Nov. 10, 1964 F. O. BACH 3,156,183

THERMOGRAPHIC OFFSET MASTER AND METHOD OF USE

Filed April 24, 1961

FIG. 1

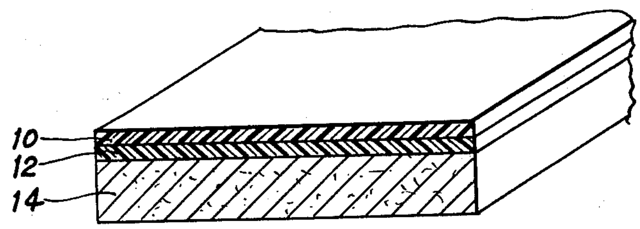


FIG. 2

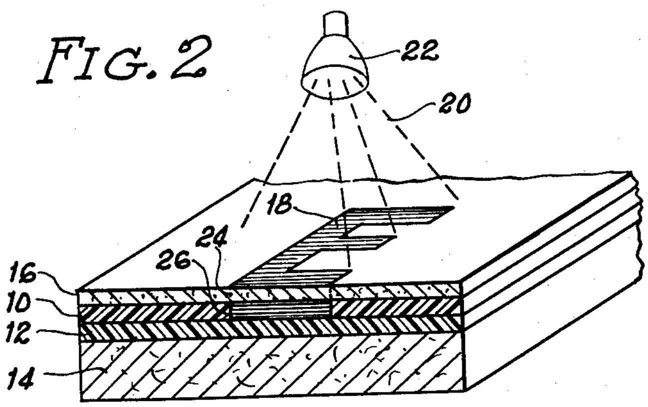


FIG. 3

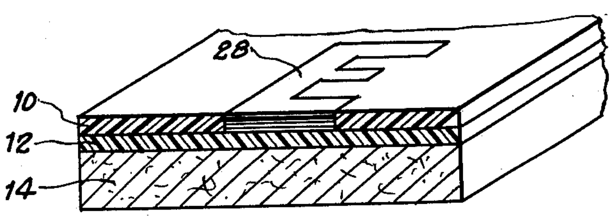
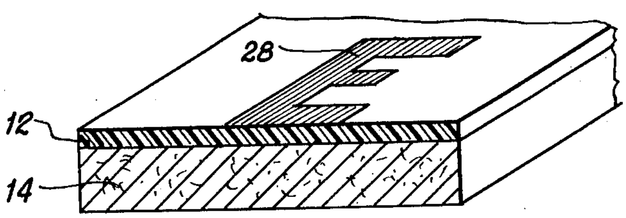


FIG. 4



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THERMOGRAPHIC OFFSET MASTER AND METHOD OF USE

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This invention relates to an offset master and to the method for imaging same and it relates more particularly to an offset master which can be imaged by a heat pattern, such as may be obtained by irradiation of an original in contact with the imageable surface of the offset or lithographic plate.

This invention will be described with reference to a lithographic plate that can be imaged directly by irradiation of an original in contact with the imageable surface of the plate whereby the radiations are absorbed by the imaged portion of the original and converted into heat to develop a heat pattern which is transferred to the lithographic plate to form the corresponding ink receptive, water repellent image on the lithographic surface of the plate. It will be understood that the development of the ink receptive, water repellent image in response to heat can be adapted to other thermographic processes for imaging the plate, such for example as a heated die, heated stylus, or the like.

To the present, use has been made of the thermographic technique for imaging a plate directly from an original wherein the original is formed with a radiation-absorbing-heat generating imaged portion. Such process has required the use of a separate transfer sheet having a transfer coating of an ink receptive, water repellent imaging material which is interposed between the original and the lithographic surface of the plate whereby the heat pattern which is developed upon irradiation of the original transfer from the original to the transfer sheet to cause fusion of corresponding portions of the transfer coating whereby the fused portions of the transfer coating can be displaced to the lithographic plate to form the ink receptive, water repellent image on the lithographic surface thereof.

There are a number of objections to adoption of the thermographic technique in a system of the type described. In the first instance, the introduction of a transfer sheet with its transferred coating as an intermediate sheet between the original and the lithographic plate results in excessive spread of the heat pattern or image whereby copy of poor quality and definition is secured.

In the second place, the transfer sheet is capable of but a single use in the preparation of an imaged master and thus materially adds to the cost of the preparation of the imaged plate. Further, it constitutes an additional element which raises problems of storage, inventory and use and thereby undesirably complicates the process and increases the cost thereof.

