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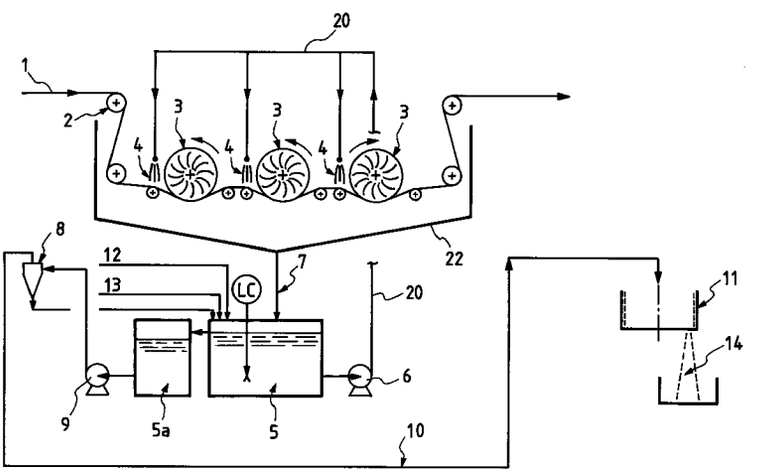
## (54) Method for treating surface of an aluminum support for printing plate

(57) A method for treating the surface of an aluminum support for a printing plate, the hardness of abrasive used for the brush graining is lower than any conventional one, and the hardness in the new Mohs scale which has been not specified conventionally is set to be equal to or greater than 2 but less than 6. The minimum-side-to-maximum-side ratio of the grain should not be less than 0.4, and the sharpest angle of the grain to be used should be equal to or greater than 45°. Aluminum hydroxide may be adopted as the abrasive having these characteristics. It is good when the average size of the grains is set to be equal to or greater than 5 μm but less than 200 μm. It is preferable that the density of the abrasive slurry is equal to or greater than 5 weight per cent but less than 90 weight per cent.

*FIGURE*




EP 0 734 883 A1

## Description

### BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method for treating the surface of an aluminum support for a printing plate, and particularly to a method for treating the surface of an aluminum support which is low in running costs and excellent in printing performance.

2. Description of the Related Art

An aluminum plate has been widely used as a support for a lithographic printing plate, and a treatment of roughening the surface of the support, that is, a so-called graining treatment has been given thereto in order to improve the adherence between the support and a photosensitive layer and to give water retentivity to a non-picture portion. As specific means for this graining treatment, there are proposed mechanical graining methods due to sand-blast, ball graining, wire graining, brush graining with nylon brush and abrasive/water slurry, slurry jet by spraying the surface with abrasive/water slurry at a high pressure, and so on, and chemical graining methods of roughening the surface with an etching agent containing a base, an acid or a mixture thereof.

In addition, there are proposed electrochemical graining methods as disclosed in Japanese Patent Unexamined Publications No. Sho 54-146234 and No. Sho 48-28123.

For example, there are proposed methods in which a mechanical graining method and an electrochemical graining method are combined, as disclosed in Japanese Patent Unexamined Publication No. Sho 53-123205, Japanese Patent Examined No. Sho 57-16918, and Japanese Patent Unexamined Publication No. Sho 62-25117.

There is also known a method in which a mechanical graining method is combined with a chemical graining method by a saturated water solution of an aluminum salt of a mineral acid, as disclosed in Japanese Patent Unexamined Publication No. Sho 56-55261.

However, in the case of the ball graining, not only the selection of the kind (material) and size of balls used therein, the adjustment of the water content at the time of graining, and so on, are difficult but also the productivity is poor because of batch processing. Therefore, the ball graining is seldom used currently.

The wire graining is also apt to make graining uneven, and therefore it is seldom used currently.

Further, if the control of electrolytic conditions is selected properly in the electrochemical roughening method, considerably good supports can be obtained. However, the power consumption in the electrolytic treatment is large, and the waste disposal of an electrolytic liquid also costs much. There is another defect that the property of graining varies largely in accordance with the metal structure of the support.

