorporated with a wetting agent and/or surface active agent which improves the coatability of the desensitizing solution. Examples of wetting agents
25 include lower polyhydric alcohol such as ethylene glycol,

diethylene glycol, triethylene glycol, propylene glycol, butylene glycol, pentane diol, hexylene glycol, tetraethylene glycol, polyethylene glycol, dipropylene glycol, tripropylene glycol, glycerin, sorbitol, and pentaerythritol.

5 Preferable among them is glycerin. Examples of surface active agents include nonionic surface active agents such as polyoxyethylene alkylphenyl ether and polyoxyethylene polyoxypropylene blockcopolymer; anionic surface active agents such as fatty acid salts, alkylsulfate ester salt, 10 alkylbenzenesulfonate, alkyl naphthalenesulfonate, dialkylsulfosuccinate ester salt, alkylphosphate ester salt, naphthalenesulfonic acid, and formalin condensate; and betaine type, glycine type, alanine type, and sulfobetaine type amphoteric surface active agents.

15 These wetting agents and/or surface active agents should be added in an amount of about 0.5 to 10 wt%, preferably 1 to 5 wt%, based on the total weight of the desensitizing solution.

 The desensitizing solution to be used in this 20 invention may be incorporated with a filler such as silicon dioxide, talc, and clay in an amount less than 2 wt% and with a dye or pigment in an amount less than 1 wt%.

 The desensitizing solution used in this invention is an aqueous solution of hydrophilic polymeric compound 25 as mentioned above; however, an emulsion-type desensitizing

solution such as disclosed in U.S. Patent Nos. 4,253,999, 4,268,613, and 4,348,954 may be used. It is used when there is the possibility that the sensitive layer of PS plate might be adversely affected.

5 The application of the above-mentioned desensitizing solution to the cut ends of PS plates may be accomplished by applying the solution to the edge of the individual PS plates. However, it should preferably be accomplished by applying the solution to the cut ends of many piled PS
10 plates (say, 1000 sheets) all at once. It is possible to apply the solution to piled PS plates, each separated by interleaf, as described in Japanese Patent Publication No. 23259/1982, corresponding to U.S. Patent 4,336,093 and Japanese Patent Application (OPI) No. 99647/1982
15 (The term "OPI" as used herein refers to a "published unexamined Japanese Patent Application"), corresponding U.S. Patent 4,403,030. The desensitizing solution should preferably be applied to the cut ends in a coating weight of about 50 to 150 g/m².

20 Fig. 1 is a schematic sectional view of a PS plate obtained as mentioned above. An aluminum support 1 is covered with a sensitive layer 2, and both ends thereof are covered with a coating 3 of hydrophilic polymeric compound formed by applying the desensitizing
25 solution.

This invention can be applied to various kinds of aluminum-supported PS plates, having a sensitizing layer preferably composed of diazo resin and hydrophobic resin, a sensitizing layer composed of o-quinonediazido compound and novolak resin, a sensitizing layer of a photopolymerizable composition comprising addition-polymerizable unsaturated monomer, photopolymerization initiator and binder of organic polymeric compound, or a sensitizing layer of photosensitive resin which has the -CH=CH-CO- linkage in the molecule and undergoes photocrosslinking reaction.

The invention is described in more detail with reference to the following, in which "%" and "parts" mean "wt%" and "parts by weight", respectively, unless otherwise specified. However, the scope of the invention is not limited to these examples.

EXAMPLE 1

Positive type PS plates were prepared as follows: Aluminum supports 0.3 mm thick which had undergone graining was partly etched by dipping in 2% sodium hydroxide aqueous solution at 40°C for 1 minute. After rinsing, the aluminum supports were dipped in sulfuric acid - chromic acid mixture for about 1 minute so that the surface of pure aluminum was exposed. The aluminum supports were then anodized in 20% sulfuric acid at 30°C for 2 minutes, at a voltage of 1.5 V

DC and a current density of 3 A/dm^2 , followed by rinsing and drying. The aluminum supports were continuously coated with a sensitizing solution of the following composition in a coating weight of 2 g/m^2 (dry basis) by using a roll coater. The coating was dried at 100°C for 2 minutes.

