Oct. 14, 1969 D. A. NEWMAN ET AL 3,472,162

PLANOGRAPHIC PRINTING PLATES AND METHODS FOR PREPARING THE SAME

Filed July 29, 1966

Fig. 1

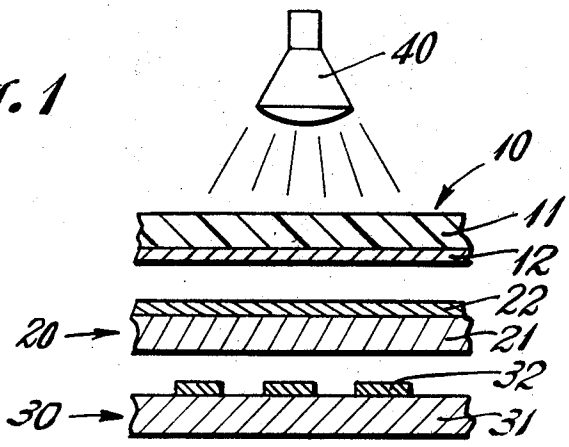
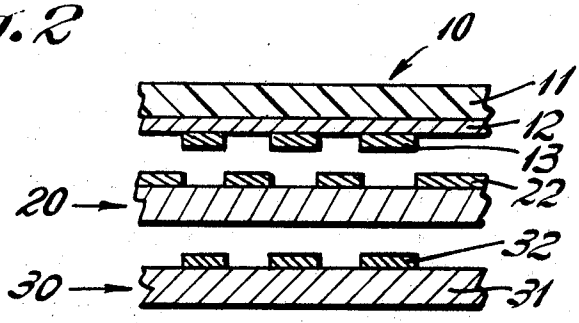


Fig. 2



INVENTORS
Douglas A. Newman
William E. Trecker
BY
Johnson and Kline
ATTORNEYS

United States Patent Office 3,472,162 Patented Oct. 14, 1969

3,472,162

PLANOGRAPHIC PRINTING PLATES AND METHODS FOR PREPARING THE SAME

Douglas A. Newman, Glen Cove, and William E. Trecker, Huntington, N.Y., assignors to Columbia Ribbon and Carbon Manufacturing Co., Inc., Glen Cove, N.Y., a corporation of New York

Continuation-in-part of application Ser. No. 517,882, Dec. 13, 1965. This application July 29, 1966, Ser. No. 568,936

Int. Cl. B41n *1/00, 3/00;* B41m *5/00*

U.S. Cl. 101—460 4 Claims

ABSTRACT OF THE DISCLOSURE

Heat-stable, transpicuous planographic printing plates adapted for the reception of heat-transferred oleophilic imaging material in the reflex thermographic process. The plates have a plastic film foundation with a hydrolyzed cellulose ester surface to which is bonded a planographic printing layer comprising a hydrophilic binder material and a filler.

This application is a continuation-in-part of copending application Ser. No. 517,882, filed Dec. 13, 1965, now abandoned, which in turn is a continuation-in-part of application Ser. No. 273,659, filed Apr. 17, 1963, now abandoned.

In the art of planographic printing, plates are provided having a surface coating which is hydrophilic and oleophobic in nature. When it is desired to produce copies of subject matter, the subject matter is inscribed on the hydrophilic coating of the plate in the form of oleophilic images, etching solution is wiped over the hydrophilic coating to wet the plate and render the unimaged areas water-receptive, and the plate is mounted on a planographic printing machine. On the machine the plate is continuously moistened with fountain solution containing dilute etching solution by means of a water roll and contacted with an oleous ink which adheres to the plate only in the oleophilic image areas. The ink is transferred from the image areas to an offset roller and then to a series of copy sheets to form one thousand or more copies of the original subject matter, as desired.

Planographic printing plates are conventionally formed of relatively heavy paper stock which is pretreated to give it wet strength properties. Aside from the necessity of the wet strength treatment, paper stock presents other problems leading to the production of plates which may be difficult to handle due to their stiffness and tendency to curl or roll or which may not perform in satisfactory manner due to the tendency of the coating thereon to crack, peel, flake or walk-off the plate in the course of the printing operation.