In addition, also in the case of the chemical roughening, similarly to the electrochemical roughening method, there is a defect that the waste disposal of a treatment liquid costs much, and it takes a long time to perform the disposal.

In a slurry jet method (U.S. Patent No. 4,613,413 and U.S. Patent No. 4,746,591), slurry containing abrasive fine powder dispersed therein is accelerated and sprayed to an aluminum surface by compressed air, or the like. Accordingly, since it is necessary to spray a high-pressure fluid at a high rate, the equipment therefor becomes large in scale. In addition, there are many troubles such as abrasion, choking, and so on, of pipe arrangements due to the slurry, so that it costs much for power for high-pressure pumps, etc., equipment maintenance, and so on.

In the brush graining method, supports excellent in performance can be obtained continuously by brushing aluminum supports by means of a rotating brush with abrasive slurry (so-called pumice generally obtained from valcanic ashes, or alumina or the like. The abrasive slurry has a certain hardness, that is, the hardness of which is not less than 6 in new Mohs scale. The minimum-side-to-maximum-side ratio of grain of the abrasive slurry is less than 0.4 and the grain sharpest angle of which is less than 45°. However, there has been a case that the abrasive inserts the support and brought thereby causes a trouble in the next step because the abrasive is so hard, or often so sharp. Additionally, in the rough surface of the support, the valley portion is considerably deep in comparison with any other method, so that the mountain portions form very sharply projecting burrs. Therefore, sometimes, the printing performance is lowered particularly in "stains", and it costs much to exchange the brush exhausted by abrasion, and to dispose the exhausted abrasive, and so on.

### SUMMARY OF THE INVENTION

The present invention has been made to solve the foregoing problems in the brush graining, and therefore an object of the present invention was to provide a method for treating the surface of an aluminum plate for a printing plate, in which a support having a good printing performance without any "stains" and with improved "narrowing of shadowed portions" can be manufactured at a low cost and stably.

In order to solve the above problems, the present invention has been acheived by the provision of a method for treating the surface of an aluminum support for a printing plate through the brush-graining surface treatment technique in which slurry of abrasive is rubbed against the support by means of an abrasive brush to perform graining on a surface of the support, characterized in that abrasive having a new Mohs scale which is equal to or greater than 2 but less than 6 is used.

Also, according to the present invention, there is provided a method for treating the surface of an aluminum support for a printing plate through the brush-grain surface treatment technique in which slurry of abrasive is rubbed against the support by means of an abrasive brush to perform graining on a surface of the support, characterized in that said abrasive includes grains having a minimum-side-to-maximum-side ratio is not less than 0.4, and having the sharpest angle equal to or greater than 45°.

Further, according to the present invention, there is provided a method for treating the surface of an aluminum support for a printing plate through the brush-graining surface treatment technique in which slurry of abrasive is rubbed against the support by means of an abrasive brush to perform graining on a surface of the support, characterized in that aluminum hydroxide is used for said abrasive.

In the method for treating the surface of an aluminum support for a printing plate as described above, the average grain size of said abrasive is set to be equal to or greater than 5 μm but less than 200 μm, and the density of said abrasive slurry is set to be equal to or greater than 5 weight per cent but less than 90 weight per cent.

The above and other objects and features of the present invention will be more apparent from the following description taken in conjunction with the accompanying drawing.

## BRIEF DESCRIPTION OF THE DRAWINGS

Figure is a schematic side view showing a process for treating the surface of an aluminum support for a printing plate according to the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A description will be given in detail of embodiments of the present invention with reference to the accompanying drawing.

Figure is a schematic side view showing a process for the surface of an aluminum support for a printing plate according to the present invention.