	Naphthoquinone-1,2-diazido(2)-5-sulfonic ester of acetone-pyrogallol resin*	5	g
	PR-50530 (t-butylphenol-formaldehyde resin, a product of Sumitomo Durez Co., Ltd.)	0.5	g
	Hitanol #3110 (cresol-formaldehyde resin, a product of Hitachi Chemical Co., Ltd.)	5	g
10	Methyl ethyl ketone	50	g
	Cyclohexanone	40	g

* Synthesized according to the process described in Example 1 of U.S. Patent No. 3,635,709.

Fifty sheets of the resulting PS plates were piled one over another with interleaf inserted.

15 The interleaf was polyethylene-laminated (one side) paper composed of substrate paper having a base weight of 50 g/m^2 and a $10\text{-}\mu$ thick polyethylene layer. It was inserted such a way that the polyethylene layer contacted the photosensitive layer. The piled PS plates were cut to
20 the size of 1310 mm by 800 mm by using a quillotine cutter. The desensizing solution as mentioned below was applied to the cut ends of the piled PS plates by using a sponge in a coating weight of 70 g/m^2 , followed by drying at room

temperature.

Preparation of desensitizing solution

A desensitizing solution having a viscosity of 13 cps at pH 2.1 was prepared as follows: 61 parts of 30% aqueous solution of gum arabic was diluted with 30 parts of water. To the resulting aqueous solution were added and dissolved 0.7 part of sodium hexametaphosphate, 1 part of sodium nitrate, 1.2 parts of magnesium sulfate, and 2.4 parts of 85% phosphoric acid, with thorough stirring. Finally, 1.2 parts of polyoxyethylene-polyoxypropylene block copolymer (trade name "pluronic") was added.

The PS plate prepared as above was exposed to "Fuji Film PS Light" placed 1 meter away for 30 seconds through a transparent positive film by using a vacuum frame. (The light source is Toshiba metal halide lamp, Type MU2000-2-OL, 3 kW, available from Fuji Photo Film Co., Ltd.) The exposed plate was developed by dipping in a developing solution of the following composition.

Sodium silicate (JIS No. 3)	10 g
Aerosol OS (sodium isopropyl naphthalene-sulfonate, made by American Cyanamide)	20 g
Benzyl alcohol	30 g
Water	q.s. to 1000 ml

The developed PS plates underwent gumming up with a 14° Be aqueous solution of gum arabic.

Two sheets of thus treated PS plates were attached side by side to an offset rotary press. Ten thousand sheets were printed in the usual way. The printed matter was satisfactory, with no scumming at the parts corresponding to the edges of the plates.

For the purpose of comparison, the same PS plates as above were prepared, except that the desensitizing solution was not applied to the cut ends of the PS plates, and printing was carried out as above using the PS plates. The resulting printed matter had scumming at the parts which came into contact with the edges of the plate.

EXAMPLE 2

PS plates were prepared as follows: Aluminum supports 0.15 mm thick were degreased with an aqueous solution of sodium phosphate. The degreased aluminum supports were electrolytically grained at a current density of 3 A/m^2 in a hydrochloric acid bath and then anodized in a sulfuric acid bath. The aluminum supports were treated with an aqueous solution of sodium metasilicate for sealing. The aluminum supports thus obtained were coated with a sensitizing solution of the following composition in a coating weight of 2.5 g/m^2 (dry basis), by using a whirler, followed by drying at 100°C for 2 minutes.

	Copolymer-1*	5.0 g
	Hexafluorophosphate of condensate of p-diazodiphenylamine and formaldehyde	0.5 g
	Victoria pure blue BOH (made by Hodogaya Chemical Co., Ltd.)	0.1 g
	Cellulose ethyl ether	0.2 g
5	Tricresyl phosphate	0.5 g
	Methyl cellosolve	95 ml
	Water	5 ml

* Copolymer-1 has the composition of p-hydroxy-phenylmethacrylamide/2-hydroxyethylmethacrylate/
10 acrylonitrile/methylmethacrylate/methacrylic acid
= 10/20/25/35/10 (by weight) and has an average
molecular weight of 60,000.

The PS plates thus prepared were cut and the
desensitizing solution was applied to the cut ends in
15 the same way as in Example 1.

The PS plates were exposed for 40 seconds to
a 3 kW metal halide lamp placed 1 meter away through a
transparent negative film. The exposed PS plates were
developed by dipping in a developing solution of the
20 following composition, with light rubbing with a sponge.

