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METHOD OF PRODUCING IMAGES ON
RIGID SURFACES

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1

This invention relates to a method of producing an image on a printing element such as an electrophotographic plate or other rigid surface from a powder image on an electrophotographic plate, with particular reference to making a metal printing plate or cylinder for producing multiple copies of an image which has been formed on the electrophotographic plates by electrically charging a photoconducting insulating layer on the conductive backing of the plate and exposing the charged layer to produce an electrostatic image to which electroscopic powder is applied to form a powder image, and it has for its purpose to afford a practical, simple and expedient way of successfully producing a printing element which has pronounced advantages over methods heretofore proposed and of successfully transferring such a powder image on the conductive backing of the plate to any hard, non-yielding or rigid surface.

With the previously known methods of preparing printing plates or cylinders by electrophotographic methods according to which a powder image is transferred directly from an electrophotographic plate to a printing element and fused thereto, it has not been possible to produce satisfactory metal printing plates owing to irregularities in the contacting surfaces of the metal printing plate and the electrophotographic plate, because of which as well as other factors, printing plates made in this fashion have failed in many instances to function, and it is a purpose of this invention to afford a method of transferring a powder image from one metal plate to another metal or other rigid or non-yielding surface so as to enable the production of uniformly satisfactory metal printing elements, either metal electrophotographic plates and cylinders for electrically reproducing multiple copies or metal lithographic plates for multiple reproduction of copies.

Another objection to the rigid surface to rigid surface method of producing printing plates using an electroscopic powder has been that in order for the printing element to carry a reversal of the image, which is required for printing processes other than offset-printing, or where the printing element engages and prints directly on the paper, there must be a mirror projection of the image on to the electrophotographic plate or typed copy must have carbon reversal on the back, which gives a weaker image than is desired or an image wherein the lines are frayed and not clear cut and it is a further purpose of the present invention to afford a method by which the powder image, which is a mirror reversal of the subject,

2

is duplicated as a clear cut strong image on the printing plate or other support because the subject can be projected directly on to the electrophotographic plate.

Still a further purpose of the invention is to overcome defects in the printing element, resulting from irregularities in the electrophotographic or printing plates, by transferring the powder image first from the electrophotographic plate to a paper or flexible transfer sheet in contact therewith by electrically charging the transfer sheet and then transferring the powder image from the paper transfer sheet to the printing element while in contact therewith by electrically charging the transfer sheet with a charge of opposite polarity to the charge which effects transfer from the electrophotographic plate to the transfer sheet.

The invention is carried out in connection with a powder image formed on an electrophotographic plate in the manner disclosed in patent application of Lewis E. Walkup and Edward N. Wise, filed May 1, 1948, Serial No. 24,674, according to which a photoconductive insulating layer is subjected to an electrostatic charge and then exposed to produce an electrostatic image on the layer after which suitable electroscopic powder is dusted over the electrostatic image to produce the powder image, and the present invention has to do with transferring such powder image to a metal printing plate, cylinder, lithographic plate for continuously producing multiple copies, or other rigid or non-yielding support.

It has been found that satisfactory results cannot be obtained by transferring a powder image from a rigid plate directly from the electrophotographic plate to a metal printing plate, metal lithographic plate, or other rigid or non-yielding support, and in order to overcome the existing objections and to obtain a satisfactory printing element with an accurate clear lined powder image correctly placed thereon, the powder image is first transferred from the electrophotographic plate to a paper or other flexible transfer sheet, while positioned in contact with the powder image by applying an electrostatic charge to the flexible transfer sheet by means of suitable corona discharge needles or other electrical charging instrumentalities, resulting in creating an electric field around the powder image and between the powder image and the transfer sheet, causing the latter to be attracted electrically against the powder image and electrophotographic plate, the transfer sheet being held by electrical attraction firmly against the powder image while the powder particles are attracted toward and held by the

3

transfer sheet, all of which is in accordance with the procedure disclosed in pending application of Roland M. Schaffert, Serial No. 21,737, filed April 17, 1948, now abandoned.

During the operation just described, the paper or flexible sheet adheres closely to the electrophotographic plate and conforms to any irregularities that may exist in the plate so that the powder image is accurately transferred to the flexible transfer sheet in the exact relationship which it occupies on the electrophotographic plate, following which the powder image, which is now held on the flexible transfer sheet by electrostatic attraction, is transferred to the printing plate, printing cylinder, or lithographic plate in the manner now to be described, and permanently affixed thereto.

To accomplish this, the transfer sheet is then positioned with the unfused and electrically held image face down, in contact with the metal printing plate or other printing element to which the powder image is to be transferred, the surface of the printing element having first been thoroughly cleaned, and an electrostatic or other electrical charge is thereupon sprayed or otherwise imposed on or applied to the flexible transfer sheet by suitable corona discharge needles or other electrical charging mechanism, similarly to the mechanism disclosed in the aforesaid copending application Serial No. 21,737.

