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METHOD OF MAKING PRINTING MEMBERS

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This invention relates to photo-engraved printing members made of elastic material and more particularly relates to an elastic printing member which is normally soluble in water but which may be made insoluble in water by projecting light thereon.

The invention is concerned with a printing plate and the process of making the printing plate from a relatively thick sheet of transparent elastic material, such as polyvinyl alcohol, which normally is soluble in water but which has been photo-sensitized so that light makes it insoluble in water. The invention is further concerned with a method of stretching the elastic material before it is treated photographically, so as to cause an elongation of the characters or the design photographed thereon, as the material is returned to normal, said elongation being in the direction opposite to the direction of stretching, so that the printing plate may thereafter be bent around a cylinder for printing purposes without circumferential distortion of the contours intended to be printed.

The process to be described may be used to provide a printing plate either with or without the use of a silk screen, and said process requires but a few simple operations and a minimum of craftsmanship, which makes this invention a forward step in the art of photo-engraving.

Therefore, one of the objects of this invention is to provide a simple method for making a printing plate by photo-engraving.

Another object of the invention is to provide a printing plate made by photo-engraving elastic material.

Another object of the invention is to provide a method for making a printing plate of polyvinyl alcohol.

Another object of the invention is to provide a method of making a printing plate from a water-soluble light-sensitive elastic sheet.

Another object of the invention is to provide a method of making an elastic printing plate from a water-soluble transparent sheet which has thereon areas made insoluble by light.

Another object of the invention is to provide a method of photo-engraving a printing plate in a manner to compensate for the distortion caused by wrapping the finished plate around a printing cylinder of small diameter.

Another object of the invention is to provide a method of photo-etching a printing plate while stretched in one direction, so that when said printing plate, having returned to its normal dimensions, is wrapped around a printing cylinder,

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the printing faces will assume undistorted contours.

With these and other objects in view, the invention includes certain steps and combinations of steps and elements, which will be more fully described hereinafter.

General description

The invention, although applicable to any transparent soluble elastic sheet material into which may be incorporated light-sensitive substances which, when affected, render the sheet material differentially soluble, is particularly concerned with the poly-vinyl alcohols which are water-soluble.

Printing plates made of transparent poly-vinyl alcohol with the process to be described not only are easy and simple to make, but may be made within a wide range of hardness and flexibility by the incorporation of plasticizing agents and, by the incorporation of more or less light-sensitive material, may be made more or less sensitive to light. By use of the silk screen process, it is possible to give half-tone etching to the plate, just as in the photo-engraving of metal. The printing plate may be made with a high relief, free from undercutting, due to the transparency of poly-vinyl alcohol, which permits light directed normally to the surface to be transmitted from side to side in the sheet without any lateral diffusion. The light renders those parts of the solid through which it is projected insoluble in water, the non-lighted areas being soluble. Such areas of solubility and insolubility continue from one surface to the other surface of the sheet, which allows the etching or dissolving away of the areas not sensitized by the light to be as deep as desired, without there being any undercutting effect at the edges of the relief.

The raw sheet material to be processed is first made the desired thickness and size and is then soaked, in the absence of light, in a solution of light-sensitive insolubilizing material, such as sodium dichromate which has been made in a saturated water solution. The light-sensitive solution should be in contact with the raw sheet material until it permeates the sheet.

While still in the dark room, the sheet has projected thereon, preferably by rays of light normal to the surface of the sheet, a design of light in the contour of the subject matter to be printed, which design may be furnished by a contact negative or by a projected pattern of light, either with or without a silk screen, for a

sufficient time to cause a photo reaction in the light-affected regions.

While still in the dark room, the sheet is washed in water upon the intended front side until the soluble areas are dissolved out to the desired depth. Some soft material, such as a pledget of cotton, may be used to thoroughly clean away the dissolved portion. By dissolving the soluble areas to the depth usually found in letter press type, a printing plate for letter press type of printing is produced in a very simple manner.

Because the light shows through the sheet from one side to another, therefore making the back side of the sheet similar to the front side in its differential solubility, the back side may be protected against the washing action by attaching to it and to the edges of the sheet some water-resistant material. Poly-vinyl alcohols requiring hot water to dissolve them may, for instance, be used as such a backing for a poly-vinyl alcohol soluble in cold water.

When a printing plate is wrapped around a printing cylinder of small radius, the outer printing surface of the printing plate becomes elongated in a circumferential direction, distorting the contours of the design or the type standing in relief thereon, such distortion being greater the smaller the radius of the printing cylinder. This invention provides a means to overcome such distortion by causing the printing plate to be etched in a distorted manner, so that the circumferential elongation when the printing plate is wrapped around the cylinder will be previously compensated for. After the sheet has been rendered sensitive to light, the sheet is stretched flat, in the direction of the circumference of the printing cylinder around which it is to be wrapped, to a degree which is equivalent to the elongation caused by curvature of the printing cylinder. The surface is then illuminated by the design desired, and, after the surface is etched, which may be done either before or after the printing plate is allowed to resume its normal dimensions, upon the printing plate assuming its normal dimensions, the contours of the design etched thereon will be found to be elongated in the direction perpendicular to the direction in which it was stretched, so that, when the plate is wrapped around the printing cylinder, the elongation will disappear and the contours will become normal.

The invention is not limited to the use of poly-

vinyl alcohol, as any elastic transparent sheet having the photo-sensitive quality of rendering the sheet differentially soluble will suffice, nor to the particular chemical mentioned as a sensitizing agent, for other dichromate salts and other light-sensitive chemicals will accomplish the same purpose, nor to the order of steps involved in the process, as it is evident that each material has a considerable range of equivalents and that the order of the steps of the process may be varied without departing from its scope and purposes.

What is claimed is:

1. The method of making an elastic printing plate for use in cylinder printing, consisting of the step of impregnating a plate of transparent plasticized elastic poly-vinyl alcohol in a saturated solution of sodium dichromate in water the step of stretching the plate an extent equal to the elongation of the printing surface which will occur when the plate is placed around the cylinder; the step of subjecting said stretched plate to a light pattern of the matter to be printed; and the step of etching the surface upon which light was projected by a water wash.

2. The method of distorting a design in relief on an elastic printing member, consisting of the step of stretching the printing member in one direction; the step of etching the design on said printing member while in the stretched condition; and the step of then allowing the member to resume its normal form.

3. The method of making a flexible and elastic printing plate, adapted to be wrapped around a cylinder printing roll without distorting the contours of the relief design desired thereon, consisting of the step of impregnating a sheet of transparent poly-vinyl alcohol in a chemical which makes poly-vinyl alcohol insoluble by a certain former solvent after exposure to light; the step of stretching the poly-vinyl alcohol in the direction of the circumference of the cylinder upon which it is to be placed; the step of projecting an image of light upon the intended printing surface of said sheet; the step of etching away the remaining part by the certain solvent, leaving a relief of the image to be printed; and the step of allowing the sheet to return to its normal unstretched shape so that upon wrapping said printing member around the cylinder the axially distorted design will be returned to its undistorted shape.

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