July 11, 1967 W. S. MARX, JR., ET AL 3,330,711

METHOD FOR TRANSFER OF GRAPHIC IMAGES

Filed April 30, 1963

Fig. 1.

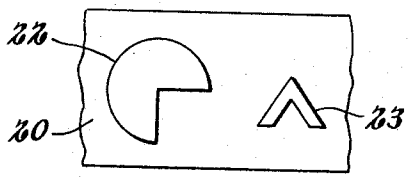


Fig. 2.

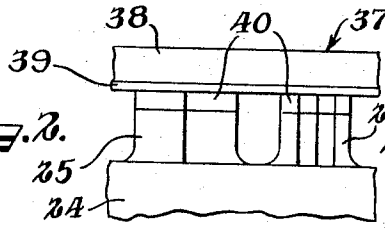


Fig. 3.

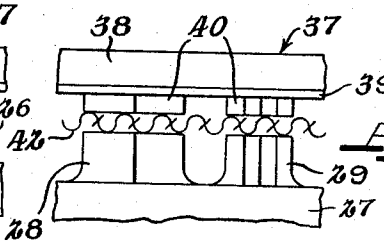


Fig. 4.

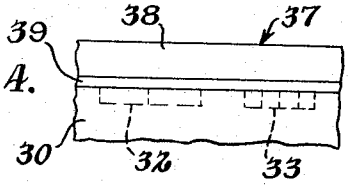


Fig. 5.

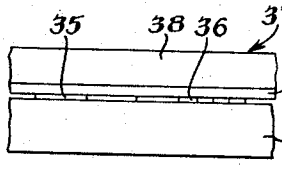


Fig. 6.

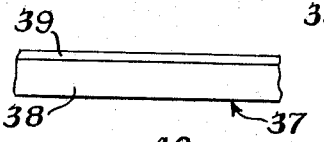


Fig. 11.

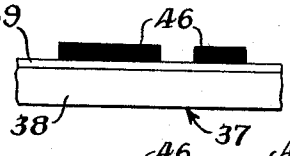


Fig. 7.

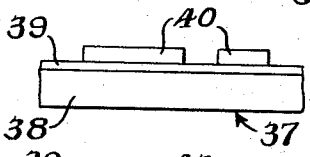


Fig. 12.

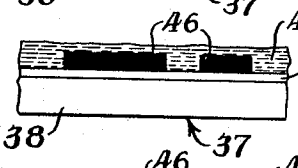


Fig. 8.

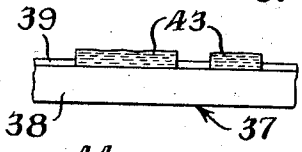


Fig. 13.

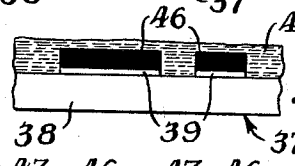


Fig. 9.

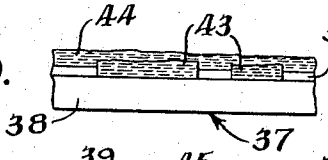


Fig. 14.

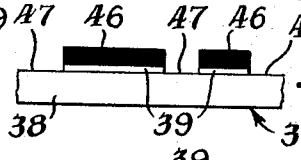


Fig. 10.

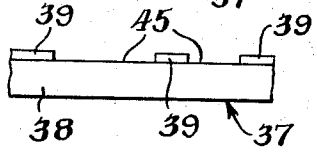
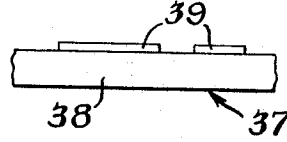


Fig. 15.



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Attys.

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3,330,711 METHOD FOR TRANSFER OF GRAPHIC IMAGES

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17 Claims. (Cl. 156—234)

This invention relates to a method for transfer of graphic images which is adapted to the accomplishment of various kinds of subsequent reproduction, and more particularly to a method by which a preestablished graphic subject which is to be reproduced is transferred by any of a plurality of specific process steps to a conversion sheet from which it may be reproduced directly, as well as readily and rapidly transformed to any of a number of usable or reproducible forms.

The method herein disclosed relates to an image-transfer method for use in various kinds of graphic reproduction, and more particularly to a method by which a graphic subject is rapidly and economically transferred to the surface of a printing plate. For example, the text matter for ultimate lithographic printing is normally first set in type, the type proofed on paper, and the proof then photographed on film. The resulting film negative is then photoprinted upon the light-sensitized surface of a lithographic plate which, after processing, is mounted on a press for inked printing. The method of this invention produces the required film negative entirely without photography. Instead, we use a conversion film wherein the image is produced by a thermal transfer or by a direct printing procedure. Such a negative is completed in less than one-tenth the time required for producing a photographic negative.

One of the objects of this invention is to provide a method by which a preestablished subject, whether pictorial or typographical can be readily transferred, either as a positive or negative image, to a conversion sheet, which conversion sheet is adapted to use in a variety of ways to accomplish multiple reproductions.

More specifically, this method has within its purview a rapidly and readily accomplished process for effecting a true graphic reproduction of a subject on a conversion sheet as an image which is easily usable in graphic reproduction, and which image can be applied to the conversion sheet in any one of a plurality of ways, including direct transfer from relief type or from a printing or intaglio plate, from a type image transferred through a ribbon such as those used on typewriters, by contact transfer from art copy, either with or without the aid of heat to produce vaporization or change the characteristics of the material being transferred, or through an image transferred to an intermediate carrier sheet and then to the aforesaid conversion sheet, either with or without the aid of heat to effect the vaporization or change the characteristics of a conditioning medium.

This invention comprehends the quick and easy transfer of a spatially and dimensionally true image of a preestablished subject, in any of a variety of ways, to an easily and quickly processable conversion sheet, from which it is usable as a unitary entity for reproduction by any of a variety of methods.

Another object of our invention is to provide a method for transfer of graphic images which is adapted to the use of a relatively inexpensive transfer sheet which is capable of being processed in far less time than that required for light sensitive photographic film.

It is further comprehended by this invention to provide a method for the transfer of graphic images which almost entirely eliminates the necessity of handwork of the type currently required when photographic processes are utilized, as, for example, the time required to spot out pin holes and dust specks which are very prevalent in processed photographic film. In this respect, it is worthy of consideration that type images usually occupy less than ten percent of the total area of a printed page, and consequently a negative image of a printed page of black type has over ninety percent of area which should be opaque to actinic light and free of holes.

Our invention has within its purview the provision of a method for transfer of graphic images in which the materials are not light sensitive, so that the steps can be carried out in full daylight.

This invention also comprehends the provision of a method for the transfer of graphic images which is capable of very high resolution and precision, because the described film coatings are free from grain of the type encountered in photographic films; and because the image-bearing layer is coated so thinly that there is a minimum of taper or shoulder at the edges dividing cleared image areas from the remaining background or non-image areas.

As another object, this invention contemplates a method of image reproduction utilizing as a conversion medium a base sheet of dimensionally stable light pervious material to which is adhered a thin coating having different light transmissive qualities than the base sheet, and which coating is cleanly and sharply disruptable or separable from contiguous areas thereof and removable from the base sheet by principally physical and manual manipulations to form a clearly and sharply defined image of a subject to be reproduced.

Our invention has for another object the provision of a method by which the image of a preestablished subject is transferred to a sheet embodying a disruptable coating adhered to and carried by a base sheet, and wherein said disruptable coating is normally inert to a clearant liquid, but is rendered disruptable from contiguous portions of the coating and removable from the base sheet by the action of a conditioner which penetrates and commingles with the coating without appreciable spreading laterally within the coating from the area thereof to which the conditioner is applied or transferred.

In one embodiment of the method of this invention, conditioner is transferred to portions of the coating on the conversion sheet which are within the image which is to be delineated, whereupon, when the conditioned portions of the coating are removed by the application of a clearant to the coating, a negative image results.

In another embodiment of this method, a repellent is applied to an image delineating portion of the coating on the conversion sheet. This repellent acts as a baffle or covers the coating surface to prevent the penetration of conditioner into the coating wherever it is covered by the repellent. Thus, when repellent is applied to the coating within an image delineating portion, and then when conditioner is applied over the coating surface, the portions outside of the image delineating portion are rendered disruptable and removable by the use of clearant, and a positive image results.

Other objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic plan view of a subject adapted to graphic reproduction and includes exemplary delineated figures which may be in the form of raised type of the kind used in printing, raised image defining portions of a printing plate, raised type of the kind used on typewriters, recessed areas of an intaglio plate, art copy on artist's board or images transferred from another source to a carrier sheet of paper or other material;

FIG. 2 is a diagrammatic illustration depicting one preferred method step adapted to use in this invention and wherein a preestablished subject form is transferred directly to a disruptable coating on a conversion sheet from

raised type or from the raised areas of a printing plate or the like;

FIG. 3 is a diagrammatic illustration of another preferred manner of accomplishing a step of the method of this invention by the transer of a subject image to a disruptable coating on a conversion sheet from raised type through an intervening ribbon, as in a typewriter;

FIG. 4 is a diagrammatic illustration of another preferred manner of accomplishing a step of our disclosed method wherein a subject image is transferred to a disruptable coating on a conversion sheet from depressed areas of an intaglio printing plate;

FIG. 5 is a diagrammatic illustration of another preferred method of effecting the transfer of a subject image to a disruptable coating on a conversion sheet as a step of our disclosed method and wherein the subject image may be art copy on an artist's board or paper or an image transferred from a source to an intermediate carrier sheet;

FIG. 6 is a schematic illustration, in side elevation, of one of the instrumentalities, namely, a conversion sheet, utilized in carying this disclosed method into effect and which constitutes a base sheet having adhered to one surface thereof a disruptable coating;

FIG. 7 is a schematic side view depicting a step in our disclosed method wherein a conditioner is transferred from a preestablished subject to the disruptable coating on a conversion sheet;

FIG. 8 is a view similar to FIG. 7, but indicates the penetration of the conditioner into the coating of the conversion sheet and the commingling of the conditioner with that coating;

FIG. 9 is a view similar to FIG. 8, and is illustrative of an additional step of this disclosed method wherein a clearant is applied to the surface of the coating on the conversion sheet to cover the areas penetrated by the conditioner, as well as contiguous portions of the coating;

FIG. 10 is a view similar to FIG. 9 wherein the clearant has been removed from the coating along with the areas of the coating which were rendered disruptable by the penetration of the conditioner, while leaving on the base sheet the portions of the coating contiguous to those affected by the conditioner;

FIG. 11 is a view similar to FIG. 7, but illustrative of another preferred manner of carrying out the method herein disclosed and in which a repellent is applied to the disruptable coating of a conversion sheet from a preestablished subject;

FIG. 12 is a view similar to FIG. 11 and illustrative of a second step in the method of FIG. 11, wherein a conditioner is applied to the coating of the conversion sheet to cover both the areas defined by the conditioner and the contiguous portions of the coating surface;

FIG. 13 is a view similar to FIG. 12 and illustrates the penetration of the conditioner into the portions of the coating which are contiguous to, and not covered by the image defining areas of repellent;

FIGURE 14 is a view similar to FIG. 13 and is illustrative of a step of the method wherein a clearant has been applied to the coating after the penetration of the coating by the conditioner and after the clearant and the portions of the coating rendered disruptable by the conditioner have been removed from the conversion sheet, leaving on the base sheet only those portions of the coating which are covered by the repellent; and

FIG. 15 is a view similar to FIG. 14 illustrative of the step of the method wherein the repellent is removed from the image defining areas of the coating which remain on the base sheet.

