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LITHOGRAPHIC PRINTING FORM AND METHOD OF PREPARING THE SAME

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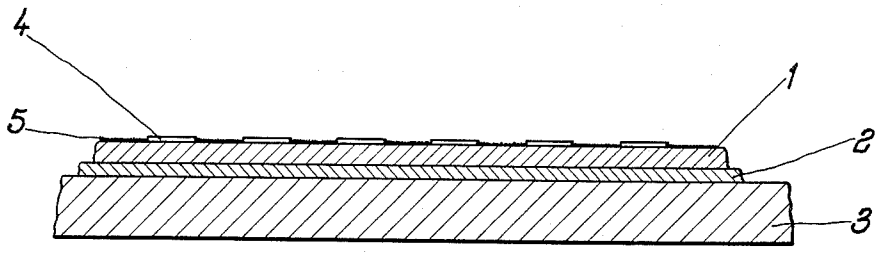

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LITHOGRAPHIC PRINTING FORM AND METHOD OF PREPARING THE SAME

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The present invention relates to a method of preparing lithographic printing forms, particularly printing foils and to the thus made product.

More specifically, the present invention is concerned with lithographic printing forms having a metallic printing face fromed for instance by an aluminum or zinc foil which may be adhered to a backing sheet such as a paper sheet.

Printing forms according to the present invention such as the above mentioned metallic printing foils may be used as lithographic printing foils for offset printing as well as for direct lithographic printing by applying printing patterns from the non-printing side of the foil with superpositioning of a fat carrier.

Lithographic printing foils up to now required roughening of the metallic printing face in order to make the same hydrophilic, i.e. in order to improve water acceptance. Such roughening could be accomplished mechanically by brushing or grinding, or chemically by etching, as well as by electrolytic oxidation of the metal surface. In any event, such roughening treatment had to be carried out prior to forming printing patterns on the printing foil, requiring an additional procedure in the manufacture of the printing foil and thus increasing the costs.

It is an object of the present invention to provide a method of preparing printing forms which does not require the roughening of the metallic printing surface.

It is a further object of the present invention to provide a printing form possessing excellent water acceptance in the surface areas which are not covered with the fatty printing pattern.

It is another object of the present invention to prepare a lithographic printing form starting with a smooth non-roughened metallic printing surface and without roughening the same in a manner such as for instance described above in connection with prior art printing foils.

Other objects an advantages of the present invention will become apparent from a further reading of the description and of the appended claims.

With the above and other objects in view, the present invention includes in a method of preparing lithographic printing forms, the steps of forming on a smooth face of a metal body a printing pattern consisting of a fat-accepting hydrophobic substance, leaving portions of the metal face free, and applying to the free portions of the face an organic hydrophilic colloid and a finely dispersed hydroxide of an alkaline earth metal, whereby the hydrophilic properties of the free portions of the metallic printing face are improved.

More specifically, the present method of preparing a lithographic printing foil may include the steps of forming on a free smooth face of a metal foil consisting essentially of a metal selected from the group consisting of zinc, aluminum and alloys of the same, a printing pattern consisting of a layer of a fatty substance covering portions only of the free face of the metal foil, applying to the free face an aqueous liquid having suspended therein finely dispersed calcium hydroxide, the aqueous liquid being repelled by the fatty substance covered portions of the metal foil face while adhering to the remainder of the face, substantially evaporating the aqueous

liquid so as to substantially cover the remainder of the face with a deposit of the calcium hydroxide, thereafter applying to the face an aqueous solution of gum arabic, the aqueous solution being repelled by the fatty substance covered portions of the metal foil face while adhering to the calcium hydroxide covered portions thereof, and evaporating the aqueous solution so as to form on the remainder of the face a deposit consisting essentially of the calcium hydroxide and the gum arabic, and treating at least the deposit covered portions of the metallic printing foil face prior to use thereof with a dilute solution of phosphoric acid.

The present invention also contemplates a lithographic printing form including a smooth metallic printing face covered in part only by a printing pattern consisting of a fat-accepting hydrophobic substance, the remainder of the metallic printing face being substantially covered by an intimate mixture of an organic hydrophilic colloid and of a finely dispersed hydroxide of an alkaline earth metal, whereby the remainder of the metallic printing face is endowed with hydrophilic qualities.

