# United States Patent

[11] 3,589,290

[72] Inventors Lewis E. Walkup
Columbus, Ohio;
Donald L. Miller, East Rochester, N.Y.
[21] Appl. No. 551,761
[22] Filed May 20, 1966
[45] Patented June 29, 1971
[73] Assignee Xerox Corporation
Rochester, N.Y.

[54] **RELIEF IMAGING PLATES MADE BY REPETITIVE XEROGRAPHIC PROCESSES**
**16 Claims, 2 Drawing Figs.**

[52] **U.S. Cl.** 101/426, 101/401.1, 96/1, 96/1.4, 96/1.5, 96/1.8, 117/17.5
[51] **Int. Cl.** G03g 13/22, B41m 1/00
[50] **Field of Search** 96/1, 1.4, 1.5, 35, 36.3; 117/17.5, 1.7; 101/1.3, 426, 401.1

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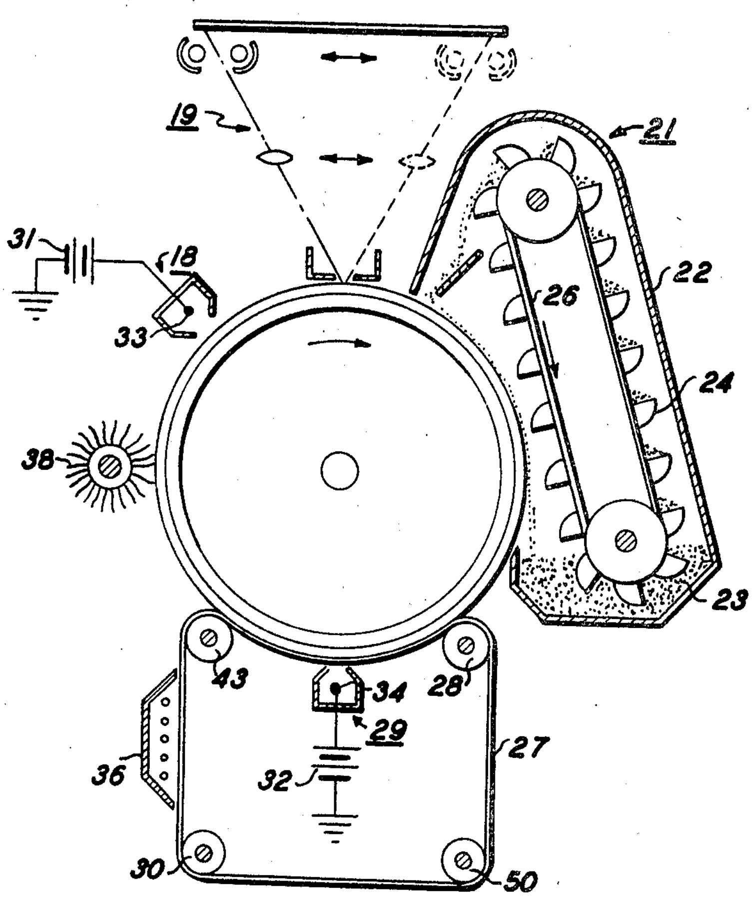
*Primary Examiner*—George F. Lesmes
*Assistant Examiner*—John C. Cooper, III
*Attorneys*—Stanley Z. Cole and James J. Ralabate

**ABSTRACT:** A method of preparing a relief printing master is disclosed whereby upon repeating in sequence and registration the steps of electrostatic imaging and development the necessary relief image may be established which may be used in a corresponding printing process.