The method of this invention contemplates the use of three main instrumentalities, namely, a conversion sheet, a coating conditioner and a clearant, which are compatible and coactive through the steps of this method for achieving the production of a conversion sheet which carries an image of a specifically defined and preestablished subject suited to graphic reproduction.

The conversion sheet, upon which the image of a subject is produced for transfer purposes, fundamentally constitutes a base sheet, preferably of a material having high dimensional stability and which is pervious or transparent to light in a relatively wide spectral range, such as a polyester or polystyrene film, and which is also inert to, and non-absorptive or non-penetrable by materials used in the coating thereon and carrying out the process steps of the invention for producing an image thereon. Although used in different ways, the conversion sheet utilized in this method is quite similar in type and in some respects to that disclosed in our copending application Ser. No. 115,285 for Softenable Film Material and Method of Using Same, filed June 7, 1961. The base sheet has thereon and adhered thereto a substantially uniform and normally stable but disruptable coating having light transmissive characteristics different than those of the base sheet as a result, for example, of being colored or containing an absorbent of ultraviolet light, or both. The coating is also coactive with a conditioner which alters the characteristics of portions of the coating with which it coacts and commingles to render those portions susceptible to the action of a clearant for completing the disruption in areas bounded by sharply and clearly defined edges and the removal from the base sheet of the portion of the coating to which the said conditioner has been applied or transferred from the contiguous portions of the coating which are unaffected by the conditioner; the portions of the coating which are unaffected by the conditioner being virtually unaffected by the clearant or the disrupted film portions removed thereby. Furthermore, the film coating on the base sheet is so thin that the conditioner penetrates and commingles therewith to the full depth of the coating without spreading laterally within the coating to any appreciable extent from the surface area to which the conditioner is initially applied or transferred.

The conditioner to which reference has been made penetrates and commingles with the coating in areas corresponding to those of a preestablished subject to alter the characteristics of those areas of the coating in a manner which facilitates the separation and removal of those said areas of the coating from contiguous portions thereof and from the base sheet. This conditioner may have any one of several normal states for initial use, and when in such state, may be active, as in a liquid or semi-liquid or paste form for transfer directly to the coating for accomplishing its intended purpose, or may be in a state from which it is changed, as, for example, by vaporization resulting from the application of heat, for transfer to, and effective coaction with the coating on the base sheet within a reasonable time, within which it is effective for accomplishing the desired results. The transfer may also be effected in one or a combination of the aforementioned ways with the additional utilization of an intermediate carrier sheet as an auxiliary instrumentality. In penetrating or being absorbed into the coating and in commingling therewith, the conditioner effects a change in the characteristics of the coating, which change renders the coating disruptable and facilitates its separation from contiguous coating portions along sharply and clearly defined lines, as well as reducing adhesion of the coating to the base sheet, so that it is removable therefrom. The conditioner further renders the coating susceptible to the action of a clearant which will not appreciably affect the areas of the coating which have not received the conditioner. It is to be understood that the function of the conditioner is to render selected and defined areas of the coating disruptable and separable from contiguous portions of the coating along sharply and cleanly defined lines and to render the areas affected thereby completely removable from the base sheet with the aid of a clearant which does not coact appreciably with the portions or areas of the film to which no conditioner has been applied or transferred.

The clearant utilized in the method of this invention

is a liquid which is not coactive or reactive with, or effective to produce ready and quick removal of the coating in its normal state and at normal temperatures of use. However, when the coating has been rendered disruptable and removable from the base sheet by the coaction therewith of a compatible conditioner, then the clearant liquid having the aforesaid characteristics becomes effective for completing the coating removal operation.

Time and temperature considerations are two factors which separately and jointly have some bearing upon the selections and operations of the aforementioned instrumentalities in conjunction with the method of this invention. For example, at least some commercial uses of the method either demand or make it desirable that a conversion sheet bearing an image of a subject, which conversion sheet is the end product of the disclosed method, should be producible in usable condition very rapidly, for example, in two minutes or less, when the method steps are carried out without delays therebetween. Although not necessarily requiring rapid sequences of steps, this method affords capabilities of the production of excellent results in much less than the two minutes mentioned.

When heat is utilized in effecting the transfer of conditioner from a subject source to the coating of the conversion sheet, both close contact between the subject source and the coating and a relatively short period of heating for effecting the transfer of the conditioner to, and its penetration into, the coating are both desirable in order to avoid, or at least to minimize diffusion of the conditioner in effecting the transfer. Such transfer of conditioner at temperatures within a working range for good results can be made with heating times varying from fractions of seconds up to several minutes, depending somewhat upon the particular coating utilized and the conditioner utilized therewith.

In some instances which are otherwise adaptable and susceptible to the aforementioned techniques and steps of the disclosed invention, it has been found convenient and expedient to define and thereby effectively segregate and distinguish between the areas of the coating to which conditioner is and is not to be coactively applied or transferred to the film coating by first applying or transferring to the coating surface a repellent which overlies and covers the coating and prevents coaction of the conditioner with the areas of the coating treated thereby. The repellent effectively prevents penetration or absorption of conditioner into the coating in the areas defined by treatment with the repellent.

Having thus, at least generally, defined the instrumentalities and their characteristics which are utilized for carrying out the steps of the method herein disclosed, as well as the terminology utilized for making references to the instrumentalities, the steps of the method, as such, may be more readily understood; it being further understood that specific examples of both the instrumentalities and the method steps of the invention shall be set forth herein, more definitely to characterize exemplary embodiments thereof which are set forth for illustrative purposes.

Thus, the method of this invention comprehends the transfer to a portion or area of the disruptable coating of a conversion sheet, in a specifically defined and preestablished image delineating pattern and by any one of several alternative ways expedient to effecting the desired end result from particular types of initial subjects, of a coating conditioner which renders one said portion or area of the film disruptable and removable from the base portion of the transfer sheet along sharply and clearly defined lines, whereupon the portion or area affected by the coating conditioner is readily disruptable and removable from the base portion of the conversion sheet along the aforementioned sharply and clearly defined lines with the aid of a clearant, thereby to leave on the base sheet, and otherwise intact, an image delineating coating definitive of the said pattern transferred thereto and usable for reproduction purposes in the graphic arts.

Having reference to the accompanying drawings, wherein exemplary phases and steps of this method are schematically depicted for illustrative purposes, FIG. 1 is a plan view of a preestablished subject **20** which includes illustrative and preestablished image forms **22** and **23**. In the practice of this disclosed method, the subject **20** may constitute a metal type character or a printing plate **24** having thereon raised image defining portions **25** and **26** corresponding to the exemplary image forms **22** and **23** or any other preestablished image form, as shown in FIG. 2, or may be a type character **27** of a typewriter having thereon raised image forms **28** and **29**, as shown in FIG. 3, or may be an intaglio plate **30** having recessed image defining areas **32** and **33** as shown in FIG. 4, or may be either art copy or artist's paper or board **34** or an intermediate carrier sheet carrying preestablished image forms **35** and **36**, as depicted in FIG. 5.

It being a purpose of the method of this invention to achieve the production of a conversion sheet which carries an image of a specifically defined and preestablished subject suited to graphic reproduction, and as has been previously indicated, an instrumentality adapted to use in carrying the method into effect is a conversion sheet **37** (FIG. 6) which includes a base sheet **38** preferably of a dimensionally stable material such as a polyester or polystyrene film which is transparent to light in a relatively wide spectral range and which has adhered thereto a relatively thin coating **39**, which coating is normally sufficiently hard to resist scratching and abrasion, as well as being rendered disruptable by the action of a conditioner and a clearant. As shown in FIG. 2, image delineating areas of a conditioner **40** which is cooperable with the coating **39** for rendering those areas of that coating disruptable may be transferred directly to the surface of the coating by first covering the raised image-defining surfaces of metal type with the conditioner, and then bringing the coating surface of the transfer sheet **37** into contact with the conditioner covered image-defining surfaces of the type. In this way, the conditioner is transferred from the preestablished subject image to spatially and dimensionally corresponding areas of the coating **39** of the transfer sheet.

As depicted in FIG. 3, a coated or saturable element, such as a typewriter ribbon **42**, carries the conditioner, so that when that ribbon is pressed against the surface of the coating **39** of a conversion sheet by raised image defining portions, such as **28** and **29** of the type character **27**, conditioner is deposited on the coating in a configuration which corresponds spatially and dimensionally to the raised image defining portions of the type character. This effects the deposit of the conditioner **40** on the coating from whence it penetrates or may be made to penetrate the coating and commingle therewith to render the coating disruptable.

In the phase of the method illustrated in FIG. 4, conditioner is carried in the depressed image defining portions of an intaglio or printing plate, and the remaining surface of the plate is wiped clean, so that no conditioner remains on the flat surface of the plate. The plate is then brought into contact with the coating **39** for deposit of the conditioner from the depressed areas onto the coating surface. This deposit may be effected either with or without the aid of heat for increasing the vapor pressure and increasing the rate of action of the conditioner, as will be more fully described.