According to a preferred embodiment the present invention contemplates a lithographic printing form, comprising in combination, a carrier sheet having opposite faces; and aluminum printing foil having a printing face covered in part only by a printing pattern consisting of a fat-accepting hydrophobic substance, the remainder of the metallic printing face being substantially completely covered with an intimate mixture of gum arabic and of finely dispersed calcium hydroxide, whereby the remainder of the aluminum printing is endowed with hydrophilic qualities, and a layer hardened water resistant adhesive material interposed between the carrier and the aluminum printing foil firmly adhering the other face of the aluminum printing foil to one face of the carrier sheet.

Thus according to the present invention, metallic printing foils are used for preparing lithographic printing forms, which foils need not be roughened by mechanical, chemical, electrolytical or any other means. To the contrary, according to the present invention, a smooth metallic printing surface is provided, for instance a smooth rolled metal foil alone or fixed to a carrier sheet, and after forming a printing pattern of fat-accepting material on the smooth metallic printing surface, the same is treated with a solution of a natural or synthetic hydrophilic organic colloid, and with a suspension of finely dispersed calcium hydroxide or of another alkaline earth metal hydroxide. Preferably, the hydroxide suspension is formed in the aqueous colloid solution, or vice versa, so that colloid and suspension may be simultaneously applied to the printing foil.

However, it is also possible first to apply the aqueous suspension, for instance, of calcium hydroxide and, either immediately thereafter or after air drying of the calcium hydroxide suspension on the printing foil, to apply the colloid solution.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing, in which the figure represents an elevational cross-section through a lithographic printing foil according to the present invention.

Referring now to the drawing, the prepared printing foil ready for use comprises a metal foil 1, for instance an aluminum foil, however zinc foils and foils of certain alloys of aluminum and of zinc may also be used advantageously. The hard aluminum foil has been rolled so as

to possess a smooth surface, and preferably has a thickness of between 0.01 and 0.04 mm. Aluminum foil **1** is adhered to paper carrier sheet **3** by means of an interposed thermoplastic or lacquer-like layer **2** of preferably water-resistant adhesive material. Carrier sheet **3** preferably consists of a paper sheet weighing between 50 and 80 grams per square meter.

Excellent results are obtained according to the present invention with an aluminum foil **1** of fat-free, hard offset quality, having a thickness of 0.015 mm., which foil is adhered to a paper carrier sheet **3** weighing 60 grams per square meter, and by adhering aluminum foil **1** and paper carrier sheet **3** to each other by means of an interposed layer **2** of a water-resistant thermoplastic adhesive.

As shown in the drawing, printing patterns **4** of fatty or fat-accepting hydrophobic material are formed on the free face of metal foil **1**. The portions of the free face of metal foil **1** which are not covered by printing patterns **4**, are covered with a deposit of a mixture of a hydrophilic organic colloid such as gum arabic and of a finely dispersed hydroxide of an alkaline earth metal. The above described deposit is indicated in the drawing by reference numeral **5**. It must be noted that upon exposure to air and to the carbon dioxide contained therein, at least part of the calcium hydroxide or the like might be transformed into a carbonate of an alkaline earth metal. Preferably, such carbonate is destroyed prior to use of the printing form by applying a dilute aqueous acid, for instance a 0.5% aqueous solution of phosphoric acid, to the printing surface.

Surprisingly, it has been found that the surface of the smoothly rolled metallic printing foils, according to the present invention, possess particularly good acceptance for the fatty material of the printing pattern, and that due to the undisturbed smoothness of the metallic printing surface extremely sharp reproduction of the printing pattern can be accomplished.