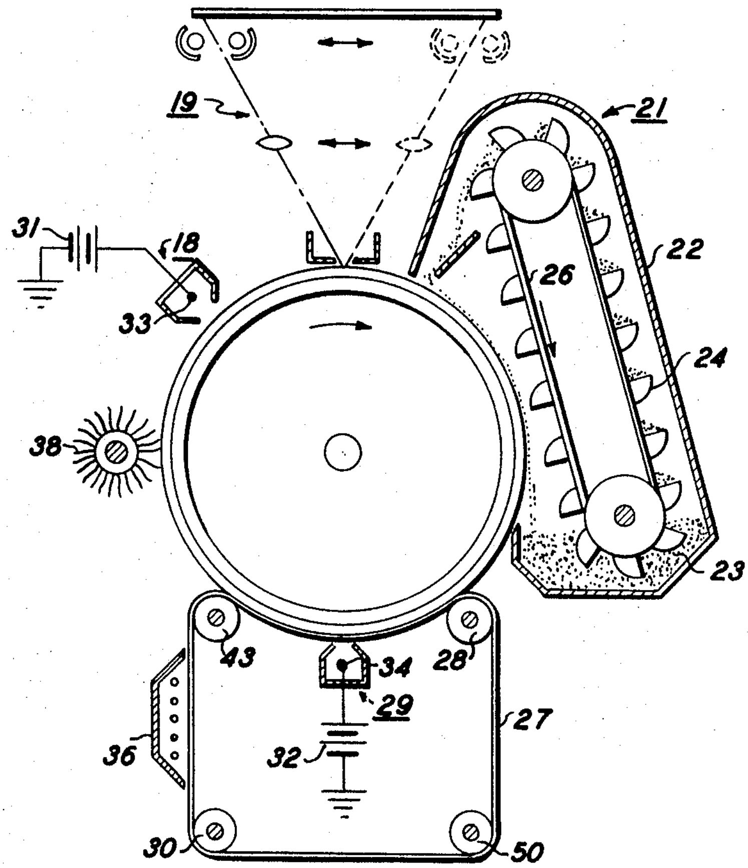



FIG. 1

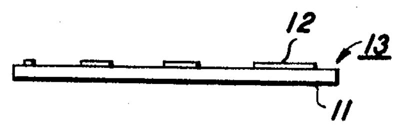



FIG. 2

INVENTOR.
LEWIS E. WALKUP
DONALD L. MILLER
BY James J. Ralabate
ATTORNEY

## RELIEF IMAGING PLATES MADE BY REPETITIVE XEROGRAPHIC PROCESSES

This invention relates to an imaging system and, more specifically, to an imaging system utilizing a relief printing plate.

Relief or typographical printing is a contact method of printing whereby the image areas of the printing plate are substantially raised above the flat reference surface of the plate. An ink roller coated with a conventional printing ink is passed across the surface of the relief printing plate. As a result of the raised relief nature of the image characters, the printing ink contacts only the image surface depositing ink in the image areas. The ink image may then be transferred directly to a copy sheet.

A number of techniques are known whereby relief printing plates may be produced for subsequent use as printing masters. For example, it has been known to prepare relief printing plates by first producing a negative image of the original subject by chemical means on, for example, a silver halide photographic film or plate, to transfer this image to a base suitable for a printing plate and to etch or otherwise prepare this base to serve as the final plate or master. More recently, a method of producing a relief printing plate utilizing the process of electrostatic imaging has been developed. This process, in general, consists of placing an electrostatic charge on a xerographic plate comprising a volatilizable photoconductive insulating layer on a metal base, selectively exposing the plate to a light source thereby producing an electrostatic latent image on the surface of the plate, developing the electrostatic latent image with a particulate electroscopic material, heating to drive off the volatile photoconductive composition in the nonimaged areas, and to fix the developed image to the metal surface, cooling and then etching the plate with acid to remove the metal not covered by the resinous image, thereby leaving the image in raised relief.

While these and other techniques have been found useful for producing relief printing masters, there are inherent disadvantages to their use. For example, when using the photgraphic film technique of preparing the printing master, it is generally necessary to employ various chemical treatments, long exposure times, and use of the photosensitive plate relatively soon after preparation. When using the xerographic approach to preparing a relief or letterpress printing plate, it is necessary to select a photoconductive material which is readily volatilized upon exposure to heat. A second disadvantage to this system is that the xerographic plate, when developed, has a toner image fixed to the surface of the plate, and is inherently nonreusable. A further disadvantage to the above techniques is that in either instance an etching process is required which is considerably involved and time consuming requiring strict control measures to prevent image degradation and produce the desired results.

It is, therefore, an object of this invention to provide a relief imaging system which will overcome the above noted disadvantages.

It is a further object of this invention to provide a novel method for the preparation of a relief printing master.

Another object of this invention is to provide a process of using a novel relief printing plate.

Still a further object of this invention is to provide an imaging system utilizing a master prepared from a xerographic plate.

Yet still a further object of this invention is to provide a method of making a relief printing plate utilizing xerography whereby the xerographic plate can be reused.

An additional object of this invention is to provide a method of making a relief printing plate which eliminates the necessity of image-degrading treatments.