In the transfer of conditioner from image defining portions of art copy or an intermediate carrier sheet, the conditioner is either incorporated in the pigmented medium utilized for rendering the art copy or is incorporated in the medium which is transferred to the image defining areas of the intermediate carrier sheet. As shown in FIG. 5, the image defining areas of the art copy on the surface of an artist's board or the image defining areas

transferred to an intermediate carrier sheet are placed in contact with the surface of the coating **34** of the conversion sheet for transfer of the conditioner to the coating. In many instances, this transfer and the penetration of the conditioner into the coating are aided and caused to be more rapidly effected by the use of heat, either from a flat-bed heater or from a source of infrared radiation, as will be described in greater detail.

FIG. 7 schematically illustrates the deposit of image defining areas of conditioner **40** on the surface of the coating **39** of the conversion sheet. This deposit of conditioner may be effected in many and various ways, such as by those illustrated in FIGS. 2, 3, 4 and 5 and as described in connection with those figures. After being thus transferred to the surface of the coating, the conditioner penetrates or is absorbed into the coating and commingles therewith, without appreciable lateral spreading in the coating, as indicated at **43** in FIG. 8. The coaction of the conditioner with the coating **39** on the conversion sheet renders the conditioned areas of the coating disruptable.

For effecting the disruption of the coating, the entire surface of the coating **39** is covered with clearant **44**, as indicated schematically in FIG. 9. The clearant there shown is a liquid and is applied to the surface coating by being rubbed thereon with the aid of a soft and saturable swab, whereupon the clearant acts upon the conditioner treated areas of the coating to effect the disruption thereof and the separation of the coating in those areas from contiguous coating portions and from the base sheet. The portions of the coating which were not treated by the conditioner being substantially inert to the action of the clearant, the removal of the excess clearant and the disrupted film portions from the conversion sheet **37** leaves the conversion sheet with clear image defining areas **45** (FIG. 10) delineated by the contiguous coated portions having light transfer characteristics different than those of the base sheet, inasmuch as the coating may be colored or may contain an absorbent for portions of the spectrum for which the base sheet is transmissive, or both.

The methods of transfer illustrated in FIGS. 2, 3 and 4 are adaptable to the phase of the method illustrated in FIGS. 11 to 15 inclusive. However, instead of transferring conditioner to the surface of the coating **39** on the transfer sheet **37**, image defining areas of a repellent **46** are transferred thereto. The repellent has characteristics such that, in the areas to which it is applied, it prevents the penetration of conditioner into the coating. FIG. 11 depicts image defining areas of repellent **46** applied to the surface of the coating **39** of the conversion sheet **37**. After such application of the image defining areas of repellent **46**, conditioner **40** is applied to the coating, as by being sprayed or swabbed onto the surface, so as to cover the areas to which repellent has been applied, as well as the remaining areas of tthe coating. As shown in FIG. 13, the areas of the coating which are uncovered and unprotected by the repellent are penetrated by or absorb the conditioner, whereupon the coating portions contiguous to those covered by the repellent are thus rendered disruptable. After such penetration by the conditioner, clearant is applied over the surface of the conversion sheet as illustrated in FIG. 9, with the aid of a soft, saturable swab, whereupon the conditioned portions of the film are disrupted and removed from the base sheet, leaving the image delineating areas on the base sheet and delineated by clear portions **47** of the base sheet, as shown in FIG. 14. The repellent may or may not be removed from the surface of the image delineating portions by the action of the clearant, but if not removed therefrom by the clearant, may, if desired, be removed, as shown in FIG. 15, by the use of an additional solvent for the repellent to which the coating is inert.

From the foregoing description and reference to the accompanying drawings, it may be understood that the method herein disclosed constitutes a method of making a reproducible image of a preestablished subject by the cooperation between a thin disruptable coating adhered to a base sheet, a conditioner covering delineating portions of the said subject, and a clearant. The method comprises the steps of positioning the subject and an image-receptive conversion sheet of the type including the base sheet to which the disruptable coating is adhered in such proximity with each other that the conditioner covering the delineating portions of said subject and the disruptable coating are in contact throughout the area of said delineating portions. Then conditioner is transferred from the said delineating portions to areas of the coating which spatially and dimensionally correspond to the delineating portions, respectively, while said conditioner and the coating are in contact with each other to enable said conditioner to penetrate and to commingle with said spatially and dimentionally corresponding areas of said coating for facilitating the separation and removal of said corresponding areas from the contiguous portions of the coating and from said base sheet. Thereafter clearant is applied to said coating for rendering said corresponding areas of said coating and said conditioner removable from said contiguous portions of said coating and from the base sheet, and the commingled conditioner and corresponding portion of said coating are separated from contiguous portions of said coating and removed from said base sheet together with excess clearant, whereby said contiguous portions of said coating remaining on said base sheet define an image of said subject conforming to said delineating portions thereof.

Having thus described various aspects and steps of the preferred method of this invention, more specific and definite examples adapted to use in carrying the method into effect will now be set forth.

In the consideration of the examples presented for illustrative purposes, it may be observed that in addition to various constituents which are adapted to use in and as the various instrumentalities, the examples also provide different manners of treatment of the instrumentalities in carrying the method into effect, and similarities and differences in end results produced, as well as different suggestive uses of the end products in connection with phases of reproduction in connection with the graphic arts. Considered separately and together, these examples are considered to be indicative of the potentialities of this disclosed method and the equivalents and modifications which are readily derivable therefrom without departing from the basic principles involved.

Example 1 is illustrative of a preferred embodiment of this invention and demonstrates the manner in which a conditioner, a conversion sheet including a base sheet and a disruptable coating and a clearant cooperate when utilized in conjunction with exemplary procedural steps to provide an accurate reproduction without photography of a predetermined image area, which reproduction is then readily and immediately adapted to the preparation of, for example, a lithographic printing plate by permitting predetermined selective exposure of the lithographic printing plate coating.

EXAMPLE 1

A metal type subject was placed on a proof press and the raised delineating portions inked with a roller with a composition comprising 57% glycerol, 15% of a mixture of fatty acid amides, and 28% titanium dioxide pigment, all by weight. The mixture of fatty acid amides used included about 6% stearamide, about 91% oleamide and about 3% lineoleamide and is available under the trade name "Armid O" from Armour and Co., Chicago, Ill. Both the glycerol and the fatty acid amide mixture function as conditioners.

The inked subject was positioned against the disruptable coating side of an image receptive conversion sheet. The base sheet of the conversion sheet used consisted of du Pont Type D Mylar polyester sheet, about 0.003" in thickness. It was uniformly machine coated by a gravure cylin-

der with a solvent mixture comprising equal volumes of methanol, isopropanol, butanol and ethylene glycol monoether, in which the coating components themselves comprised the following:

Ingredient:	Percent by weight
Ethyl cellulose	6.8
Acrylic polymer	24.4
64% light petroleum distillate solution of a sodium salt of lauryl sulfate ester	16.2
Ultraviolet light absorbers:	
4-methyl-7-diethyl amino coumarin	5.4
2,2',4,4'-tetrahydroxy benzophenone	10.8
Orange dye	16.4
Yellow dye	10.8
Red dye	9.2

The solution of the sodium salt of a lauryl sulfate ester used was Triton GR–7, available from Rohm & Haas Co., Philadelphia, Pa. The ethyl cellulose used was 7 centipoise, standard ethoxy Ethocel, as produced by Dow Chemical Co., Midland, Mich. A suitable acrylic polymer used was Acryloid B–72, a medium viscosity grade mixture of methyl and ethyl acrylates and methacrylates available from Rohm & Haas Co. The orange dye used in the foregoing formulation was Acetosol Orange RLS, a product of Sandoz Chemical Works, Inc., New York, N.Y. Acetosol Orange RLS is identified by the Colour Index as Solvent Orange 42. The yellow dye used in the foregoing formulation was Orasol Yellow 3R, a product of Ciba Co., New York, N.Y. Orasol Yellow 3R is a monoazo dye and is identified by the Colour Index as Solvent Yellow 25. The red dye included 6.5% Azosol Fast Brilliant Red B, a disazo dye, and 2.7% Azosol Fast Red BE, a monoazo (metal complex) dye, both products of Antara Chemicals Co., a division of General Aniline & Film Corp., New York, N.Y. They are identified by the Colour Index as Solvent Red 33 and Solvent Red 8, No. 12715, respectively. The Colour Index, Second Edition 1956, is a compilation by the American Associates of Textile Chemists & Colorists and the Society of Dyers & Colourists of England to identify recognized commercially available coloring materials.

The ratio of coating components to solvent mixture was adjusted to deposit the coating components in a self leveling, rapidly drying film coating which, after evaporation of the solvent mixture, produced an extremely thin film coating of from about 0.005 to about 0.0001 ounce of coating components per square foot of polyester sheet surface and which coating was adherent to that surface. A suitable such ratio of coating components to solvent mixture was about 41.5 grams to about 100 milliliters. The film coating was transparent to the eye but was of a deep orange color.

When the inked metal type was printed on the film coating, ink was transferred from the raised delineating image portions of the metal type form to areas of the coating which spatially and dimensionally corresponded thereto.

After removal from the form, the conversion sheet was then placed in a flat-bed heater, the surface temperature of which was about 160° F., for 30 seconds to facilitate commingling of the conditioners with the underlying spatially and dimensionally corresponding coating areas and to render those areas disruptable. The conversion sheet was then removed from the heater.

The image areas were then separated and removed from the adjoining contiguous portions of the coating and from the base sheet. That was accomplished by wiping the coating surface with a clearant comprising an aliphatic naphtha cut having a boiling range of 315° to 350° F., and an aromatic content of 3.7% or less. Such a cut is available under the trade designation "Shell Sol 360" from Shell Oil Co., New York, N.Y. The clearant was applied by means of a saturated swab of absorbent tissue and the wiping and swabbing of the image areas was continued until the conditioned corresponding areas of the coating had separated from the base sheet and from the contiguous portions of the coating. Since the coating is normally substantially unaffected by the clearant in portions where conditioner was not present, the contiguous portions of the coating were not disturbed by the wiping.