Thirdly, the transferred coating sometimes becomes poorly bonded to the lithographic surface of the plate with the result that portions, if not all, of the image may walk off of the plate so that copy of poor quality *is* produced.

It is an object of this invention to produce a lithographic plate capable of being imaged by lithographic technique directly from an original without the necessity to make use of a transfer sheet and it is a related object to provide a new and improved method for imaging a lithographic plate directly from an original by thermographic technique.

It is another object to produce a new and improved, low cost lithographic plate which is simple in construction and which can be economically imaged by irradiation of an original directly in contact with the surface

of the plate, and it is a related object to provide a simple and efficient method and means for imaging a plate of the type described by thermographic technique to provide a permanent image of good definition on the plate surface for use in producing multiple copies of good copy quality.

These and other objects and advantages of this invention will hereinafter appear and for purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawing in which—

FIG. 1 is a perspective view in section schematically showing a lithographic plate embodying the features of this invention;

FIG. 2 is a perspective view of the plate shown in FIG. 1 schematically illustrating the arrangement of elements for imaging from an original;

FIG. 3 is a perspective view in section of the lithographic plate shown in FIGS. 1 and 2 with the latent image formed thereon; and

FIG. 4 is a perspective view similar to that of FIGS. 1, 2 and 3 of the imaged lithographic plate.

The concepts of this invention can best be described with reference to the formulation and preparation of the thermographic offset master and the use thereof in the preparation of an imaged master directly from an original. It will be understood that the plate hereinafter to be described can also be imaged by other means for the application of heat in the imaged areas and that the following specific description is given only by way of illustration but not by way of limitation.

EXAMPLE 1

Coating Composition

16 parts by weight carnauba wax
4 parts by weight partially hydrolyzed polyvinyl acetate
16 parts by weight ethyl alcohol
64 parts by weight water

Procedure: The carnauba wax and the partially hydrolyzed polyvinyl acetate are separately ground to a relatively fine powder and thereafter blended one with the other. The mixture of powdered wax and resin is then wet out with the alcohol and the entire mixture is then introduced into the water to form an aqueous coating composition in which the wax is present in a dispersed phase.

The coating composition is then applied in coating weights of about 1½ to 6 pounds per 3,000 square feet of surface area by conventioinal coating techniques, such as roller coating, brush coating, spray coating, flow coating and the like, to provide a continuous, uniform and thin coating **10** onto the lithographic, ink repellent, water receptive, relatively non-absorbent surface **12** of a base plate **14**. The coating is then allowed to dry or may be force dried at elevated temperatures but below the melting point temperature of either the wax or the resinous binder. Thus a uniform dry coating **10** is formed on the lithographic surface to form the lithographic plate.

EXAMPLE 2

Imaging the plate: When it is desired to image the lithographic plate for use on a conventional lithographic press to produce multiple copies, the lithographic plate produced in accordance with the description in Example 1 is positioned with the coated side in surface contact with the original **16** in which the image **18** is infra-red ray absorbing-heat generating, i.e., it is formed of a material which generates heat in response to the absorption of infra-red rays. Thus upon directing infra-red **20** from a light source **22** upon the original, the rays striking the non-imaged portions of the original are, for the most part, reflected while the rays striking the infra-red ray absorbing-heat generating imaged portions 18 of the original are absorbed to develop a heat pattern 24 corresponding to the original. The heat pattern transfers to the adjacent coating 10 to cause fusion in the areas 26 corresponding to the heat pattern whereby the ink receptive, water repellent wax portion of the fused coating is capable of flow for attachment to the lithographic surface 12 to define an ink receptive, water repellent image 28 on the lithographic surface.

Thereafter, when the plate is swabbed with plate etch or other suitable solvent or aqueous medium, the non-imaged portions of the coating which have not been fused are redispersed or otherwise displaced in the aqueous medium for removal from the underlying ink repellent, water receptive, lithographic surface thereby to provide a lithographic plate containing a wax, ink receptive, water repellent image 28 corresponding to the original and from which multiple copies can be produced by conventional lithographic duplicating means.

As the water receptive, ink repellent lithographic base, use can be made of a sheet of metal, such as aluminum, zinc, copper or the like amphoteric metal, in which the surface is preferably etched, silicated or otherwise treated to enhance the ink repellent, water receptive, lithographic characteristics of the surface. Instead, use can be made of less expensive and more flexible plates such as are fabricated of paper base sheets provided with a relatively non-absorbent, water receptive, ink repellent, lithographic coating such as may be formulated of casein, as described in the Worthen Patent No. 2,534,650; alginate, as described in the Ensink Patent No. 2,835,576; carboxymethyl cellulose, as described in the Van Dusen Patent No. 2,542,784; polyacrylate, as described in the Beatty Patent No. 2,760,431, or partially hydrolyzed cellulose acetate. By way of further modifications, the lithographic base may be constructed of a thin film of metal of the type described above laminated onto a suitable paper base sheet as the carrier.