The foregoing objects and others are accomplished in accordance with this invention, generally speaking, by providing a method of making a relief printing plate wherein the conventional xerographic imaging process is used for the formation of an electrostatic latent image on a xerographic plate as is more fully described in U.S. Pat. No. 2,297,691. The electrostatic latent image is developed with electroscopic marking material whereby the electrostatically charged marking particles deposit on the plate in an imagewise configuration. The powder image is then transferred to the surface of a substrate, such as polethylene, and fixed thereto by any suitable technique such as by the application of heat. If desired, a wider base for the image characters may be formed by flaring out the image during the initial stages of the process. The imaging, development, transfer and fixing steps are repeated in registration so as to build up a raised relief image of from about 5 to 10 mils in height. The resulting relief printing master can then be used to continuously make prints whereby a printing ink is applied to the surface of the master, the ink adhering to the raised imaged areas.



Alternatively, when the image support base to which the powder image is transferred is itself electrically conductive or photoconductive then the reimaging, redeveloping and fixing steps may be carried out in their entirety on the surface of the image support base in registration to produce the relief printing device. This process would eliminate the transfer step in the approach disclosed above thereby freeing the xerographic plate upon which the initial image was formed for further use. In a second alternated approach, the raised relief printing plate may be prepared directly from the xerographic plate whereby following the development of the electrostatic latent image with the electroscopic marking material, the image is fixed directly to the base of the xerographic plate and subsequent charging in the presence of light and development in registration will bring about the fabrication of the relief printing plate from the original xerographic plate. Such a procedure would be useful when it is not desired to reuse the xerographic plate such as when using a photoconductive plate such as a zinc oxide coated paper or other expendable photoconductive plates.

An additional operative embodiment of the present invention suitable for building up a raised image to obtain the relief desired involves a strip-out procedure whereby the initially formed xerographic image is contacted with a donor sheet comprising a developer material or powder such as is disclosed hereinafter, and the developer material is stripped out of the donor sheet in an imagewise configuration. The strip-out procedure may be repeated so as to build a relief image in situ or the powder image may be transferred to the surface of a substrate, such as aluminum, and fixed thereto, and the entire procedure repeated in registration until a master is produced with a relief image of the required height thereon.

Any suitable photconductive material may be used in the course of this invention. Typical inorganic photoconductor materials are sulfur, selenium, zinc sulfide, zinc oxide, zinc cadmium sulfide, zinc magnesium oxide, cadmium selenide, zinc silicate, calcium-strontium sulfide, cadmium sulfide, mercuric iodide, mercuric oxide, mercuric sulfide, indium trisulfide, gallium triselenide, arsenic disulfide, arsenic trisulfide, arsenic triselenide, antimony trisulfide, cadmium sulfoselenide and mixtures thereof. Typical organic photoconductors are triphenylamine, 2,4-bis (4,4'-diethyl-aminophenyl)-1,3,4-oxadiazol, N-isopropylcarbazol, triphenylpyrrol, 4,5-diphenylimidazolidinone, 4,5-diphenylimidazolidinethione, 4,5-bis (4'-amino-phenyl)-imidazolidinone, 1,5-dicyanonaphthalene, 1,4-dicyanonaphthalene, aminophthalodinitrile, nitrophthalidinitrile, 1,2,5,6-tetraaza-cyclooctatetraene-(2,4,6,8), 2-mercaptobenzthiazole 2phenyl-4-diphenylidene-oxazolone; 6-hydroxy-2,3-di (p-methoxy-phenyl)-benzofurane; 4-dimethylamino-benzylidene-benzhydrazide; 3-benzylidene-amino-carbazole; polyvinyl carbazole; (2-nitro-benzylidene)-p-bromo-aniline; 2,4-diphenylquinazoline; 1,2,4-triazine; 1,5-diphenyl-3-methyl-pyrazoline; 2-(4'-dimethylaminophenyl)-benzoxazole; 3-aminocarbazole; phthalocyanines and mixtures thereof.