After clearance and removal of the commingled conditioner and corresponding coating areas, the resulting reproducible image or negative consisted of clear sharp light-transmitting image areas corresponding to the raised delineating image portions of the metal type form in a background of the contiguous orange-colored coating portions.

The reproducible image of the subject was then used to expose a lithographic plate coating and to prepare a lithographic plate for use in printing reproductions of the original subject. To do that, the reproducible image or negative of the subject was placed against a lithographic plate coating, sensitive to high-range ultraviolet and low-range visible light, with the coating side facing away from the plate coating. A conventional carbon-arc light source was directed at the plate coating through the negative. The contiguous coating portions absorbed, hence failed to pass, the actinic light, while the clear image areas passed the light to which the plate coating was sensitive and allowed the lithographic plate coating to become exposed in portions corresponding thereto. The lithographic plate was then conventionally processed for subsequent printing use.

Similarly, the reproducible image, or negative, was adapted to and used to expose a conventional photoengraving plate coating which is sensitive to high-range ultraviolet and low-range visible light. The plate was then processed and etched in the usual manner for subsequent printing use.

Many absorbers for high-range ultraviolet radiation wave lengths are available and may be employed. In addition to those alredy described, that is, methyl diethyl amino-coumarin and 2,2',4,4'-tetrahydroxy benzophenone, other examples include various 2-benzophenone compounds (2,4-dihydroxy benzophenone; 2-hydroxy-4-methoxy benzophenone; 2-hydroxy-4-methoxy-5-sulfo benzophenone, etc.) as well as 3,5-dichloro benzophenone; quinine compounds such as quinine, quinine hydrochloride; picric acid; coumarin derivatives such as benzyl beta methyl umbelliferone; certain nitro compounds such as paranitrophenol and 3,5-dinitro salicylic acid; aniline compounds such as benzene azo betanaphthylamine; and others.

Furthermore, dyes or colorants other than those already described may be used to impart desired color characteristics to the coating. As illustrative of other dyes, certain triphenyl methane dyes may be employed. In this class, a satisfactory red dye is para rosaniline acetate, a satisfactory yellow dye is aurin and a satisfactory blue dye is Patent Blue, AF, Colour Index Acid Blue 7. Xanthene coloring matters may also be employed, and as typical examples, rhodamine may be employed as a red color and fluorescine may be employed as a yellow color. Another satisfactory blue dye consists of a mixture of pentamethylbenzyl-p-rosaniline (methyl violet) and phenyltetramethyl triamido-a-naphthyldiphenyl carbinol hydrochloride (Victoria Blue, B, Colour Index Basic Blue 26). Yellow dyes, such as p-dimethyl-amido azobenzene (methyl yellow), may also be used. Azo and diazo type dyes may also be employed. Since the dyes are employed principally to contribute their color, suitable dyes are numerous and it is apparent that the foregoing examples are intended to be illustrative only. In all cases the colorants or dyes, and the ultraviolet light absorbers must be compatible in the filmed coating as a whole so that the coating is continuous and adheres to the base sheet.

Other exemplary solvents which may be used in deposit-

ing the coating components on the base sheet include ethylene glycol monomethyl ether; and a mixture, by volume, of 70% methyl ethyl ketone, 20% toluol and 10% propylene glycol monomethyl ether. Other plasticizer-softeners which may be used in the stead of the sodium salt of lauryl sulfate ester include sodium dioctyl sulfosuccinate; a condensation product of polypropylene glycol and ethylene oxide having a molecular weight of about 8,000 and 80 to 90% ethylene oxide available from Wyandotte Chemicals Corp., Wyandotte, Mich., under the name Pluronic F68; and polyoxyethylene stearate, a waxy solid having a specific gravity of 1.11 and available from Atlas Chemical Industries, Inc., Wilmington, Del., under the name Myrj 53.

Other clearants which might be used with substantially equal facility with the disruptable coating, base sheet and conditioner of Example 1 to provide systems useful to carry out the illustrative process of Example 1 include equal volumes of tetrachlorodifluoroethane and trichlorotrifluoroethane, carbon tetrachloride, toluol, propylene dichloride, and mixtures thereof. All coact with the commingled conditioner and coating to facilitate separation and removal of those areas of the coating while having no substantial disruptive effect upon the unconditioned coating portions.

While exemplary conditioners, conversion sheets and clearants have been used in Example 1 to illustrate a specific process wherein the objects and advantages of this invention may be obtained, of course this invention is not so limited. Examples 2 to 4 describe in the context of additional exemplary processes, additional base sheet materials which may be used to provide desirable results with a disruptable coating similar to that used in Example 1. Still other base sheet materials include vinyl polymer, gelatin-coated cellulose acetate, urea formaldehyde and acrylic resin sheets, among others.

EXAMPLE 2

The same procedures were followed as specified in Example 1, except that the conversion sheet used consisted of a thin transparent polystyrene base sheet filmed uniformly with a thin coating of about the thickness described in Example 1, consisting by weight of 16.2% ethyl cellulose, as described in Example 1; 16.2% of a 64% petroleum distillate solution of a sodium salt of lauryl sulfate ester, as described in Example 1; 5.4% 4-methyl-7-diethylamino courmarin; 5.4% 2,2',4,4'-tetrahydroxybenzophenone; 8.2% of a mixture of tetrasubstituted benzophenones including 2,2'-dihydroxy-4,4'-dimethoxybenzophenone, available as "Uvinul 490" from Antara Chemicals Co. (the latter two being ultraviolet light absorbers); and dyes including 21.6% Azosol Fast Red BE, 21.6% Orasol Yellow 3R, and 5.4% Acetosol Blue RLS, available from Sandoz Chemical Works, Inc., New York, New York. Acetosol Blue RLS is identified by the Colour Index as Solvent Blue 47. The film, when deposited and adhered to the base sheet was transparent to the eye and was a deep ruby red in color.

While heating the conversion sheet it was necessary to make certain that the temperature was not high enough to disturb the polystyrene base sheet. It is somewhat more heat sensitive than the polyester sheet of Example 1.

When the conversion sheet was cleared in accordance with the procedure described in Example 1, a comparable reproducible image was provided which was adapted to similar uses.

EXAMPLE 3

The same procedures were followed as specified and described in Example 2 except that the coating of Example 2 was provided in a very thin layer on a transparent polyethylene base sheet.

As in Example 2, it was necessary to make certain that the more heat sensitive polyethylene is not heated to a temperature great enough to disturb or distort it.

When the conversion sheet was cleared in accordance with the procedures described in Example 1, a comparable reproducible image or negative was provided, which reproducible image was adapted to the uses of Example 2.

EXAMPLE 4

The same procedures were followed as specified and described in Example 2 except that the coating of Example 2 was provided in a very thin layer on a transparent polytetrafluoroethylene base sheet.

When the conversion sheet was cleared in accordance with the procedures described in Example 1, a comparable reproducible image or negative was provided, which reproducible image was adapted to the uses of Example 2.

In Examples 5, 6, 7, 8 and 9 to follow, it may be observed that the same base sheet described as useful in Example 1 has been provided with different exemplary disruptable coatings, all of which provide the desirable results to be obtained in accordance with the teachings of this invention. In all cases, a negative of an original metal type form subject was secured, which negative was adapted to the preparation of a suitable lithographic printing plate, if desired. It is of interest to note that in addition to the exemplary coatings described in the context of the processes of Examples 5, 6, 7 and 8, other coatings such as a thin red disruptable coating deposited on a polyester base sheet from a suitable solvent solution of Azosol Fast Red BE, and a thin yellow disruptable coating deposited from a suitable solvent solution of Orasol Yellow 3R, both in the manner described in Example 8, were disruptable and removable to form negatives comparable to those obtained in Example 8 when the procedures of Example 8 were followed. So also have additional exemplary clearants been described.

EXAMPLE 5

The same procedures were followed as specified and described in Example 2 except that the coating of Example 2 was provided in a very thin layer, of about the thickness described in Example 1, on a transparent polyester sheet.

The conversion sheet, when cleared in accordance with the procedures described in Example 2, provided a reproducible image or negative comparable to and adapted to the uses of that described in Example 2.

EXAMPLE 6

The same procedures were employed here as were described in connection with Example 2. However, the conversion sheet used was somewhat different, that sheet including a thin transparent polyester base sheet bearing a thin uniform coating, of about the thickness of Example 1, on one side of the base sheet including the same ingredients set forth in Example 2 except that 16.2% polyvinyl acetate having a softening point of 223° F. was substituted for the ethyl cellulose of Example 2.

The conversion sheet, when cleared in accordance with the procedures described in Example 2, provided a reproducible image or negative comparable and adapted to the uses of that described in Example 2.

EXAMPLE 7

The same procedures were employed here as were specified and described in connection with Example 2. However, the conversion sheet used was somewhat different, that sheet including a thin transparent polyester base sheet bearing a thin uniform film coating of about the thickness as described in Example 1, on one side of the base sheet including the same ingredients as Example 2 except that 16.2% of a film-forming styrene-maleic anhydride copolymer having a specific gravity of 1.14 to 1.16 and an equivalent weight of 295 to 310 was substituted for the ethyl cellulose of Example 2. A suitable such copolymer is Lytron 820 available from Monsanto Chemical Co., St. Louis, Mo.

The conversion sheet, when cleared in accordance with the procedures described in Example 2, provided a re-

producible image or negative comparable to and adapted to the uses of that of Example 2.

EXAMPLE 8

The same procedures employed in Example 1 were followed in this instance. However, the conversion sheet was different than that used in Example 1, that sheet including a thin transparent polyester sheet and a disruptable coating deposited from a solution of orange dye having film forming characteristics. A suitable orange dye for that purpose is Acetosol Orange RLS. When deposited from a solution of 20 grams of dye in 60 ml. isopropanol and 40 ml. ethylene glycol monoethyl ether, the orange dye dried to a glossy orange coating, about the thickness of Example 1, on the polyester base sheet. The film was relatively resistant to damage from handling.

The conversion sheet was conditioned and cleared in accordance with the procedures of Example 1. After clearance, the resulting reproducible image or negative provided was comparable to that of Example 1 and was adapted to similar uses.