In the figure, an aluminum support 1 is supported by pass rollers 2 so as to be subjected to surface treatment mechanically with abrasive brushes 3 and abrasive slurry 4. The abrasive slurry 4 is applied to the surface of the aluminum support 1 by a circulating pump 6 through a pipe 20, rubbed by the abrasive brushes 3 against the aluminum support 1, and then returned from a receiver 22 to a circulating tank 5 through an abrasive slurry return pipe 7. In the surface treatment by brush graining, the grain size of the abrasive slurry becomes smaller so that the surface treatment becomes difficult if the slurry once used for surface treatment is used again as it is. Therefore, new grain abrasive and water are supplied to the circulating tank 5 through pipes 12 and 13, respectively. Consequently, a part of the abrasive slurry flows to an overflow tank 5a. The overflowed abrasive is classified by a cyclone 8 so that large-grain abrasive is returned to the circulating tank 5 while the remainder small-grain abrasive is discharged to the outside of the system through an abrasive slurry discharge pipe 10. The discharged abrasive is solid/liquid separated by a centrifuge separator 11, and used small-grain-size abrasive 14 is extracted as grains so as to be treated.

In the above-mentioned process, the hardness of abrasive used as brush graining is lower than any conventional one. Conventionally, 10 kinds of minerals are selected in accordance with the hardness used as Mohs scale in the field of minerals, and a surface is scraped with the thus selected minerals one by one sequentially so that if there is a damage, it is determined that the surface is softer than the mineral. Though the hardness of the abrasive has been selected to be not less than 5 in Mohs scale conventionally, it is selected to be equal to or greater than 2 but less than 6 in new Mohs scale according to the present invention. Because of an increase of use, the new Mohs scale is defined by adding 5 kinds so that the old scale between 1 and 10 are widened to between 1 and 15. In the sections 1-15 of the new Mohs scale, 1-6 are the same as those in the old Mohs scale.

The hardness equal to or greater than 2 but less than 6 means the hardness corresponding to No. 2 gypsum, No. 3 calcite, No. 4 fluorite and No. 5 apatite, respectively.

Also, in the above-mentioned process, the minimum-side-to-maximum-side ratio (as three-dimensional size ratio) of the grain should be 0.4 or more, which has been regarded as good conventionally, and the sharpest angle of grains to be used should be 45° or more. When the minimum-side-to-maximum-side ratio of the grain is less than 0.4, and the sharpest angle of the grains is made to be less than 45°, the grain inserts the surface of the aluminum support so that the grain is brought into the next step causing a trouble as a result. It is necessary that the minimum-side-to-maximum-side ratio of the grain is equal to or greater than 0.4, preferably not less than 0.5 but not more than 1, and the sharpest angle of the grain should be equal to or greater than 45°, preferably not less than 60° but not more than 120°.

Aluminum hydroxide may be adopted as the abrasive having the above-mentioned characteristics.

Further, it is effective that the average size of grains of the abrasive is equal to or greater than 5 μm but less than 200 μm. It is desirable that the density of the abrasive slurry is equal to or greater than 5 weight per cent but less than 90 weight per cent. If the average size of grains of the abrasive is equal to or greater than 5 μm but less than 200 μm, graining with desired surface roughness can be attained. If the average size of grains of the abrasive is less than 5 μm, the roughness is insufficient, and if it is not less than 200 μm, the surface becomes too rough. The more preferable range of the average size of grains of the abrasive is from 8 μm to 100 μm. On the other hand, if the density of the abrasive slurry is less than 5 weight per cent, the surface roughness becomes insufficient so that the surface is apt to be damaged by the brush, while if it is not less than 90 weight per cent, it becomes difficult to handle the slurry. Although desired surface roughness can be obtained under the above-described condition, the more preferable range of the density is from 10 weight per cent to 60 weight per cent.

(Examples)

Examples of the surface treatment method in accordance with the present invention will be described below.

Aluminum hydroxide (new Mohs scale 3), pumice (new Mohs scale 5) and alumina (new Mohs scale 12) having properly selected three-dimensional size and the selected sharpest angle of grains were used as abrasive in the surface treatment process shown in Figure, and the surfaces of aluminum supports for printing plates were treated with the respective abrasive. Table 1 shows the relationship between the grain shapes and the printing performances at that time.

This surface treatment was performed under the conditions as follows:

width of the aluminum plate = 1,000 mm; and treatment speed = 30 m/min.