Any suitable binder material may be incorporated, when desirable, into the photoconductive insulating layer of the xerographic plate used in the course of the present invention. Typical binder materials are similar to those disclosed in U.S. Pats. Nos. 3,121,006 and 3,121,007. The specific binder material chosen will depend upon the nature of the photoconductor pigment utilized to prepare the xerographic plate used in conjunction with the present invention. When necessary, the binder material employed with the photoconductive compound is such that it is an insulator to the extent that an electrostatic charge placed on the photoconductive layer is not conducted by the binder, at least in the absence of illumination, at a rate to prevent the formation and retention of an electrostatic latent image thereon. When the binder material is photoconductive, it is preferred that the specific resistivity of the binder be at least about $10^{13}$ ohm/cm. to satisfactorily fulfill the requirements of the resulting photoconductive insulating plate. The binder material is adhered tightly to the base of the plate and provides an efficient dispersing medium for the photoconductive pigment. Further, a binder material should be selected so as to be relatively inert when in the presence of the photoconductive compound. Typical nonphotoconductive organic binders are polystyrene, silicone resins such as DC-801, DC-804 and DC-996 commercially available from the Dow Corning Corporation, acrylic and methacrylic polyesters such as Acryloid A-10 and Acryloid B-72, polymerized ester derivatives of acrylic and alpha-acrylic acids all commercially available from Rohm and Haas Company, Lucite, polymerized butylmethacrylate commercially available from E. I. DuPont de Nemours & Co. and vinyl polymers and copolymers such as polyvinylchloride and polyvinylacetate. Typical photoconductive binders are amorphous selenium, anthracene, and sulfur. Mixtures of the above mentioned binder materials may also be employed.

Any suitable backing material for the xerographic plate may be used in the course of this invention. Generally, the preferred backing material should have an electrical resistance less than the photoconductive layer so that it will act as a ground when the electrostatically charged coating is exposed to light. Typical materials are aluminum, brass, steel, e.g., stainless and low carbon, copper, nickel, zinc, and both conductive and nonconductive paper. Other materials having electrical resistances similar to the aforementioned can also be used as a backing material to receive the photoconductive layer thereon. Other nonconductive materials such as thermoplastics may be used as the backing of the xerographic plate. When used, however, it is necessary to charge both sides of the xerographic plate according to a process as set out in U.S. Pat. No. 2,922,883.

Any suitable toner or developer may be used in the course of this invention such as those disclosed in U.S. Pats. Nos. 2,788,288, 3,079,342 and Re. 25,136. The toner is generally a resinous material which, when fixed, has the necessary properties which will retain ordinary printing inks. Typical developer powders are styrene polymers, including substituted styrene such as the Piccolastic resins commercially available from the Pennsylvania Industrial Chemical Corp., phenol formaldehyde resins, as well as other resins having similar properties. The developer powder or electroscopic marking particles may be applied directly to the latent image of the xerographic plate or admixed with a carrier such as glass beads. The toner may be applied in the form of a mixture with magnetic particles such as magnetic iron to impart a charge to the developer powder particles triboelectrically. A developer particle is so chosen that it is attracted electrostatically to the charged image and or repelled from the background area to the charged image and held thereon by electrostatic attraction. If a negative charge is applied to the photoconductive insulating material, a positive toner is used which adheres to the negatively charged image. If the charge applied is such that the latent image retains a positive charge, then a negative toner will be applied.

Liquid developers may also be used in the course of this invention. Typical developers are disclosed in U.S. Pats. Nos. 2,890,174 and 2,899,335. Generally, the developer comprises a liquid combination of mutually compatible ingredients, which when brought into contact with an electrostatic latent image, will deposit upon the surface of the image in an imagewise configuration. In its simplest form, the composition comprises a finely divided opaque powder, a high-resistance liquid and an ingredient to prevent agglomeration. Liquids which have been found suitable include such organic dielectric liquid as carbon tetrachloride, kerosene, benzene, trichloroethylene and any substituted hydrocarbon having a boiling point between 70° and 200° C. Any of the finely divided opaque solid materials known in the art such as carbon black, talcum powder, or other pigments may be used in the liquid developer. Silica aerogel, commercially available from Monsanto Chemical Company, is a deagglomeration ingredient generally used. However, any suitable ingredient known to be useful by the prior art in a liquid development system may be utilized.

Any suitable development means may be used in the course of this invention, such as cascade development, more fully described in U.S. Pat. Nos. 2,618,551 and 2,618,552, powder cloud development more fully described in U.S. Pats. Nos. 2,725,305 and 2,918,910 and magnetic brush development more fully described in U.S. Pats. Nos. 2,791,949 and 3,015,305.

Any suitable means may be used to transfer the developed image from the surface of the xerographic plate to the support base of the printing master. A particularly useful and generally preferred method of carrying out the transfer operation comprises an electrostatic transfer technique wherein the support base is contacted with the image-bearing surface and an electric charge applied to the reverse side of the support base from, for example, an adjacent ion source such as a corona discharge electrode or any similar device placed closely behind the support member. Such an ion source may be similar to the charging source employed for sensitization of the xerographic plates, and is maintained at a high electrical potential with respect to the backing of the image bearing surface, whereby corona discharge occurs resulting in the deposition on the support member of ionized particles which serve to charge the member. The transfer member is charged to a polarity opposite to that on the developed image and strong enough to overcome the potential initially applied to the surface of the xerographic plate. Adhesive pickoff is another form of image transfer that may be used. The electrostatic transfer method is preferred in the present invention in order to obtain maximum image transfer while retaining high image resolution.