Due to the porosity and adsorption properties of paper, plates based thereon must be treated with far more etching solution than is necessary to accomplish the intended function of rendering the hydrophilic coating ink-repellent. Most of the applied etching solution is absorbed by the paper stock and is wasted in this manner. Because of this, the etching solution must be manually applied to the plate surface before the plate is mounted on the printing machine. While it is possible to include some amount of dilute etching solution in the fountain solution to be applied by the water roll, it is not possible to include the large amounts of etching solution required by paper base plates without fouling the water roll with crust deposit since the etching solution contains large amounts of materials such as barium nitrate, oxalic acid, ammonium sulfate, gum arabic and the like.

Finally, most paper base plates do not have the necessary translucency to meet the requirements of the recent application of planographic plates to the field of thermography wherein the oleophilic images are automatically applied to the plate surface and/or fused in place by means of infrared radiation.

While it is possible to apply conventional planographic compositions in conventional weights to plastic film foundations, plates produced in this manner are completely unsatisfactory for thermographic imaging purposes. Conventional plastic film foundations repel an aqueous planographic composition and resist the formation of a good bond between the film surface and the dried planographic layer.

Also, conventional planographic compositions generally contain a high amount of filler relative to hydrophilic binder, in the area of about five or more parts per part of binder, and are applied at a rate of at least 6 to 8 pounds per ream so that the formed coatings are very high in filler content per ream of foundation, a ream equaling 500 sheets 25" x 38". While such coatings produce excellent results on paper for manual imaging, they are completely unsatisfactory for use on plastic film for thermographic imaging since such coatings pick or transfer to the surface of the oleophilic imaging layer rather than vice versa during the heat-imaging step, and also pick or transfer to the ink roll of the planographic printing machine during the printing step.

For these same reasons it has been found that conventional planographic coating compositions and weights cannot be applied to plastic films for thermographic imaging. Conventional coat weights generally range above 6 pounds per ream. While such coatings on paper can be pressure-imaged and thermographically-imaged in the shoot-through method without any difficulty, when applied to plastic film, they cannot be pressure-imaged or thermographically-imaged without picking or transferring back to the oleophilic imaging layer. This is due to the fact that planographic coatings of this type are brittle and poorly bonded to the film due to the low content of binder material. In the thermographic process, the oleophilic transfer material is melted in the heated areas and is absorbed at least in part by the planographic layer in contact therewith. When heat is removed, the oleophilic composition resolidifies and when the transfer sheet is stripped from the plate the resolidified oleophilic imaging material sometimes remains bonded to the transfer sheet and carries with it the bonded portion of the planographic layer due to the lack of internal strength in the relatively thick and brittle planographic layer and its poor bond to the film foundation. In the pressure-imaging of these plates, the bond created between the impressed oleophilic layer and the planographic layer is greater than the bond between the layer and the film so that back-transfer occurs.

It is known to produce photosensitive lithographic plates having plastic film foundations. Such plates have the ink-receptive images formed photographically thereon and therefore do not present the problem of image receptivity or retention. Such plates are not heat-stable due to the sensitivity of the photosensitive layer to infrared radiation whereas the present plates are heat-stable in that heat or infrared radiation does not distort them dimensionally or interfere with their planographic properties or render them non-transpicuous.

Faced with these problems, we have attempted to produce a planographic plate which requires a minimum of etching solution and which is transparent so as to eliminate the diffusion and reflection of infrared radiation. The use of a plastic film foundation in place of paper showed promise except for the fact that conventional planographic coating compositions and conventional coating

thicknesses do not adhere to thin plastic film foundations sufficiently well to resist stripping from the film during the imaging of the plate and/or during the production of printed copies in the planographic process.

Elimination of the opacifying filler from the planographic composition improved the adhesion between the film and coating and the translucency of the plates but resulted in plates which require more than simple machine moisture conditioning (require manual etching) and do not provide proper receptivity of the imaging material or retention thereof during printing. The use of conventional frosted or matte finish films also improves the adhesion between the film and the coating but further increases the opacity of the plates to a point at which the plates are inoperative in the thermographic reflex process due to the combined opacifying effects of the filler in the coating and the frosted surface of the film. Some films are etched to such a degree that they are sufficiently opaque per se so as to produce unsatisfactory plates even when the filler is excluded from the planographic coating.