Instead of carnauba wax in Example 1, use can be made of other oleaginous, ink receptive, water repellent imaging materials capable of being subdivided into a particulate or powdered substance for distribution as the dispersed phase in the binder system but which is reducible to a fused state capable of flow and adhesion to the lithographic surface for image development when heated to a temperature capable of being developed upon infra-red radiation of the original and preferably at a temperature above ambient temperature and more preferably a temerature on the order of about 150° F. or above. Representative of suitable materials capable of use in substitution for the carnauba wax in Example 1 are castor wax, sugar cane wax, shellac wax, fatty acid soaps such as zinc, aluminum, barium and the like stearates, palmitates, etc.

The partially hydrolyzed polyvinyl acetate functions as the binder component in the coating composition. It is preferred to make use of a binder which is soluble in aqueous medium for solution in the coating composition and for solution in the aqueous medium with which the exposed plate is treated to remove the coating in the non-imaged areas of the plate. Where sufficient coating strength is available from a binder in a dispersed phase, use can be made of a water dispersible binder which can be redispersed in the aqueous medium with which the exposed plate is treated. Thus instead of the partially hydrolyzed polyvinyl acetate, use can be made of polyvinyl alcohol, methyl cellulose, water and alcohol soluble waxes, such as aquawax and the like. It is preferred to make use of a binder component which is also characterized by a fusion temperature within the range of the fusion temperature for the dispersed particles of the ink receptive, water repellent component of the coating composition; otherwise it will be more difficult for the fused image forming materials to migrate to the surface of the plate to form the image and strongly to bond the image to the lithographic surface.

It is desirable to formulate the coating composition with a high concentration of the image forming component. The amount of binder should be sufficient merely to hold the particles together in the coating and to hold the coating onto the lithographic surfaces until the plate is imaged for copy reproduction. For this purpose, it is desirable to maintain the image foaming component in a ratio at least equivalent to the binder composition in the coating but not greater than 10 parts by weight of the imaging material to 1 part by weight of the binder. When the amount of imaging material is less than a 1 to 1 ratio with the binder, a poor image is formed and the image cannot be strongly bonded to the lithographic surface and thus tends to walk off during the copy process. It is difficult to formulate a good and uniform coating composition on the lithographic surface when the imaging material exceeds 10 parts by weight per 1 part by weight of binder. For best practice, the imaging component should be present in the ratio of from 2 to 5 parts by weight of the imaging material to 1 part by weight binder.

By way of modification, readability of the image formed in the applied coating can be achieved by formulation of the coating composition to contain a small proportion of a relatively non-infra-red absorbing dyestuff which is soluble in the oleaginous, ink receptive, water repellent material when reduced to a fluid or fused state whereby the dyestuff can dissolve in the fused imaged portion to develop color which contrasts with the remainder of the coating corresponding to the non-imaged portion of the plate. For this purpose, it is desirable to incorporate a small amount of such oil or wax soluble dyestuff or combinations of dyestuffs in the coating composition to become dispersed with the dispersed ink receptive, water repellent substance for solution therein when reduced to a fused state. Until the dyestuff becomes dissolved in the image forming material, characteristic color development will not take place. Thus the imaged portion will become colored by the dissolved dyestuff for readability by contrast with the remainder.

The following are examples of additional coating compositions which may be employed, as in Example 1, for application onto a suitable lithographic surface to produce a lithographic plate capable of being imaged by thermographic techniques:

EXAMPLE 3

15 parts by weight zinc palmitate
5 parts by weight aquawax
15 parts by weight alcohol
65 parts by weight water

EXAMPLE 4

25 parts by weight shellac wax
5 parts by weight partially hydrolyzed polyvinyl acetate
14.6 parts by weight alcohol
55 parts by weight water
0.1 part by weight Oil Blue A dyestuff (Du Pont)
0.1 part by weight Oil Yellow ENC (American Cyanimid)
0.2 part by weight surface active agent

In Example 4, the dyestuffs are in dispersion and therefore have a different (greenish) color value in the formed coating. However, when the coating is fused upon transfer of the heat pattern upon irradiation of the original, the wax in the fused portion of the coating acquires a distinctive blue color which enables the image to be read directly from the imaged plate before removal of the coating from the non-imaged portions.