The toner image may be fixed to the surface of the support base by any suitable means such as vapor fusing or treatment of the developed image with a regulated amount of heat. It is preferred to use the latter method of fixing the tonered image inasmuch as it allows for a higher degree of control for the fixing step.

Any suitable material may be used as the support base for the developed image which is transferred from the xerographic plate in order to form the relief raised printing master. Typical types of substrate are zinc, aluminum, brass, nickel, steel, aluminum coated glass, copper, polyethylene, polypropylene, polyethylene terephthalate, and ordinary bond paper. When a conductive substrate is used as the support base and the image is transferred from the xerographic plate electrostatically, it is desirable to follow the procedure described in U.S. Pat. No. 3,004,860. The selection of the particular support base for the printing master will be dictated by the specific use that is desired, such as, the use of a particular flexible substrate when flexibility is required.

The invention is illustrated in the accompanying drawings in which:

FIG. 1 is a side sectional view of an exemplary xerographic processing apparatus employed to produce the raised relief printing master of this invention;

FIG. 2 is a side view of the relief printing master of this invention.

An exemplary xerographic copying apparatus adapted to prepare the relief printing plate of this invention in the form of a cylindrical drum is shown in FIG. 1. The drum, when in operation, is generally rotated at a uniform velocity in the direction indicated by the arrow so after portions of the drum periphery pass the charging unit **18** and have been uniformly charged, they come beneath a scanning imaging mechanism **19** or other means for exposing the charged plate to the image to be reproduced. Subsequent to charging and exposure, section of the drum surface move past the developing unit generally designated **21**. This developing unit is of the cascade type which includes a powder container or cover **22** with a trough at the bottom containing a supply developing material **23**. The developing material is picked up from the bottom of the container and dumped or cascaded over the drum surface by a number of buckets **24** on an endless driven belt **26**. This development technique which, as stated above, is more fully described in U.S. Pats. Nos. 2,618,551 and 2,618,552, utilizes a two-element development mixture including finely divided, electroscopic marking particles or toner and larger carrier beads. The carrier beads serve both to deagglomerate the fine toner particles for easier feeding and charge them by virtue of the relative positions of the toner and carrier material in the triboelectric series. The carrier beads with toner particles clinging to them are cascaded over the surface of the drum. The electrostatic field of the charge pattern on the drum attracts toner particles from the carrier beads thereby developing the image. The carrier beads, along with any toner particles not used to develop the image, fall back into the bottom of container **22** and the developed image continues around until it comes into contact with the copy web **27** which is passed up against the drum surface by two idler rollers **28** and **43**, so that the web moves at the same speed as the periphery of the drum. An electrostatic transfer unit **29** is placed behind the web and spaced slightly from it between the rollers **28**. This unit is similar in nature to the plate-charging mechanism **18** in that both operate on the corona discharge principle. Both the charging device **18** and the transfer unit **29** are connected to a source of high DC potential of the same polarity identified as **31** and **32**, respectively, including a corona discharge wire **33** and **34**, respectively, surrounded by a conductive metal shield.

In the case of charging unit **18**, the voltage source **31** is preselected to be of such a magnitude that it will produce a corona discharge on the drum under almost any conditions of relative humidity and atmospheric pressure normally encountered which would tend to charge a conventional xerographic plate while above the desired voltage. This "excessively" high potential source is preset and need not be adjusted because the retained voltage on the plate is controlled by the electrical characteristics of the plate itself in such a way that any excessive current which flows through the plate during the corona discharge is drained away by the voltage-regulating characteristics of the plate. In the case of the corona discharge transfer unit **29**, a charge is deposited on the back of web **27** and this charge is of the same polarity as the charge initially deposited on the drum, by charging unit **18** and also opposite in polarity to the toner particles utilized in developing the latent image on the drum.