The use of a separate intermediate layer between the film foundation and the planographic layer is useful in some instances but does not provide a reliable solution to the bonding problem. In order that the plate be correctable, the intermediate layer must be hydrophilic. As such, it is repelled by the film foundation to nearly the same extent as the planographic coating composition. If the intermediate layer is not hydrophilic, then the plate is not correctable and there is no affinity between the planographic layer and the intermediate layer.

With all of these considerations in mind, the objectives of the present invention are to produce a planographic printing plate which requires a minimum of etching solution capable of being supplied by the printing apparatus, which is sufficiently translucent to be reliably sharply imaged in the reflex thermographic process, which is capable of being reliably sharply imaged manually, and which is receptive to oleophilic imaging material and retentive thereof during printing.

These and other objects and advantages are attained as will be clear to those skilled in the art in the light of the present disclosure, including the drawing, in which:

FIGURE 1 is a diagrammatic cross-section, to an enlarged scale, of a transpicuous film-base planographic printing plate according to one embodiment of this invention, superposed in the reflex process with a transfer sheet and an original sheet under the effects of infrared radiation.

FIG. 2 is a diagrammatic cross-section, to an enlarged scale, of the sheets of FIG. 1 after irradiation and separation, demonstrating the formation of oleophilic images on the planographic coating.

The several objects and advantages of the present invention are accomplished by means of our discovery of a critical relationship between the surface of the plastic film being used and the planographic coating composition used. We have discovered that hydrolyzed cellulose ester films form an exceptionally strong bond with hydrophilic coatings, apparently due to a chemical bonding reaction which takes place, so that hydrophilic coatings of various types and thicknesses may be reliably bonded to thin plastic films of this type and will not crack, flake or walk-off the plate surface during the imaging or printing steps.

The preferred plastic film foundations used according to the present invention are flexible films of hydrolyzed cellulose acetate although films of hydrolyzed cellulose acetate propionate and hydroyzed cellulose acetate butyrate also provided excellent results.

The present plates are transpicuous by which is meant that images of contrasting color on an underlying sheet in contact with the plate are clearly legible through the plate using incident light with no light required behind the underlying sheet. This definition includes only some

translucent plates since degrees of translucency vary and those translucent plates which are not transpicuous are found to diffuse and/or reflect infrared radiation to such a degree that they cannot be clearly or sharply imaged in the reflex thermographic process. The reflex process is as illustrated in the drawing.

The hydrolyzed cellulose ester film foundation of the present plates should have a thickness which is no greater than about 4 mils and is preferably from 0.7 to 3 mils. Greater thicknesses are unsatisfactory due to reduced flexibility, heat-conductivity and/or lateral radiation-transmissivity. Smaller thicknesses are difficult to handle, coat and use.

The film is preferably smooth but may be very lightly frosted or etched by chemical or mechanical means, if desired. Mechanically-frosted films are produced by casting the film against a lightly-etched drum. The frost or etch of the film must be so slight that the final coated plate is transpicuous.

The planographic coating is preferably relatively low in filler content and applied in a thickness of from about ½ to no greater than about 5 pounds per ream so that the weight of filler per ream is kept as low as possible, within the range of from about ¼ to 4 pounds per ream and preferably between 1 and 3 pounds per ream. The planographic coating composition generally has a solids content of 15% to 25%, over 90% of which consists of filler and hydrophilic binder material in a ratio of from a minimum of 1:1 to a maximum of about 4:1.

The present planographic compositions preferably also include a relatively small amount of a volatile organic liquid, such as a lower aliphatic alcohol, which is miscible with water and has a lower density and is more volatile than water. The organic liquid generally comprises from 3% to 10% by weight of the total planographic composition and appears to function as a wetting agent for the film foundation and reduces the surface tension of the aqueous planographic coating composition so that a more even coating can be applied.

The following example is set forth by way of illustration and should not be considered limitative.

EXAMPLE

A film of cellulose acetate having a thickness of about 2.25 mils and having both surfaces hydrolyzed is coated on one surface with the following planographic composition in a weight of about one pound per ream of 500 sheets 38" x 25" in dimension.