In order to effect movement of the powder particles forming the image away from the flexible transfer sheet and into intimate engagement with the metal or other printing element, the electric charge imposed on the flexible transfer sheet has a polarity opposite to that of the charge used in transferring the powder image from the electrophotographic plate to the transfer sheet, as a consequence of which the powder image is repelled from the flexible transfer sheet and attracted to the surface of the printing element to which it adheres. After the powder image has been entirely transferred from the flexible sheet to the metal printing plate or other printing element, the transfer sheet is removed and the powder image thereupon fused or otherwise permanently affixed to the printing element, which is then ready for making multiple copies by charging the permanent image electrostatically, dusting the same with electroscopic powder, and transferring the resultant powder image to a paper or other support, or by the usual lithographic printing process.

In cases where a lithographic plate is produced, the same procedure as described above is followed except that the electroscopic powder employed is of such a character as to be properly wetted by lithographic ink in addition to responding to the electrical forces set up in transferring the powder from the electrophotographic plate to the flexible transfer sheet and from the flexible transfer sheet to the lithographic plate. To effect this, any of the resinous electroscopic powders such as disclosed in the aforesaid copending application Serial No. 24,674 can be successfully used, and most of the known electroscopic powders employed in electrophotography are satisfactory for lithographic purposes, after the powder image is permanently affixed to the lithographic plate.

The procedure herein described has the advantage that the flexible transfer sheet, when in contact with the electrophotographic plate and subsequently with the printing plate or printing element, readily conforms to irregular-

4

ities or imperfections in the respective plates, and thus the powder image on the electrophotographic plate is accurately transferred and reproduced on the printing element bringing about a result that cannot be had where transfer is made directly from an electrophotographic plate to a metal printing plate. A further advantage lies in the fact that the image on the printing plate is a reversal of the original subject being copied, making it unnecessary to employ a mirror in photographing the copy or to type copy with a carbon at the back for contact work. Where transfer of a powder image is made directly from an electrophotographic plate to a printing element, provision must be made to provide the printing element with a reversal of the original subject, and this is obviated with the present invention.

In addition to making printing plates, the invention may be utilized for producing templates, name plates, decorating wood, metal, plastic, glass or porcelain surfaces, or other rigid, non-yielding surfaces to which an image or decoration is to be transferred, and photoengraving plates can also be made according to the invention by etching the metal plate after final transfer of the image thereon.

While the invention has been described with reference to a more or less specific procedure, it is not limited to the detailed steps herein disclosed, and this application is intended to cover such departures or modified procedures as may come within the purposes of the improvement and the scope of the following claims.

I claim:

1. The method which comprises transferring a powder image from an electrophotographic plate to a flexible transfer sheet by means of an electric charge applied by corona discharge to the transfer sheet while the latter is in contact with the plate, then transferring the powder image from said flexible transfer sheet to the rigid surface of a printing element by means of an electric charge applied by corona discharge to the transfer sheet while the latter is in contact with the printing element, and fixing the powder image on said printing element.

2. The method which comprises transferring a powder image from an electrophotographic plate to a flexible transfer sheet by means of an electric charge applied by corona discharge to the transfer sheet while the latter is in contact with the plate, then transferring the powder image from said flexible transfer sheet to a rigid surface of a printing element by means of an electric charge applied by corona discharge to the transfer sheet while the latter is in contact with the printing element, said charge having a polarity opposite to that of the first mentioned charge, and fixing the powder image on said printing element.

3. The method of transferring an electroscopic powder image from an initial supporting surface to a final supporting surface which comprises placing a transfer sheet of flexible insulating material against said initial surface carrying said powder image and applying an electrostatic charge to the back of said transfer sheet, said charge being opposite in polarity to the predominant charge on said powder, thereby to effect transfer of at least part of said powder to said transfer sheet, removing said transfer sheet with its adhering powder image from said initial surface, placing the image-bearing face thereof against said final surface, then apply-

5

ing a second electrostatic charge to the back of said transfer sheet, said second charge being opposite in polarity to the first-mentioned charge applied to said transfer sheet, thereby to effect transfer of at least part of said previously transferred powder image to said final surface, and then removing said transfer sheet from said final surface.

4. The method as claimed in claim 3 in which said initial surface is the photoconductive insulating coating of an electrophotographic plate. 10

5. The method as claimed in claim 3 in which said initial and final surfaces are rigid.

6. The method as claimed in claim 3 in which said initial surface is the photoconductive in- 15

6

ulating coating of an electrophotographic plate and said final surface is the face of a metal plate.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
420,765	Brings -----	Feb. 4, 1890
526,557	Brookman -----	Sept. 25, 1894
2,297,691	Carlson -----	Oct. 6, 1942
2,376,922	King -----	May 29, 1945
2,408,144	Huebner -----	Sept. 24, 1946
2,483,462	Huebner -----	Oct. 4, 1949