Following transfer of the toner image to web **27**, the web moves beneath a fixing unit **36** which serves to fuse or permanently fix the toner image to the web. In this instance, a resistance heating-type fixer is illustrated. However, here again, as mentioned above other techniques known in the art may also be utilized including, for example, the subjection of the toner image to a solvent vapor. After fixing, the web bearing the fixed developed image is recycled by way of idler rollers **30** and **50**, so as to return the fixed image to the xerographic drum where it again passes the transfer unit **29**, at which time a second image which has been developed on the surface of the xerographic drum identical to that of the first image is transferred in registration to the already fixed image. The complete cycle is continuously repeated until the raised relief image on the surface of the copy web approaches a height of from about 5 to 10 mils. When this stage in the procedure is reached, the number of cycles having been preselected be feeding the information into the system, the copy web or whatever means has been chosen as the support base for the relief printing plate, is removed from the system for subsequent printing use.

After passing the transfer station, the xerographic drum continues around and moves beneath a cleaning brush **38** which prepares it for a new cycle of operation, i.e., the reimaging of the original image. The drum is operated at a rate which will correspond to that of the copy web such that the exposed and developed image on the drum will contact the transfer web at the precise time which will enable the developed image to be transferred in registration to the surface of the image which preceded it to the recycled transfer web. The xerographic apparatus may be operated at varying speeds by setting the corona discharge in it at a high enough voltage so that the plate will be charged fully at the highest speed. Overcharging will not occur at the lower speeds because of self-regulation by the plate. Although the invention has been described in connection with corona charging, it is to be understood that this is exemplary only, and that the self-regulating plate may, in fact, be employed with any suitable charging technique. Other typical charging methods include friction charging and induction charging as described in U.S. Pats. Nos. 2,934,649 and 2,833,930, and roller charging as described in U.S. Pat. No. 2,934,650.

FIG. **2** illustrates a raised belief printing plate **10** prepared by the process of the present invention comprising a support base or backing material **11** and a raised relief image **12**. As mentioned above, the selection of the supporting substrate **11** is based upon the desired use of the relief printing plate, such as to give the plate additional strength or to provide added flexibility in situations requiring it.

To further define the specifics of the present invention, the following examples are intended to illustrate and not limit the particulars of the present system. Parts and percentages are by weight unless otherwise indicated. The examples are also intended to illustrate various preferred embodiments of the present invention.

## EXAMPLE I

A sheet of aluminum having a vitreous selenium layer about 20 microns thick is charged to about +400 volts by means of a laboratory corotron unit powered by a high-voltage power supply. The charging current is about 0.1 of a milliamp at about 7,500 volts. The surface of the selenium coated plate is selectively exposed through a transparent positive test chart to a light source consisting of a tungsten filament at about 2,800° K. for an exposure of about 1.5 to 3 foot-candle-seconds. The electrostatic latent image produced is then developed with a toner material comprising polystyrene in the presence of a carrier by cascading the toner material across the surface of the imaged xerographic plate as disclosed in U.S. Pat. No. 2,618,551. The developed electrostatic latent image is then brought into contact with an aluminum substrate and the toner image electrostatically transferred from the xerographic plate to the aluminum substrate according to the process disclosed in U.S. Pat. No. 3,004,860. The transferred image is then fused to the surface of the aluminum substrate by the application of heat and the entire cycle repeated in registration until the image on the aluminum substrate has been built up to a height of about 8 mils. About 16 transfers are required. The resulting raised relief plate is then inked with a printing ink by means of a rubber roller and the plate successively used as a printing master. Images of good optical density and resolution are obtained.

## EXAMPLE II

A sheet of commercial zinc oxide paper available from Charles Bruning Company is charged to about −400 volts by means of a laboratory corotron unit powered by a high-voltage power supply. The charging current is about 0.1 of a milliamp at about 7,500 volts. The charged xerographic plate is then selectively exposed to a light source through a transparent positive image with a 75-watt photoflood lamp. An exposure of about 20 foot-candle-seconds is required for the zinc oxide paper. The electrostatic latent image produced is then developed with a toner material comprising polystyrene in the presence of a carrier by cascading the toner composition across the surface of the imaged zinc-oxide-coated plate. The developed electrostatic latent image is subjected to a heat source thereby fixing the image to the surface of the zinc oxide paper. The charging, developing and fixing steps are repeated in register until an image of about 10 mils in height is obtained. The resulting raised relief printing plate is then contacted with a printing master. Images comparable to those of Example I are obtained, however, in this instance, the xerographic plate obviously is not reusable.

## EXAMPLE III

The procedure of Example I is repeated excepting an ordinary bond paper base is substituted for the aluminum substrate to serve as the support base for the relief image. In this instance, the electrostatic transfer is made directly by placing the paper transfer member contiguous to the image bearing surface, and an electric charge opposite to the charge on the image body deposited on the reverse side of the transfer member. Results similar to those of Example I are obtained.