Ingredients:	Parts by wt., gms.
Polyvinyl alcohol	3.5
Clay	10.5
Glyoxal	0.5
Acetic acid	0.6
Water	73.0
Methanol	4.3

The coated film is subjected to controlled heating to evaporate the water and form the dried planographic coating which is intimately bonded to the surface of the film so as to be resistant to cracking and flaking off. The formed plate is exceptionally flexible, transpicuous and may be thermographically-imaged and used to produce one thousand or more copies of excellent sharpness and clarity free of objectionable background staining.

The present plates are particularly adapted for use in the reflux thermographic imaging process as illustrated by the drawing, the sheets being shown out of contact for purposes of illustration. In the reflex process the original sheet, transfer sheet and planographic plate are superposed in the order shown, the transpicuous plate **10** being nearest the infrared radiation source **40** with its planographic layer **12** in contact with the oleophilic heat-transferable layer of the transfer sheet **20**. Original sheet **30** is furthest from the radiation source and has its infrared radiation-absorbing images **32** facing the radiation source.

Since the plate is transpicuous and thus does not reflect or diffuse the applied radiation to any substantial degree, the radiation is able to penetrate to the original images **32** to be absorbed thereby and generate an imagewise heat pattern which is conducted back to the oleophilic transfer layer **22** causing corresponding areas thereof to melt or soften and adhere to the planographic coating **12**. When the sheets are stripped apart, they appear as illustrated by FIG. 2 which shows mirror-reverse images **13** transferred from oleophilic layer **22** to the planographic layer **12**.

The reflex process is important for the copying of original sheets **30** which have an opaque foundation **31** or carry images on the side opposite to the images to be copied. The transfer sheet **20** may be of the conventional radiation-transmissive type and comprises a foundation **21** such as tissue paper or plastic film and a heat-transferable oleophilic layer **22** which generally comprises an oleophilic wax binder material and a small amount of dissolved dyestuff for proofreading purposes.

Because of the infinite wet strength of the present plates and their ability to be adequately etched on the planographic printing machine, the present plates are suitable for use as direct-printing plates as well as for their more common use as offset-printing plates. In the direct-printing process the plates are imaged with mirror-reverse oleophilic images, mounted on a printing drum and continuously alternately contacted with moistening rollers and inking rollers. The plate surface makes contact with a succession of copy sheets which accept ink from the plate images to form direct-reading copies of the plate images. In the offset-printing process the plate images are direct-reading images and the printing ink applied thereto is continuously transferred to a printing roller which in turn transfers the images to a succession of copy sheets. Most printing plates are useful only as offset plates since they cannot accept and retain a sufficient amount of moisture or etch to withstand the continuous loss of moisture or etch by absorbency into the copy sheets.

We claim:

1. The process of making a heat-stable transpicuous planographic printing plate adapted to be imaged in the reflex thermographic transfer process which comprises the steps of providing a translucent flexible hydrophilic hydrolyzed cellulose ester film foundation having a thickness of between about 0.7 and 3 mils, applying directly to the hydrophilic surface thereof an aqueous planographic composition comprising 1 part by weight of a hydrophilic binder material and from about 1 to about 4 parts by weight of a filler and evaporating the water to form a translucent planographic printing layer having a weight of between about 0.5 and 5 pounds per ream bonded to said film foundation.

2. The process of claim **1** in which the plastic film foundation comprises a film of hydrolyzed cellulose acetate.

3. A heat-stable transpicuous planographic printing plate adapted to be imaged in the reflex thermographic transfer process comprising a translucent flexible hydrophilic hydrolyzed cellulose ester film foundation having a thickness of from about 0.7 to 3 mils and having directly on the hydrophilic surface thereof from about 0.5 to about 5 pounds per ream of a translucent planographic printing layer comprising a hydrophilic binder material and a filler in a weight ratio of between 1:1 and 1:4.

4. A printing plate according to claim **3** in which the film foundation comprises a film of hydrolyzed cellulose acetate.

References Cited

UNITED STATES PATENTS

1,943,486	1/1934	Ostwald	101—461 XR
2,304,541	12/1942	Caton	101—462
2,808,778	10/1957	Newman et al.	101—460
3,122,997	3/1964	Raczynski et al.	101—471
3,256,811	6/1966	Bach	101—467

ROBERT E. PULFREY, Primary Examiner

FREDERICK FREI, Assistant Examiner

U.S. Cl. X.R.

101—463; 117—34, 145