Table 1

| | Examples | | | | Comparatives | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 |
| Abrasive | aluminum hydroxide | | alumina | | alumina | permis |
| Hardness (new Mohs scale) | 3 | | 12 | | 12 | 5 |
| 3-dimensional size ratio | 0.9 | 0.3 | 0.9 | 0.4 | 0.3 | 0.1 |
| Sharpest grain angle | 90° | 30° | 90° | 45° | 30° | 30° |
| Stains | very good | very good | very good | good | bad | good |
| Narrowing of shadowed portion | very good | very good | very good | very good | very good | good |

Aluminum hydroxide was used in Examples 1 and 2, and satisfied the conditions that the abrasive has a new Mohs scale which is equal to or greater than 2 but less than 6, and that aluminum hydroxide is used for the abrasive. Alumina was used in Examples 3 and 4. Although the new Mohs scale thereof was high in this case, the three-dimensional size ratio and the sharpest angle of grains satisfied the conditions that the abrasive includes grains having a minimum-side-to-maximum-side ratio not less than 0.4, and having a sharpest angle equal to or greater than 45°.

Any of Comparatives 1 and 2 did not satisfy any of Claims 1 to 4, and their printing performance was bad.

The defects in the brush graining method were improved by the surface treatment method of the present invention, and the printing quality against "narrowing of shadowed portions" and "stains" was improved. Accordingly, the performance of printing could be improved conspicuously.

The foregoing description of a preferred embodiment of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and modifications and variations are possible in light of the above teachings or may be acquired from practice of the invention. The embodiment was chosen and described in order to explain the principles of the invention and its practical application to enable one skilled in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the claims appended hereto, and their equivalents.

## Claims

1. A method for treating a surface of an aluminum support for a printing plate, comprising the steps of:
preparing abrasive having a new Mohs scale equal to or greater than 2 but less than 6; and
rubbing slurry of said adrasive against said aluminum support by means of an abrasive brush to perform graining on the surface of said aluminum support.

2. A method for treating a surface of an aluminum support for a printing plate, comprising the steps of:
preparing abrasive with grains having a minimum-side-to-maximum-side ratio not less than 0.4, and having the sharpest angle equal to greater than 45°; and
rubbing slurry of said adrasive against said aluminum support by means of an abrasive brush to perform graining on the surface of said aluminum support.