## EXAMPLE IV

The process of Example I is repeated excepting a xerographic plate comprising a polyvinyl carbazole photoconductive layer about 20 microns thick doped with about 10 percent 2,4,7trinitro-9-fluorenone on an aluminum substrate is substituted for the selenium coated aluminum. The quality of the images obtained from the printing master prepared from the xerographic plate of this example are comparable to those of Example I.

## EXAMPLE V

A sheet of commercial zinc oxide paper available from Charles Bruning Company is charged to about −400 volts by means of a laboratory corotron unit powered by a high-voltage power supply. The charging current is about 0.1 of a milliamp at about 7,500 volts. The charged photoconductive plate is then selectively exposed to a light source through a transparent positive image with a 75-watt photoflood lamp. An exposure of about 20 foot-candle-seconds is required for the zinc oxide paper. The electrostatic latent image produced is then developed with a toner material comprising polystyrene in the presence of a carrier by cascading the toner composition across the surface of the imaged zinc oxide coated plate. The developed electrostatic latent image is subjected to a heat source thereby fixing the image to the surface of the zinc oxide paper. The image-bearing zinc oxide paper is then contacted with a developer donor strip-out sheet comprising polystyrene blended with a carbon black pigment. The image bearing zinc oxide photoconductive plate is then separated from the donor sheet with portions of the developer respectively retained thereon. The zinc oxide photoconductive plate is then contacted with a polyethylene terephthalate substrate and the developer material from the strip-out sheet adhesively transferred to the surface of the polyethylene terephthalate substrate. The transferred image is then fused to the surface of the substrate by the application of heat, and the entire cycle repeated in registration until the image on the polyethylene terephthalate substrate has been built up to a height of about 10 mils. The resulting relief printing plate is then inked with a printing ink by means of a rubber roller and the plate successfully used as a printing master. Images of good optical density and resolution are obtained.

Although the present examples were specific in terms of conditions and materials used, any of the above-listed typical materials may be substituted when suitable in the above examples with similar results. In addition to the steps used to prepare the relief printing plate of the present invention, other steps or modifications may be used, if desirable. For example, a reciprocating registration apparatus may be substituted for the method of registering the developed images of the present invention herein illustrated. In addition, other materials may be incorporated in the developer, ink, photoconductive material or xerographic plate which will enhance, synergize, or otherwise desirably effect the properties of these materials for their present use. For example, the spectral sensitivity of the xerographic plates used in accordance with the present invention may be modified by incorporating photosensitizing dyes therein.

Anyone skilled in the art will have other modifications occur to him based on the teaching of the present invention. These modifications are intended to be encompassed within the scope of this invention.

What I claim is:

1. A process for preparing a relief printing master consisting essentially of:

a. forming an electrostatic latent image on the surface of an electrophotographic plate;

b. developing said latent image with electroscopic marking particles to form an image pattern thereon comprising areas of image body and areas of background;

c. fixing said developed image; and

d. thereafter in at least one successive cycle reforming said electrostatic latent image on the surface of said plate, redeveloping said latent image and fixing said developed image to form said relief printing plate.

2. The process of claim 1 wherein said electrophotographic plate comprises a photoconductive layer comprising selenium.

3. The process of claim 1 wherein said electrophotographic plate comprises a photoconductive layer comprising an inorganic photoconductor selected from the group consisting of zinc oxide, zinc sulfide, zinc cadmium sulfide, cadmium selenide, cadmium sulfide and mixtures thereof.

4. The process of claim 1 wherein said electrophotographic plate comprises a photoconductive layer comprising an organic photoconductor.

5. The process of claim 4 wherein said organic photoconductor comprises polyvinylcarbazole.

6. A method for the production of a relief printing master which comprises forming an electrostatic latent image on the surface of a photoconductive insulating member, depositing electroscopic marking particles on said member in conformity with said electrostatic latent image to form an image pattern thereon comprising areas of image body and areas of background, said areas of image body comprising loose electroscopic marking particles adhering to said electrostatic latent image, transferring said image body to an image support member yielding an electrophotographic print on said image support member, fixing said transferred image to said support member and thereafter in at least one successive cycle reforming said electrostatic latent image on the surface of said photoconductive insulating member, depositing additional electroscopic marking particles on said member in conformity with said latent image to reform said image pattern thereon, transferring marking particles in registration to the surface of the preceding transferred image body and fixing said transferred image to form said relief printing master.