EXAMPLE 9

A metal type form subject was placed on a proof press and the raised delineating image portions thereof inked with a roller with a composition comprising, by weight, 42.5% water, 12% tribasic potassium phosphate, 12% 1,4,3,6 sorbide, 25% finely divided titanium dioxide pigment and 8.5% potassium hydroxide. The alkaline components functioned as film conditioners in this process.

The inked subject was then positioned against the disruptable coating side of an image-receptive conversion sheet. The conversion sheet used consisted of Du Pont's "Mylar" polyester sheet, Type D, about 0.003" in thickness coated uniformly with a very thin film coating deposited from a solvent mixture consisting of equal volumes of methanol, isopropanol, butanol and ethylene glycol monoethyl ether, the coating component comprising 20% of the styrene-maleic anhydride copolymer of Example 7, 6.7% 4-methyl-7-diethylamino coumarin, 13.3% 2,2',4,4'-tetrahydroxy-benzophenone, 26.7% of a red dye such as Azosol Fast Red BE, 26.7% of a yellow dye such as Orasol Yellow 3R and 6.6% of a blue dye such as Acetosol Blue RLS, all by weight. The proportion of the solvent mixture to the coating ingredients was adjusted to produce a film coating of from 0.005 to 0.0001 ounce per square foot of polyester sheet surface. The coating was a deep ruby red color, substantially transparent to the eye.

While the subject was thus positioned against the coating, ink was transferred from the raised delineating image portions of the metal type form which were in contact with the coating to areas of the coating which spatially and dimensionally corresponded thereto.

The inked conversion sheet was then removed from its position of contact with the subject and the conditioners were allowed to commingle with and penetrate the spatially and dimensionally corresponding coating areas. Penetration required about 2 minutes.

Thereafter, the image areas were separated and removed from the adjoining contiguous portions of the coating and from the base sheet. That was accomplished by swabbing the coating surface with a clearant comprising water. The clearant was applied and removal effectuated with a saturated swab of absorbent tissue and then wiping and swabbing of the image areas was continued until the loose ink was removed, and until conditioned corresponding areas of the coating had separated from the base sheet and from the contiguous portions of the coating. Since the coating is substantially unaffected by the clearant in the portions where conditioner was not present, the contiguous portions of the coating were not disturbed by wiping.

After clearance and removal of the commingled conditioner and corresponding coating areas, the resultant reproducible image or negative was comparable to that of Example 1. It was adapted to similar uses.

Examples 1 to 8 illustrate an exemplary conditioner, while Example 9 illustrates another system of conversion sheet, conditioner and clearant within the contemplation of this invention. Yet another illustrative system is described in Example 10 wherein an alkyl aryl polyether alcohol is used as a coating conditioner.

EXAMPLE 10

A metal type form subject was placed on a proof press and the raised delineating portions inked with a roller carrying an ink composition including, by weight, 47% of octylphenoxy polyoxyethylene ethanol with a polyoxyethylene chain of 9 to 10, available as Triton X–100 from Rohm & Haas Co., the conditioner in this example, 13% sucrose benzoate, and 40% of a soluble black azine dye. A suitable black azine dye is Nigrosine Base NB, available from General Dyestuff Corp., a division of General Aniline & Film Corp., New York, N.Y., and having a color index identification of Color Index Solvent Black 7, No. 50415B.

The inked or proofed subject was positioned against the disruptable coating side of the image receptive conversion sheet used in Example 1. While thus interpositioned between the subject and the conversion sheet, ink containing the conditioner was transferred from the raised delineating image portions of the subject which were in contact with the coating to areas of the coating which spatially and dimensionally corresponded to those delineating raised portions. The inked conversion sheet was then placed in a flat-bed infrared heater and exposed to infrared radiation for about one second. During that period of heating, the conditioner component of the ink penetrated the coating in the underlying or corresponding image areas and became commingled with the coating in those areas. The existence of the infrared absorbing black dye in the ink caused the ink to absorb infrared energy and thereby selectively heat the film and the conditioner in the ink areas.

After the heating was concluded, the conversion sheet was removed from the infrared heater and the corresponding film areas were separated and removed from the adjoining contiguous portions of the coating and from the base sheet. That was accomplished by wiping the coating surface with a clearant comprising equal volumes of (1) a naphtha cut having a boiling range of 315° to 350° F. and having 3.7% aromatics or less by volume and (2) 1,1,1-trichloro ethane. The clearant was applied with a saturated swab of absorbent tissue, and the wiping and swabbing of the corresponding coating area was continued until those areas of the coating had separated from the base sheet and from the contiguous portions of the coating. The coating in the contiguous portions was substantially unaffected by wiping with the clearant.

After clearance, the resulting reproducible image or negative provided was comparable to that of Example 1 and was adapted to similar uses.

It is to be noted that another suitable conditioner which may be used instead of the Triton X–100 and which works with equal facility here, as well as in Examples 9 and 10, is polyoxyethylene sorbitan monolaurate.

In addition to illustrating another suitable conditioner, Example 10 also describes and shows how other clearants may be used in the practice of the method of this invention. Another clearant which has been used with substantially equal facility in the illustrative process of Example 10, as well as Examples 11 and 12, is a mixture of equal volumes of tetrachlorodifluoroethane and trichlorotrifluoroethane.

It will be noted that Examples 1 to and 10 have utilized a source of heat to facilitate commingling of the conditioners with the disruptable coatings. Exemplary useful sources of heat have been shown to be flat-bed or platen heaters as well as infrared heaters. Example 11 to follow shows that in other instances illustrative of the method of this invention infrared and platen heaters may be used interchangeably. Example 12, as well as prior Example 9,

demonstrates that heat is not always necessary to facilitate ample commingling of a conditioner with a disruptable coating.

EXAMPLE 11

The process described in Example 10 was carried out in the manner there described except that the heating source used was a flat-bed conventional heater, the surface temperature of which was about 175° F. The conversion sheet was maintained in the flat-bed heater in contact with the ink at that temperature for 30 seconds during which time the conditioner commingled with and penetrated the underlying spatially and dimensionally corresponding coating areas. Upon removal from the heater, the conversion sheet was cleared in the manner described in Example 10 and the resulting reproducible image was comparable to that obtained in accordance with Example 10 and adapted to the same uses.

EXAMPLE 12

The process described in Example 10 was carried out in the manner there described except that the heating step was entirely omitted. Instead, the proofed conversion sheet was allowed to stand for one hour at ambient room temperatures. During that time, the conditioner commingled with and penetrated the underlying spatially and dimensionally corresponding areas of the coating so that at the end of the hour the corresponding areas were readily separated and removed by wiping and clearing in the manner described in Example 10. The resulting negative of the subject was comparable to that obtained in accordance with Example 10 and was adapted to the same uses.

In some instances a conditioner may be relatively inactive at ambient room temperatures and therefore not readily commingleable with the disruptable coating of a conversion sheet. In such a case, illustrated by Example 13, a source of heat is provided to "activate" the conditioner. A convenient method of selectively heating the transferred conditioner in corresponding areas only, as suggested earlier in Example 10, is to utilize an infrared absorbent in admixture with the conditioner and to use infrared energy therewith as the heat source.

EXAMPLE 13

A metal type form subject was placed on a proof press and the raised delineating image portions inked with a roller with a composition including, by weight, 66% castor oil, 18% palmitic acid and 16% of a suspension of carbon black in isopropanol available under the trade designation "Alkoblak 322" from Columbian Carbon Co., New York, N.Y. The palmitic acid served as a conditioner.

The inked subject was then positioned against the disruptable coating side of the image receptive conversion sheet used in Example 1. While positioned against the coating, ink was transferred from the raised delineating image portions of the subject which were in contact with the film, to areas of the disruptable coating which spatially and dimensionally corresponded to those delineating raised image portions. The proofed conversion sheet was then placed in a flat-bed infrared heater and exposed to an infrared energy source for about one-half second. The source used was a General Electric 1350 watt quartz infrared lamp operated at 280 to 300 volts. The filament of the source was maintained at a distance of about one-half inch from the ink. A convenient unit in which such a source is available is a Thermo-Fax copying machine, made by Minnesota Mining & Mfg. Co., St. Paul, Minn. Because of the infrared energy absorptive carbon black present in the transferred spatially and dimensionally corresponding areas, those areas became heated and the normally solid palmitic acid conditioner became active and penetrated and commingled with the coating in the corresponding area. Without being heated, the palmitic acid, solid at ambient room temperatures, would not so commingle. And because the base sheet and coating were not infrared absorbing, the only areas affected by the infrared radiation were the inked areas. After about one-half second of exposure to the infrared energy source, the conversion sheet was removed from the infrared heater.

The image areas were then separated and removed from the adjoining contiguous portions of the film and from the base sheet in the manner described in Example 10. The resulting reproducible image or negative of the subject was comparable to that of Example 1 and adapted to similar uses.

Examples 1 to 13 have illustrated exemplary processes in which conditioner was first transferred to the disruptable coating of a conversion sheet after which the conversion sheet was removed from contact with the delineating subject and cleared. Example 14, in addition to describing a manipulative variation advantageous under certain circumstances, describes yet another conditioner suitable for use in accordance with this invention.

EXAMPLE 14

The raised delineating portions of a metal type form subject were inked with a roller with a composition including, by volume, 40% methyl pyrrolidone, 40% water, and 20% of the suspension of carbon black in isopropanol described in Example 13. Methyl pyrrolidone is the conditioner.

The inked or proofed subject was positioned against the disruptable coating side of an image receptive conversion sheet of Example 1 so that the coating was in contact with the raised delineating inked image portions of the metal type form throughout those raised delineating portions.

While thus in contact with disrupter interpositioned between the subject to be reproduced and the conversion sheet, infrared radiation was directed against the back of the conversion sheet. Since both the base sheet and the orange disruptable coating are substantially transparent to infrared radiation, the radiant energy passed through the conversion sheet. The source of infrared radiation used was a 250-watt General Electric, infrared-industrial, reflector type lamp. Since the lamp filament was maintained at a distance of about 9 inches from the conversion sheet, a temperature of about 140° F. was developed in the inked image areas which absorbed that energy because of the presence of the infrared-absorbing carbon black. That temperature was sufficient to increase the vapor pressure of the methyl pyrrolidone on those raised image portions so that it was transferred in a gaseous state from the raised delineating image portions to spatially and dimensionally corresponding areas of the coating, and in being transferred penetrated and commingled with the coating in those corresponding areas. While some of the commingling and penetration was no doubt due to the contact and the attendant liquid state migration of the conditioner from the inked raised image portions to the coating, it is the case that vaporization played a substantial part in the transfer and in the ultimate pentration of the disruptable coating in the corresponding areas. The infrared irradiation was continued for 25 seconds.