However, the smoothly rolled metal surface does not possess hydrophilic qualities, in other words, the water-acceptance of the portions of the metal surface which are not covered with the hydrophobic printing pattern, is poor. This is overcome, according to the present invention, by applying calcium hydroxide or the like and an organic hydrophilic colloid in an aqueous carrier to the printing foil after the hydrophobic printing pattern has been formed thereon. The aqueous liquid will not adhere to the portions of the printing form which are covered by the printing pattern, but a sufficient quantity of the aqueous liquid will adhere to the smooth free metal surface portions, so that upon drying, a substantially continuous deposit of for instance calcium hydroxide and gum arabic will be formed on the free portions of the metal surface. The thus formed deposit will endow the portions of the printing foil surface which are not covered with the fatty printing pattern, with excellent hydrophilic, i.e. water-accepting qualities.

Without limiting the present invention to any specific explanation of the foregoing, it may be assumed that treating the smooth metal surface with calcium hydroxide or the like, i.e. the hydroxide of another alkaline earth metal, will better bind the simultaneously or subsequently applied organic colloid to the smooth metal surface. Thereby it is achieved that the free metal surface which originally possessed fat-accepting and water-rejecting properties, upon application of the hydroxide and the colloid is transformed into a water-accepting and fat-rejecting surface.

Upon air drying of the thus prepared printing forms, the carbon dioxide content of the air causes partial transformation of the hydroxide into a carbonate. In view thereof, it has been found advantageous to treat the printing foil before using the same with a diluted aqueous acid such as a 0.5% aqueous phosphoric acid. Short treatment with the dilute acid will suffice to destroy the calcium carbonate or the like.

The following examples are given as illustrative only of the present invention, the invention, however, not being limited to the specific details of the examples.

EXAMPLE 1

Composition of treating liquid A

	G.
Gum arabic	10.0
Barium hydroxide	7.5
Distilled water	120.0

EXAMPLE 2

Composition of treating liquid B

Gum arabic	12.0
Strontium hydroxide	6.0
Water	120.0

While it is desirable to prepare the treating liquids with distilled water, the present invention is not limited to the use of the same.

EXAMPLE 3

Composition of treating liquid C

	G.
Gum arabic	20
Water	80
10% suspension of calcium hydroxide in water	50

EXAMPLE 4

Composition of treating liquid D

Gum arabic	20
Calcium hydroxide	5
Water	125

Preferably, the calcium hydroxide content of treating liquids such as are described in Examples 3 and 4 will be kept to between 2 g. and 15 g. per 150 g. of treating liquid, and the gum arabic content to between 10 and 30 g.

Gum arabic may be replaced by other synthetic or natural organic colloids, such as polyvinyl alcohol, methyl cellulose, cellulose glycolate, starch or dextrine.

As described further above, it is possible, according to the present invention, to apply either one treating liquid containing the colloids and also the hydroxide, or, for instance, the calcium hydroxide dispersion of Example 3 may be first applied and subsequently the aqueous solution of gum arabic described in the same example.

EXAMPLE 5

Composition of treating liquid E

	G.
Tylose Str 25 (methyl cellulose)	5
Distilled water	185
Calcium hydroxide	10

EXAMPLE 6

Composition of treating liquid F

Tylose KZ (cellulose glycolate)	10
Distilled water	180
Calcium hydroxide	10

EXAMPLE 7

The process according to the present invention, may be carried out, for instance, in the following manner:

An aluminum foil having a thickness of 0.015 mm., adhesively adhered to a paper carrier sheet weighing 60 grams per square meter, is provided in a typewriter with a printing pattern by supraposition of a sheet containing a fatty surface layer.

After thus forming a printing pattern on the aluminum foil, the printing foil is treated by pouring over the same a few cubic centimeters of the treating liquid described in Example 3. The liquid is evenly distributed over the printing surface of the foil, for instance by means of a viscose sponge. Excess of the liquid is removed by apply-

ing the sponge which previously has been compressed so as to remove liquid from the same. The foil is then wiped with a clean linen cloth whereby care must be taken not to exert too much pressure upon the printing surface. Thereafter, the foil is air dried, for instance by waving it by hand.

After fastening the thus treated lithographic printing foil to a direct printing machine, the foil is wiped with a 0.5% aqueous phosphoric acid solution. Thereafter, the cylinder of the printing machine is allowed to turn a few times for moistening only, and then printing is carried out in conventional manner.