7. The process as defined in Claim 6 wherein said photoconductive insulating member comprises a photoconductive layer comprising selenium.

8. The process as defined in claim 6 wherein said photoconductive insulating member comprises a photoconductive layer comprising an inorganic photoconductor selected from the group consisting of zinc oxide, zinc sulfide, zinc cadmium sulfide, cadmium selenide, cadmium sulfide, and mixtures thereof.

9. The process as defined in claim 6 wherein said photoconductive insulating member comprises a photoconductive layer comprising an organic photoconductor.

10. The process as defined in claim 9 wherein said organic photoconductor comprises polyvinylcarbazole.

11. A method for producing a relief printing master which comprises forming an electrostatic latent image on the surface of a photconductive insulating member, depositing electroscopic marking particles on said member in conformity with said electrostatic latent image to form an image pattern thereon comprising areas of image body and areas of background, said areas of image body comprising loose electroscopic marking particles adhering to said electrostatic latent image, transferring said image body to an image support member yielding an electrophotographic print on said image support member, fixing said transferred image to said support member and thereafter in at least one successive cycle reforming said electrostatic latent image on the surface of said image support member, depositing additional electroscopic marking particles on said member in conformity with said latent image to reform said image pattern thereon and fixing said reformed image to form said relief printing master.

12. The process as defined in claim 11 wherein said image support member comprises an aluminum substrate.

13. A process for preparing a relief printing master from a zinc oxide xerographic plate said process comprising charging said zinc oxide plate, selectively exposing said charged plate to a light source so as to produce an electrostatic latent image thereon, depositing electroscopic marking particles comprising polystyrene on said plate in conformity with said electrostatic latent image to form an image pattern thereon, transferring said electroscopic marking particles in imagewise configuration to the surface of an aluminum image support member, heating said image support member so as to fuse said transferred particles to the surface of said image support member and thereafter in at least one successive cycle recharging said zinc oxide xerographic plate, reexposing said charged plate thereby reproducing said electrostatic latent image, depositing additional electroscopic marking particles in conformity with said reproduced electrostatic latent image, transferring said deposited particles in registration to the surface of the image-bearing aluminum substrate, and fusing said transferred electroscopic marking particles to the surface of the preceding fused image to form said relief printing master.

14. A method of making multiple copies from a relief printing master which comprises:

a. forming an electrostatic latent image on the surface of a xerographic plate;
b. developing said latent image with electroscopic marking particles;
c. fixing said marking particles in imagewise configuration;
d. in at least one successive cycle, repeating the foregoing steps in their given sequence in registration on the surface of the preceding fixed image so as to form a raised relief image on the surface of said xerographic plate;
e. contacting said raised relief image with a printing ink;
f. contacting said inked relief image with a copy sheet so as to transfer an imprint of said image thereto; and
g. repeating the inking and transfer steps until the desired copies are produced.

15. A method of making multiple copies from a xerographic image which comprises:

a. forming an electrostatic latent image on the surface of xerographic plate;
b. depositing on the surface of said plate electroscopic marking particles in conformity with said electrostatic latent image to form an image pattern thereon comprising areas of image body and areas of background;
c. transferring said electroscopic marking particles in imagewise configuration to the surface of an image support member;
d. fixing said transferred particles to said image support member;
e. in at least one successive cycle, repeating the foregoing steps in heir given sequence in registration to form a relief image on the surface of said image support member;
f. contacting said relief image with a printing ink;
g. contacting said inked relief image with a copy sheet so as to transfer an imprint of said image to said copy sheet; and,
h. repeating steps (f) and (g) until the desired copies are produced.

16. A method of making multiple copies from a relief printing master which comprises:

a. forming an electrostatic latent image on the surface of a xerographic plate;
b. depositing on the surface of said plate electroscopic marking particles in conformity with said electrostatic latent image to form an image pattern thereon comprising areas of image bodies and areas of background;
c. transferring said electroscopic marking particles in imagewise configuration to the surface of an image support member;
d. fixing said transferred particles to sad image support member;
e. in at least one successive cycle, reforming an electrostatic latent image on the surface of said image support member in conformity with the preceding fixed imaged, developing said electrostatic latent image with electroscopic marking particles, and fixing said developed image, to form a relief image on the surface of said image support member;
f. contacting said relief image with a printing ink;
g. contacting said ink relief image with a copy sheet so as to transfer an imprint of said image to said copy sheet; and,
h. repeating steps (f) and (g) until the desired copies are produced.