Once the heating was concluded, the conversion sheet was removed from its position adjacent the subject and cleared in accordance with the method described in Example 10. The resulting reproducible image was comparable to that of Example 1.

Examples 15 and 16 describe additional illustrative embodiments of this invention. In one case they describe the use of additional conditioners and in both instances they describe also additional manipulative variations within the purview of this invention, all of which embody advantages and carry forth objects of this invention. Specifically, Examples 15 and 16 discuss the use of intermediate transfer media whereby a conditioner delineated image is transferred to a disruptable coating through the intermediary of an intermediate carrier sheet.

EXAMPLE 15

The raised delineating image portions of a metal type

form subject were inked with a roller with a conditioning composition comprising, by weight, 40% glycerol, 50% titanium dioxide pigment and 10% of a sodium salt of lauryl sulfate ester such as that available from Rohm & Haas Co. under the trade name "Triton GR–5." Triton GR–5 comprises 64% sodium salt of lauryl sulfate ester in a 1-to-1 mixture of isopropanol and water as the carrier.

The so inked subject was brought into printing contact with a rubber blanket of the type conventionally used in offset printing. The blanket was secured to the impression cylinder of a proof press. Ink was transferred from the raised delineating image portions of the subject to the rubber blanket in areas spatially and dimensionally corresponding to the raised image portions by bringing the blanket into proper printing contact with the inked subject. The transferred image supported upon the blanket was itself then brought into contact with the coating side of the conversion sheet described in Example 1, and ink was transferred from the corresponding image areas to similarly corresponding areas of the disruptable coating. Specifically, that transfer was effected by supporting the conversion sheet on a flat type-high block on the proof press bed after which the blanket was brought into printing contact with the coating of the conversion sheet.

The proofed conversion sheet was then heated, the inked areas conditioned and finally cleared in the manner described in Example 1, except that the clearant used was one including equal volumes of (1) an aliphatic naphtha cut having a boiling range of 315° to 350° F. and having 3.7% or less by volume of total aromatics, and (2) 1,1,1-trichloroethane. The resulting reproducible image or negative consisted of clear, sharp light-transmitting image areas corresponding to the raised delineating portions of the subject, against a background of the contiguous orange-colored film portions. However, the reproducible image was laterally reversed from the original and from the corresponding negative, say of Example 1, because of the intermediate transfer. It was, however, adapted to be used in the manner described in Example 1 to produce a lithographic printing plate, except that the plate is exposed in face-to-face contact with the reproducible image or negative.

EXAMPLE 16

A metal type form subject was placed on a proof press and in the raised delineating image portion by roller application inked with an ink comprising, by weight, 57% glycerol, 15% of the mixture of fatty acid amides described in Example 1, and 28% of the suspension of carbon black in isopropanol described in Example 13. The inked subject was then positioned in contact with a piece of smooth-surfaced paper and an inked impression or proof of the delineating raised image portions of the subject created thereupon. That paper proof was then positioned so that the transferred ink image was in contact throughout the transferred image areas with the image-receptive conversion sheet coating described in Example 1. The proof and the conversion sheet, while in contact with each other and therefore with the conditioner interposed therebetween, were placed in a flat-bed infrared heater and exposed to infrared radiation directed at the back of the conversion sheet in the manner and for the time specified in Example 13. During that period, because of the presence of the infrared-absorbing carbon black, the ink was caused to be heated. The temperature was raised sufficiently to cause some of the glycerol to vaporize from the black ink image areas of the paper proof to spatially and dimensionally corresponding areas of the disruptable coating. The vaporized conditioner penetrated and become commingled with the film in those corresponding areas during the period of radiation.

While some of the commingling in and the resulting penetration of the corresponding coating areas may have been due to the contact between the conditioner and the coating and the attendant liquid state migration of conditioner, it is the case that vaporization played a substantial part in the transfer of conditioner to the coating and in the ultimate penetration of the coating.

The penetrated image areas were then separated and removed from the adjoining contiguous portions of the coating and from the base sheet by clearing in the manner described in Example 10. The resulting reproducible image or negative, as in the case of Example 15, was laterally reversed. It was adapted to similar uses.

Example 17, while utilizing yet another conditioner, describes how the depressed or intaglio portions of a photoengraving may be utilized as the conditioner delineated image portions to be transferred to a disruptable coating thereby making it clear, in conjunction with the preceding examples, that conditioner may be transferred in delineating image areas from image areas which are raised, which are depressed or which are substantially planar. The examples to follow will continue to bear that fact out.

EXAMPLE 17

A photoengraving subject was filled in its sub-surface depressed image delineating portions with a composition comprising equal proportions by weight of benzoic acid and of lamp black. The raised areas of the photoengraving were then burnished clean with the non-abrasive side of a section of fine emery cloth. In that manner the usual printing areas, those portions corresponding to the portions reproduced, for example, in Example 1, were completely clear of the benzoic acid-lamp black composition.

The disruptable coating side of the image-receptive conversion sheet described in Example 1 was then positioned against and in contact with the surface of the photoengraving. The usual printing areas of the photoengraving contacted the film and the benzoic acid-lamp black composition was near but largely out of direct contact with the coating in those non-printing portions. An infrared energy source was then directed toward the uncoated surface of the conversion sheet and since the base sheet and the coating of the conversion sheet are substantially non-infrared-absorbing, infrared radiation passed therethrough and was selectively absorbed in the sub-surface depression portions wherein the infrared absorbing lamp black was present. The radiation source used was a 250-watt General Electric, infrared-industrial, reflector type lamp. During a period of about 20 seconds wherein the lamp filament was maintained at a distance of approximately 8 inches from the conversion sheet, a temperature of about 130° to 140° F. was developed. That temperature was sufficient to raise the vapor pressure of the benzoic acid to the extent that some of the benzoic acid in the filled depression image portions vaporized, then contacted, penetrated and commingled with the coating in areas of the coating spatially and dimensionally corresponding to the sub-surface depression portions, while being effectively prevented from access to the printing areas. The raised printing areas themselves in contact with the disruptable coating, prevented the invasion of vaporized benzoic acid into those areas.

After irradiation was completed, the disrupted corresponding areas of the coating were separated and removed from the adjoining contiguous portions of the film and from the base sheet. That was accomplished in the manner described in Example 10. After clearance, the resulting reproducible image was a positive of the photoengraving (compared to the negative of Example 1) and consisted of clear, sharp light-transmitting background areas corresponding to the initial delineated sub-surface depression portions of the photoengraving, surrounding an image of the orange-colored coating portions. The reproducible positive image was then ready for use in preparing a negative-working lithographic printing plate in accordance with the method described in Example 1.

In accordance with this invention substantially all raised type forms may be conditioner delineated to facilitate the reproduction of the raised type form. Certainly the

invention is not limited to the use of the illustrative metal type forms and photoengravings of the preceding examples. As such, a typewriter may be used to facilitate the transfer of conditioner in the raised portions of the type to the disruptable coating of a conversion sheet. In the examples illustrating this aspect of the invention, additional conditioners within the contemplation of this invention are set forth.

EXAMPLE 18

A conversion sheet described in Example 1 was placed in a typewriter in the same manner that a sheet of paper would be placed in that typewriter. The disruptable coating faced outwardly so that the subject type of the typewriter might contact it. A carbon ink typewriter ribbon impregnated with oleic acid was placed in the typewriter. Oleic acid served as a conditioner. A message was conventionally typed on the conversion sheet utilizing the oleic acid impregnated typewriter ribbon. The ink from the typewriter ribbon indicated whether adequate coverage was provided and made the type message visible.

When the message was concluded, the conversion sheet was removed from the typewriter and placed in a flat-bed heater, the surface temperature of which was about 175°, for 1 minute, to penetrate the coating in the typewritten image areas and to facilitate the commingling of the oleic acid with the underlying spatially and dimensionally corresponding coating areas. The conversion sheet was then removed from the heater.

The image areas were then separated and removed from the adjoining contiguous portions of the coating and from the base sheet by clearing in the manner described in Example 10.

The resulting reproducible image consisted of clear, sharp light-transmitting typewritten image areas corresponding to the initial subject type which defined the typed message, against a background of the contiguous orange-colored coating portions. That reproducible image or negative was comparable in character to that obtained in Example 1 and was adapted for use in preparing a lithographic printing plate in the manner described in Example 1.

EXAMPLE 19

In a manner similar to Example 18 a message was typed using as the conditioner palmitic acid. The carbon ink ribbon impregnated with palmitic acid provided blackened typewritten image portions incorporating the conditioner when typed upon the conversion sheet.

When the conversion sheet was placed in a flat-bed infrared heater and exposed to infrared radiation, the infrared energy absorptive black carbon ink-palmitic acid image areas on the surface of the disruptable coating were heated to a temperature of between about 160° F. and about 250° F. at which the palmitic acid melted, and then penetrated and became commingled with the disruptable coating in areas corresponding to the delineating typewritten image portions. The infrared heater and source was the same described in Example 13. After irradiation, the corresponding areas were ready to be separated and removed from the adjoining contiguous portions of the coating and from the base sheet. At that time the conversion sheet was removed from the infrared heater, and the image areas separated and removed in the manner described in Example 10.

After clearance, the resulting reproducible image or negative was comparable to that of Example 18 and was adapted to similar uses.

EXAMPLE 20

A typewriter ribbon was impregnated with a conditioning composition comprising, by weight, 25% alpha naphthol, a conditioner; 35% of a finely divided black pigment; and 40% castor oil. With that ribbon, a message was typed directly upon smooth-surfaced white paper.