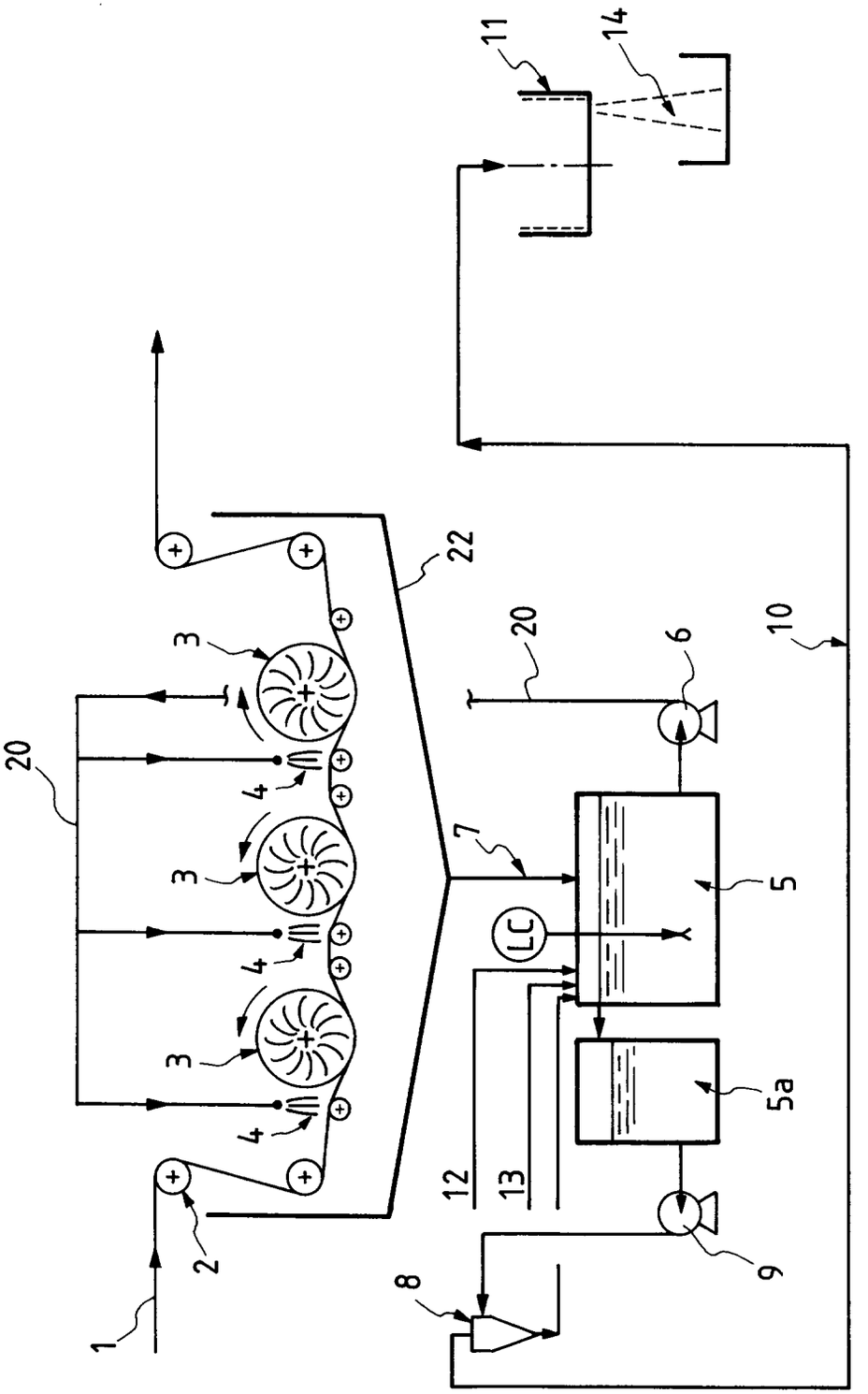
3. A method for treating a surface of an aluminum support for a printing plate, comprising the steps of:
preparing abrasive made of aluminum hydroxide; and
rubbing slurry of said adrasive against said aluminum support by means of an abrasive brush to perform graining on the surface of said aluminum support.

4. A method for treating a surface of an aluminum support as claimed in claim 1, wherein an average grain size of said abrasive is set to be equal to or greater than 5 μm but less than 200 μm, and a density of said abrasive slurry is equal to or greater than 5 weight per cent but less than 90 weight per cent.

5. A method for treating a surface of an aluminum support as claimed in claim 2, wherein an average grain size of said abrasive is equal to or greater than 5 μm but less than 200 μm, and a density of said abrasive slurry is equal to or greater than 5 weight per cent but less than 90 weight per cent.

6. A method for treating a surface of an aluminum support as claimed in claim 3, wherein an average grain size of said abrasive is equal to or greater than 5 μm but less than 200 μm, and a density of said abrasive slurry is equal to or greater than 5 weight per cent but less than 90 weight per cent.

FIGURE



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# EUROPEAN SEARCH REPORT

Application Number
EP 96 10 5119

## 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.6) |
|---|---|---|---|
| X<br>Y | US-A-3 891 516 (CHU SIMON L) 24 June 1975<br>* column 4, line 8 - line 19 * | 1<br>1 | B41N3/04 |
| X<br>Y | EP-A-0 213 371 (FUJI PHOTO FILM CO LTD) 11 March 1987<br>* column 5, line 30 - line 34 * | 1<br>1 | |
| Y | FR-A-2 418 059 (FROMSON H A) 21 September 1979<br>* the whole document * | 1 | |
| E | EP-A-0 704 320 (HOECHST AG) 3 April 1996<br>* column 6, line 23 - line 30 * | 1 | |
| | | | TECHNICAL FIELDS SEARCHED (Int.Cl.6)<br>B41N |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 9 July 1996 | Rasschaert, A |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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