The alcohol component in the coating compositions is not essential but it does assist in wetting out the powdered wax so that the powdered wax can be more easily and more uniformly dispersed in the aqueous coating composition. It also appears to help the binder wet out the wax particles so that a tougher coating can be produced on the lithographic surface. The amount of alcohol, such as methyl, ethyl, propyl, butyl, glycol and the like, can range from 0 to about 30 percent by weight of the diluent but it is preferred to make use of an amount within the range of 10 to 20 percent by weight.

The non-imaged portions of the coating, corresponding to the unfused areas, can be removed by the etch used ordinarily in processing of an imaged lithographic plate for production of copies. Instead, use can be made of other aqueous medium in which the binder system can be dissolved or redispersed and it is preferred to make use of an aqueous system containing an alcohol of the type previously described and preferably a polyhydric alcohol, such as glycerol, glycol, ethylene glycol and the like, to enhance wet-out and removal.

The coating formed on the plate should not be highly absorbent of infra-red radiations, otherwise the entire coating might be reduced to a fused state for image formation upon radiation of the original. While it is understood that some radiation absorption will ordinarily take place, use should be made of materials wherein the amount of absorpton would be insufficient to cause an increase in temperature to the fused state of any of the components in the coating.

While description has been made with reference to the use of an original separate and apart from the plate, it will be understood that the infra-red ray absorbing-heat generating image may be applied directly to the surface of the coating or the plate for the development of a heat pattern upon radiation thereby thermographically to develop the corresponding image in the coating. Under such conditions, the original image may be provided on the plate surface by inscription, by typewriter ribbon, die impression or the like imaging means.

While the description has been made with reference to the use of infra-red for irradiation, it will be understood that use can be made of other radiations which operate to develop heat upon absorption in an original and it will be further understood that the heat pattern applied to cause fusion of the coating may be generated by other means.

When the coating on the non-imaged portions has been removed, the imaged plate can be mounted in a conventional lithographic press for operation in the usual manner to produce a number of inked copies.

It will be understood that changes may be made in the details of formulation, construction and operation without departing from the spirit of the invention, especially as defined in the following claims.

I claim:

1. The method of imaging a lithographic plate directly from an original in which the image contains a radiation absorbing-heat generating material comprising the steps of positioning the original in surface contact with the coated side of a lithographic plate in which the coating on the lithographic surface of the plate is formed of an ink receptive, water repellent imaging material which is reducible to a molten state at a temperature capable of being developed in the imaged areas

of the original upon irradiation and which is dispersed in an aqueous separable binder, directing radiations onto the original whereby the radiations are absorbed in the imaged areas of the original in sufficient quantity for generation of a heat pattern which transfers to the adjacent coating to reduce the corresponding areas of the ink receptive, water repellent imaging material to a fused state, and then treating the coating with an aqueous medium to remove the coating from the lithographic surface and leave fused imaging material on the underlying lithographic surface.

2. The method of imaging a lithographic offset master directly from an imaged portion in the original in which the original contains infra-red ray absorbing-heat generating material comprising the steps of positioning the original in surface contact with the coated side of a lithographic master in which the coating on the lithographic surface of the plate is formed of an ink receptive, water repellent, imaging material as a dispersed phase in an aqueous soluble binder and in which the ink rceptive, water repellent imaging material is reduced to a molten state at the temperature generated in and transferred from the imaged areas of the original upon irradiation with infra-red, directing infra-red radiations at high concentration onto the original whereby the image absorbs infra-red in sufficient quantities to generate a heat pattern to cause melting of the corresponding areas of the coating upon transfer of the heat pattern to define the imaged areas of the plate, and then treating the coating with an aqueous medium to remove the coating from the lithographic surface and leave imaging material on the underlying lithographic surface.

3. The method as claimed in claim 2 in which the materials are present in the coating in the ratio of 1 to 10 parts by weight of imaging material to 1 part by weight of the binder.

4. The method as claimed in claim 2 in which the materials are present in the ratio of 2 to 5 parts by weight of the imaging material to 1 part by weight of the binder.

5. The method as claimed in claim 2 in which both the imaging material and the binder have a melting point temperature above about 150° F.

6. The method as claimed in claim 2 in which the coating includes a dyestuff which is soluble in the imaging material when reduced to a molten state and which becomes dissolved in the imaging material upon irradiation of the original whereby the fused areas of the coating acquire a contrasting color of the dyestuff by comparison with the unfused areas of the coating.

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