The typewritten delineated side of that subject message bearing paper, which has been heretofore referred to as an intermediate carrier sheet, was then placed in overall contact with the image receptive film of the conversion sheet of Example 1. Together they were placed in a flat-bed infrared heater in the manner and for the period described in Example 13 and irradiated with infrared energy directed against the uncoated surface of the conversion sheet. The black pigment of the typewritten delineating image portions absorbed infrared energy and caused the typewritten image portions on the white paper to become heated. As the temperature rose, alpha naphthol vaporized from the image portions and penetrated and became commingled with the conversion sheet disruptable coating in areas of the coating spatially and dimensionally corresponding to and in contact with the delineating typewritten image portions upon the white paper. When the conversion sheet was removed from the infrared heater, it was cleared in the manner described in Example 10.

The resulting reproducible image consisted of clear, sharp light-transmitting image areas corresponding to the delineating typewritten image portions of the subject paper against a background of the orange-colored coating. Because an intermediate paper sheet was used, the image was laterally reversed. The reproducible image was adapted to prepare a lithographic printing plate in the manner described in Example 1, except that negative and plate were in face-to-face contact.

Other conditioners which may be used in place of the alpha naphthol with substantially equal facility include beta naphthol and o-bromobenzoic acid. Another representative clearant which may be used in place of that illustrated in Example 20 is carbon tetrachloride.

So far illustrative processes within the purview of this invention have been described in terms of initial subjects having image areas depressed or raised. However, this invention is not so limited. A conditioner delineated plane image from which conditioner may be transferred to a disruptable coating has been described as part of at least several earlier examples. Many of the examples which follow will amplify upon such use and will explain the ramifications and possibilities inherent in such use.

Of particular merit and advantage is the fact that in accordance with the method of this invention it is possible to reproduce an artist's wash drawing, on a halftone or combination line-and-halftone negatives with hitherto unavailable speed and economy. Example 21 is illustrative of such a process and incidentally points to yet other conditioners and systems of conditioners, disruptable coatings and clearants within the contemplation of this invention.

EXAMPLE 21

An image was delineated on an art board by drawing with an artist's brush with a composition comprising, by weight, 88% water, 10% glycerol. The addition of 2% of an ultraviolet absorbing material, such as 4,4'-diamino-2,2'-disulfostilbene, will condition the art for the ultimate use in accordance with the process described in U.S. Patent 2,191,939. Glycerol is the conditioner. A black water-color pigment was mixed with that composition in the proportions necessary to provide various shades of gray in the brushed delineating image portions of the subject artwork. Several such compositions were made to give a suitable range of gray shades. Black ink lines, and type areas, without conditioner were added to the art as usual.

When the subject was finished and was dry to the touch, it was positioned in face-to-face contact with the image-receptive film coating of the conversion sheet described in Example 1 and the two were placed on a flat-bed heater, the surface temperature of which was 175° F., for 1 minute. During that time, some of the conditioner from delineating image portions of the subject artwork was vaporized and became transferred to and commingled with areas of said coating spatially and dimensionally corresponding to the juxtaposed delineated image portions. The heating in-

creased the vapor pressure of the glycerol so that substantial amounts were vaporized to the conversion sheet; it is likely also that, to a slight extent, direct liquid phase transfer occurred in part.

After heating, the conversion sheet was separated from the subject artwork, and the image areas of the coating were cleared by wiping with the clearant of and in the manner described in Example 10. Swabbing was continued until the conditioner and the commingled coating were separated from the contiguous portions of the coating and from the base sheet. The resulting reproducible image provided a mask consisting of an orange background of coating in which clear, sharp light-transmitting image areas corresponding to the initial delineating art rendered image portions appeared.

Another suitable clearant which has been used with substantially equal facility is carbon tetrachloride. And it was found that another suitable conditioner was propylene glycol when the platen temperature was 140° F. and heating continued for 1 minute.

The mask was then placed in registry with the original subject artwork and was secured thereto with a temporary tape "hinge" along one edge thereof. Alternatively hinging might have been provided when the subject and conversion sheet were first placed in face-to-face contact. The originally delineated and rendered image portions of the artwork, those conditioner delineated, were visible through cleared areas of the mask, and photographable through those cleared areas. Contrarywise, line, type, and background portions of the subject art which had not been conditioner delineated were covered by colored contiguous portions of the mask. Those colored portions of the coating, constituted to absorb actinic light, then served to mask selectively those portions of the art underlying the colored contiguous portions of the mask during a photographic exposure.

The use of such masks is well-known in the art of photoengraving to prevent photography of linework or type, adjacent to or interspersed with art rendering in grays, during a halftone exposure to record such various shades of gray in terms of correspondingly varied sizes of halftone dots. During an unscreened exposure subsequently made to record said linework or type without a screen-pattern, the conversion medium mask is removed by folding to one side on its tape hinge. During that unscreened exposure to record linework and type, and if an ultraviolet-absorbing material has been used in the artist's wash medium, the ultraviolet-absorbing gray areas of the artwork (as well as black lines and type) are self-masked (non-photographic) when that exposure is made by ultraviolet light only.

The resulting composite negative is normally referred to as a "combination line and halftone negative" inasmuch as various shades of gray in the original art rendering are reproduced by a screened halftone dot pattern, and the line or type areas are reproduced free of screen pattern, as is also the white background behind such line or type areas.

The mask described by this example was produced in less than two minutes. Conventional hand-rendered masks, using black pigment on clear plastic sheeting, normally require from five minutes to half an hour, depending on the complexity in design of the original artwork. Illustrations such as lace curtains, plaid fabrics, machinery, and the like, often require hours of painstaking handwork to produce such masks.

While a brush has been described as the instrument for creating the artwork of Example 21, other tools, such as pens, may be used to make a sketch or drawing. Thus a pen and ink sketch can be created upon an artboard with a conditioning composition including, by volume, about 90% India ink, which is infrared absorptive, and about 10% glycerol. After infrared irradiation of such a conditioner delineated sketch and a juxtaposed conversion sheet coating, the conversion sheet may be separated from the sketch and the coating may be cleared in the manner described in Example 21. From the resulting reproducible image or line negative of the sketch, photoengravings and lithographic plates may be made.

Examples 22 and 23 inclusive are patterned after Example 21. They illustrate, however, that various conversion sheets may be used in accordance with this invention. They illustrate, in some instances, yet additional conditioners and describe exemplary additional disruptable coatings and base sheets which are useful in the practice of various phases of this invention.

EXAMPLE 22

The procedures of Example 21 were followed using artist's washes including different predetermined amounts of water color pigments in a delineating conditioning composition comprising, by volume, 10% glycerol, 10% methyl pyrrolidone, the conditioners, and 80% water. That composition was used to penetrate the disruptable coating of the conversion sheet described in Example 2. When cleared, there was provided a negative or mask having clear, sharp, light-transmitting image areas corresponding to the wash drawing delineating image portions in a background of the contiguous red colored coating portions. The mask was adapted to be used in the manner described in Example 21.

The conversion sheets of Examples 3, 4, 5, 6 and 7 were processed as described in Example 22. In each case, the mask was comparable to that of Example 22 and was adapted to similar uses.

EXAMPLE 23

The procedures employed in Example 21 were here followed, using, however, a conversion sheet including a thin transparent polyester base sheet and a glossy orange coating including a film-forming orange dye, such as Acetosol Orange RLS, and Triton GR–7 which had been deposited from a solution of 20 grams of the dye and 4 grams of Triton GR–7 in 60 ml. of isopropanol and 40 ml. of ethylene glycol monoethyl ether.

When commingled with ink washes of the character described in Example 21, but including a conditioning composition, by volume, of 10% glycerol, 10% methyl pyrrolidone, and 80% water and finally cleared, the resulting negative was comparable in quality and prospective use to that obtained in Example 21.

It was also found that other dyes, such as Azosol Fast Red BE and Orasol Yellow 3R, as well as the Acetosol Orange RLS, when mixed with ingredients other than Triton GR–7, such as Nekal WS99, a powdered sodium salt of sulfonated aliphatic polyester available from General Dyestuff Corp., or sodium dioctyl sulfosuccinate, in amounts equal to about 10% by weight of the dye and deposited similarly on polyester base sheets did, in fact, form disruptable coatings which were useful in the manner described in Example 23.

To facilitate the transfer of conditioner from a conditioner delineated plane subject and to achieve certain advantages to be described, an intermediate transfer sheet may be used, as described in illustrative fashion in Example 24.

EXAMPLE 24

An artboard was delineated in predetermined image portions with an artist's brush with a composition comprising, by weight, 90% water, 8% polyethylene glycol having an average molecular weight of 200, the conditioner, and for the purpose described in Example 21, 2% of an ultraviolet light absorbent material, a suitable ultraviolet light absorbing material being 4,4'-diamino-2,2'-disulfostilbene, to which composition varying amounts of black water color pigment had been added to provide the various shades of gray as described in Example 21.

When the resulting subject artwork was dry to the touch, the artboard was positioned with the image delineated surface in contact with an intermediate con-

version sheet of cellulose acetate (about 0.005 inch thick) and the two were placed in a flat-bed heater, the surface temperature of which was about 175° for 1 minute. During that time, polyethylene glycol from the delineated image areas vaporized and was transferred to and condensed upon the intermediate carrier sheet surface in portions spatially and dimensionally corresponding to the delineated image portions of the subject artwork.

The cellulose acetate carrier sheet was promptly positioned in face-to-face contact with an image-receptive conversion sheet coating described in Example 1 and while in face-to-face contact, the two were placed in a flat-bed heater, the surface temperature of which was about 175° F., for 1 minute. During that time, some of the polyethylene glycol from the intermediate carrier sheet became vaporized and some of it migrated to and became commingled with areas of said coating spatially and dimensionally corresponding to the originally delineated image portions, thereby causing the coating to become disruptable in those areas.

The conversion sheet was then separated from the intermediate carrier sheet and cleared as described in Example 21.

Once cleared, the reproducible image or mask consisted of an orange background in which clear, sharp, light-transmitting areas corresponding to the initially delineated image portions of the artwork subject were visible. The mask was substantially identical to that produced in accordance with Example 21 except that the image was laterally reversed. Thus, when the mask was hinged to the original artwork in registry and in alignment therewith, it became possible to execute corrective and supplementary handwork on the conversion sheet directly on the coating side while the mask was in position over the clearly visible artwork which served as a guide for such supplementary work. It was not necessary, as it would have been in the case of Example 21, to lift and reverse the mask for such work.