	Benzyl alcohol	30 ml
	Sodium carbonate	5 g
	Sodium sulfite	5 g
	Sodium dodecylbenzenesulfonate	10 g
25	Water	1 liter

The developed PS plates underwent gumming up with a 14° B^e aqueous solution of gum arabic. Two sheets of thus treated PS plates were attached side by side to an offset rotary press. Fifty thousand sheets were printed in the usual way. The printed matter was satisfactory, with no scumming at the parts corresponding to the edges of the plate.

EXAMPLES 3 to 5

Example 1 was repeated, except that the following desensitizing solutions A, B, and C were used. In all cases, the printed matter was satisfactory, with no scumming at the parts corresponding to the edges of the plate.

Desensitizing solution A

Into 70 parts of 30% aqueous solution of gum arabic were dissolved 5.6 parts of 85% phosphoric acid, 1.4 parts of sodium nitrate, 0.7 part of zinc nitrate, and 1.3 parts of magnesium sulfate. The resulting solution was mixed with 14 parts of petroleum solvent ("K-solvent") and 7.0 parts of polyoxyethylene nonylphenyl ether ("Emulgen 903"). Thus there was obtained an emulsion-type desensitizing solution A.

Desensitizing solution B

Into 61.9 parts of water was dissolved 9.3 parts of carboxymethyl cellulose. Into the resulting solution

were dissolved 12.4 parts of magnesium nitrate, 12.4 parts of sodium nitrate and 4 parts of 85% phosphoric acid. Thus there was obtained desensitizing solution B.

Desensitizing solution C

5 To 40 parts of water was added 36 parts of 30% aqueous solution of gum arabic. Into the resulting solution were dissolved 17 parts of dextrin, 2.4 parts of glycerin, 0.6 part of 85% phosphoric acid, and 0.4 part of sodium nitrate. To the solution were further added 1.2
10 parts of polyoxyethylene nonylphenyl ether, 2.4 parts of dioctylsulfosuccinic acid, and 0.6 part of 2-phosphonobutane tricarboxylic acid. Thus there was obtained desensitizing solution C.

EXAMPLES 6 to 8

15 Example 2 was repeated, except that the desensitizing solutions A, B, and C used in Examples 3 to 5 were used. In all the cases, the printed matter was satisfactory, with no scumming at the parts corresponding to the edges of the plate.

20 While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof.

WHAT IS CLAIMED IS:

1. A light-sensitive lithographic printing plate precursor, comprising an aluminum support with a hydrophilic surface and a photosensitive layer formed thereon;
the aluminum support having a cut edge treated with a desensitizing solution.
2. A light-sensitive lithographic printing plate precursor as claimed in Claim 1, wherein two cut edges of the support which are opposite to each other are treated with the desensitizing solution.
3. A light-sensitive lithographic printing plate precursor as claimed in Claim 1, wherein all cut edges of the support are treated with the desensitizing solution.
4. A light-sensitive lithographic printing plate precursor as claimed in Claim 1, wherein the desensitizing solution is an aqueous solution containing a hydrophilic organic polymeric compound.
5. A light-sensitive lithographic printing plate precursor as claimed in Claim 4, wherein the hydrophilic organic polymeric compound is gum arabic.

6. A light-sensitive lithographic printing plate as claimed in Claim 4, wherein the hydrophilic organic polymeric compound is present in the aqueous solution in an amount in the range of 5 wt% to 40 wt%.

7. A light-sensitive lithographic printing plate precursor as claimed in Claim 6, wherein the hydrophilic organic polymeric compound is present in the aqueous solution in an amount in the range of 8 wt% to 30 wt% based on the total weight of the desensitizing solution.

8. A light-sensitive lithographic printing plate precursor as claimed in Claim 4, wherein the aqueous solution includes a metal salt of a strong acid in an amount in the range of 0.01 wt% to 5 wt% based on the total weight of the desensitizing solution.

9. A light-sensitive lithographic printing plate precursor as claimed in Claim 1, wherein the desensitizing solution is present on the cut edge in an amount in the range of 50 g/m^2 to 150 g/m^2 .

10. A light-sensitive lithographic printing plate precursor comprising an aluminium support (1) with a hydrophilic layer (2) formed thereon, the aluminium support (1) having at least one cut edge having a coating (3) of a desensitizing compound.