After completion of the print run, the foil is stored without special preservation of the same. When the printing foil is to be used for printing further copies, even after the lapse of a considerable length of time, it is sufficient to moisten the foil for a short period of time for instance with moistened cotton wool, whereupon conventional printing can be resumed.

It will be understood that each of the elements described above, or two or more together, may also fined a useful application in other types of printing forms differing from the types described above.

While the invention has been illustrated and described as embodied in lithographic printing foils, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a method of preparing lithographic printing forms, the steps of forming on a smooth face of a metal body a printing pattern consisting of a fat-accepting hydrophobic substance, leaving portions of said metal face free; and applying to said smooth face an aqueous liquid containing an organic hydrophilic colloid and a finely dispersed substance selected from the group consisting of the hydroxides of barium, strontium and calcium, whereby the hydrophilic properties of said free portions of said metallic printing face are improved.

2. In a method of preparing lithographic printing forms, the steps of forming on a smooth face of a metal body consisting essentially of a metal selected from the group consisting of zinc, aluminum and alloys of the same, a printing pattern consisting of a fat-accepting hydrophobic substance, leaving portions of said metal face free; and applying to said smooth face an aqueous liquid containing an organic hydrophilic colloid selected from the group consisting of gum arabic, polyvinyl alcohol, methyl cellulose, cellulose glycolate, starch and dextrine, and also containing a finely dispersed substance selected from the group consisting of the hydroxides of barium, strontium and calcium, whereby the hydrophilic properties of said free portions of said metallic printing face are improved.

3. In a method of preparing a lithographic printing foil, the steps of forming on a free smooth face of a metal foil a printing pattern consisting of a fat-accepting hydrophobic substance, leaving portions of said metal foil free; applying to said free face an aqueous liquid containing an organic hydrophilic colloid and a finely dispersed substance selected from the group consisting of the hydroxides of barium, strontium and calcium so as to form on said free portions of said face a deposit consisting essentially of an intimate mixture of said hydrophilic colloid and of said substance; and treating said deposit on said free portions of said printing foil face prior to use of said printing foil with an acidic aqueous solution, whereby the hydrophilic properties of said free portions of said metallic printing face are improved.

4. In a method of preparing a lithographic printing foil, the steps of forming on a free smooth face of a metal foil consisting essentially of a metal selected from the group consisting of zinc, aluminum and alloys of the same, a printing pattern consisting of a layer of a fatty substance covering portions only of said free face of said metal foil; applying to said free face an aqueous liquid containing an organic hydrophilic colloid and a finely dispersed substance selected from the group consisting of the hydroxides of barium, strontium and calcium, said aqueous liquid being repelled by said fatty substance covered portions of said metal foil face and being accepted by the remainder of said metal foil face so as to adhere thereto; and allowing said aqueous liquid on said metal face to dry so as to form thereon a layer consisting essentially of a mixture of said hydrophilic colloid and said substance.

5. In a method of preparing a lithographic printing foil, the steps of forming on a free smooth face of a metal foil consisting essentially of a metal selected from the group consisting of zinc, aluminum and alloys of the same, a printing pattern consisting of a layer of a fatty substance covering portions only of said free face of said metal foil; applying to said free face an aqueous liquid containing colloidal gum arabic and finely dispersed calcium hydroxide and evaporating said aqueous liquid.

6. In a method of preparing a lithographic printing foil, the steps of forming on a free smooth face of a metal foil consisting essentially of a metal selected from the group consisting of zinc, aluminum and alloys of the same, a printing pattern consisting of a layer of fatty substance covering portions only of said free face of said metal foil; applying to said free face an aqueous liquid containing colloidal gum arabic and finely dispersed calcium hydroxide, said aqueous liquid being repelled by said fatty substance covered portions of said metal foil face while adhering to the free portions thereof; evaporating said aqueous solution so as to form on said free portions of said face a deposit consisting essentially of a mixture of said calcium hydroxide and said gum arabic; and treating at least the deposit covered portions of said metallic printing foil face prior to use thereof with a dilute solution of phosphoric acid.

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