The mask is adapted for use in the same manner described in connection with Example 21.

Other conditioners which may be used in the manner and with the results described in Example 24 include methyl pyrrolidone, glycerin and propylene glycol.

As may be appreciated, within the broader aspects of this invention a variety of manipulative variations exist. Some have been described in some detail. Others will be described, while still others will be apparent to those of ordinary skill in the art from this disclosure. Several additional illustrations of particular uses of the method of this invention are set forth in Examples 25 through 28 inclusive. Particularly are different modes of providing conditioner delineated image portions exemplified in Examples 25 to 28 and for various purposes.

Example 25

A photograph of a subject was outlined with a white watercolor paint to block out the background and extraneous areas of the photograph around the subject image. The delineating white paint composition, applied with a brush, comprised, by weight, 70% water, 10% dextrine, 0.2% Triton X–100, 15.8% titanium dioxide pigment, and 4.0% diethanolamine. The diethanolamine serves as a conditioner.

When the white paint was dry to the touch, the outlined photograph was positioned in face-to-face contact with the image-receptive disruptable coating of the conversion sheet of Example 1 and the two were placed on a flat-bed heater, the surface temperature of which was about 175° F., for 1 minute.

During that time, and while the two were kept in close contact, some of the diethanolamine was vaporized and became transferred to, and commingled with, areas of the coating spatially and dimensionally corresponding to the paint delineated and outlined portion of the photograph. In that manner the coating became disruptable in the delineated portions.

The conversion sheet was then removed from the heater and separated from the photograph. The disruptable areas were cleared from the base sheet and from the contiguous adjoining coating portions in the manner described in Example 10.

The resulting reproducible image was adapted to be used as a mask. It consisted of an orange-colored background in which were provided clear, sharp light-transmitting image areas corresponding to the white-outlined delineating image portions of the photograph.

The mask and photograph were then juxtaposed so that the whited portions of the photograph were in alignment with the corresponding clear image areas of the mask. The juxtaposed unit was then photographed and the negative became exposed only in the cleared areas of the mask, the white delineating portions of the subject. This produced a continuous unscreened black record of those whited areas on corresponding areas of the negative. The mask was then removed and an exposure of the subject image made through a halftone screen to record on the same negative a conventionally screened halftone reproduction of the grays in the subject photograph. The whited background areas were thus reproduced completely free of halftone screen pattern.

In the art of photoengraving, such a negative is known as a "highlight halftone negative." The method described by this example produced such a negative without the customarily necessary hand-opaquing of the halftone negative or hand-masking of the original subject to avoid screen pattern in the background areas. The negative produced in accordance with this example was more rapidly and cheaply obtained than negatives in which hand-opaquing or masking was utilized. It provided a sure, simple method of masking. The final negative obtained was adapted to be used in the production, in a known fashion, of photoengravings or lithographic printing plates.

Example 26

An artboard was impregnated over its entire surface area with a 10% solution of glycerol in ethanol. After the ethanol had evaporated, the artboard was inscribed in predetermined areas by drawing with an artist's brush with a polyvinylidene chloride emulsion, a suitable such emulsion being available from National Starch Products, Inc., New York, N.Y., under the trade designation "Resyn 25–3600." Various amounts of black pigment were added to the emulsion to produce the range of gray values required for the illustration rendered with this medium.

When the network had dried, the artboard with the emulsion inscribed areas was positioned in face-to-face contact with the image-receptive disruptable coating of the conversion sheet of Example 1 and the two were placed on a flat-bed heater, the surface temperature of which was 175° F., for 1 minute. During that time some of the glycerol from the treated artboard became vaporized and was transferred from the baffle delineated non-image portions of the artboard and became commingled with areas of the coating spatially and dimensionally corresponding to the background non-image portions of the subject artwork. In the emulsion inscribed areas of the artwork, glycerol transfer to the coating was prevented by the blocking or baffling effect of the glycerol-impervious layer of polyvinylidene chloride. By that means delineating image portions were transferred to the conversion sheet.

The conversion sheet was then removed from the heater, was separated from the artwork, and the conditioned portions of the coating cleared by separating and removing the conditioned portions of the coating from the base sheet and the contiguous portions of the coating in the manner and with the clearant described in Example 10.

plates are notably sensitive to inadvertent marring and are limited to the printing of only a few hundred copies, at which point the original printing surface becomes destroyed.

The method of this invention provides a completely different and greatly improved process whereby relief printing forms of type, halftone, or line subjects, as well as art copy or other originals, may be transferred into an image form which renders them useful for multiple reproduction. The method avoids photography completely in the transferring of the image, and in varying aspects is capable of providing and making either a negative or a positive spatially and dimensionally corresponding to the image of the preestablished original. In accordance with the method the image is reproducible with great fidelity, so that all parts of the subject may be transferred and reproduced without the loss of definition and clarity.

In addition to the economical advantages of reproducing such images without the use of photographic materials and processing, and in addition to the advantages of avoiding both the time required and the use of cumbersome and costly equipment, the method of this invention is usually completed in one or two minutes with a single operator. The operator need not have the same degree of skill which a graphic arts photographer must have, and in this respect certain economical advantages also inhere in the method of this invention. Thus it is possible to effect reproduction with high precision, very rapidly and relatively inexpensively, in a manner heretofore unknown and without injury to the original subject that is to be reproduced and without the necessity of acquiring any substantial amount of equipment.

Having thus described our invention, what is claimed is:

1. The method of creating an image on a preformed base sheet having a removable coating thereon by removing part of said coating comprising contacting said coating with an image-bearing means, penetrating said coating with a first material capable of rendering said coating removable by a second material, said coating not being capable of being removed by said second material in the absence of said first material to thereby distinguish between image areas of said coating corresponding spatially and dimensionally with the image on said image-bearing means and non-image areas thereof, applying said second material to both said areas of the coating to render said coating in the areas penetrated by said first material removable, and removing said coating from said areas.

2. The method of claim **1** wherein said second material is frictionally applied by a soft absorbent swab.

3. The method of claim **1** wherein the removing of said coating from said areas is effected by wiping the surface of the preformed base sheet with a relatively soft and absorptive material.

4. The method of claim **1** wherein the image on said image bearing means is raised.

5. A method of creating an image on performed base sheet having a removable coating thereon by removing part of said coating comprising, contacting said coating with an image-bearing means, said image-bearing means carrying a first material capable of rendering said coating removable by a second material, said coating not being capable of being removed by said second material in the absence of said first material, transferring said first material from said image-bearing means to areas of said coating which spatially and dimensionally correspond to the image on said image-bearing means, maintaining said contact for sufficient time to allow said first material to penetrate said areas, removing said image-bearing means, applying said second material to the said areas to render said coating in said areas removable and removing said coating from said areas.

6. The method of creating an image on a preformed base sheet having a removable coating thereon by removing part of said coating comprising, contacting said coating with an image-bearing means, said image-bearing means carrying a repellant capable of preventing the penetration of the coating by a subsequently applied first material, transferring said repellant material from said image-bearing means to areas of said coating which spatially and dimensionally correspond to the image on said image-bearing means, removing said image-bearing means, applying to said coating said first material, which material is capable of rendering said coating removable by a second material, said coating not being capable of being removed by said second material in the absence of said first material, maintaining said contact for sufficient time to allow said first material to penetrate the non-image areas of the coating, applying said second material to those areas penetrated by said first material to render said coating in said areas removable, and removing said coating from said areas.

7. The method of creating an image on a preformed base sheet having a removable coating thereon by removing part of said coating comprising, contacting said coating with an image-bearing means which carries a conditioner, penetrating said coating with a conditioner capable of rendering said coating removable by a clearant so as to define the image of said image-bearing means, said coating not being capable of being removed by said clearant in the absence of said conditioner, applying said clearant to the coating to render said coating in the areas penetrated by said conditioner removable, and removing said coating from said areas.

8. The method of claim **7** wherein said clearant is frictionally applied by a soft absorbent swab.

9. The method of claim **7** wherein said conditioner is in a relatively inactive state for penetration into the coating and said conditioner is rendered active by being heated.

10. The method of claim **7** wherein said conditioner is rendered active by the addition thereto of a material reactive therewith and by being heated.

11. The method of claim **7** wherein the conditioner is added to infrared-absorbing material and the transfer of the conditioner from the image-bearing means to the base sheet is facilitated by exposure of the image-bearing means to infrared radiation.

12. The method of claim **7** wherein said image-bearing means comprises a carrier sheet having conditioner included in a material colored to visibly contrast with said carrier sheet.

13. The method of claim **7** wherein said conditioner is carried by a typewriter ribbon.

14. The method of claim **7** wherein said conditioner is initially carried by typewriter ribbon and is transferred therefrom in image defining form to an intermediate carrier sheet which serves as said image-bearing means.

15. The method of claim **7** wherein said image-bearing means has recessed image areas in an otherwise substantially planar surface, said conditioner being carried in said recessed image areas.

16. The method of creating an image on preformed base sheet having a removable coating thereon by removing part of said coating comprising, contacting said coating with an image-bearing means, said image-bearing means carrying a conditioner capable of rendering said coating removable by a clearant, said coating not being capable of being removed by said clearant in the absence of conditioner, heating said image-bearing means to cause transfer of said conditioner from said image-bearing means to areas of said coating which spatially and dimensionally correspond to the image on said image-bearing means, maintaining said contact for sufficient time to allow said conditioner to penetrate said areas, removing said image-bearing means, applying said clearant to the said areas to render said coating in said areas removable and removing said coating from said areas.

17. The method of creating an image on a preformed base sheet having a removable coating thereon by removing part of said coating comprising, contacting said coat-

ing with an image-bearing means, said image-bearing means carrying a repellant capable of preventing the penetration of the coating by a subsequently applied conditioner, transferring said repellant material from said image-bearing means to areas of said coating which spatially and dimensionally correspond to the image on said image-bearing means, removing said image-bearing means, applying to said coating said conditioner, which conditioner is capable of rendering said coating removable by a clearant, said coating not being capable of being removed by said clearant in the absence of said conditioner, maintaining said contact for sufficient time to allow said conditioner to penetrate the non-image areas of the coating, applying said clearant to those areas penetrated by said conditioner to render said coating in said areas removable, and removing said coating from said areas.

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