

May 12, 1959

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2,886,464

CONTACT TRANSFER FOR XEROGRAPHY

Filed Aug. 9, 1955

2 Sheets-Sheet 1

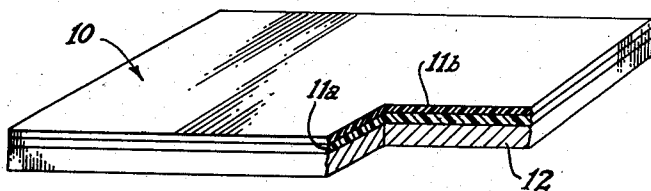


Fig. 1

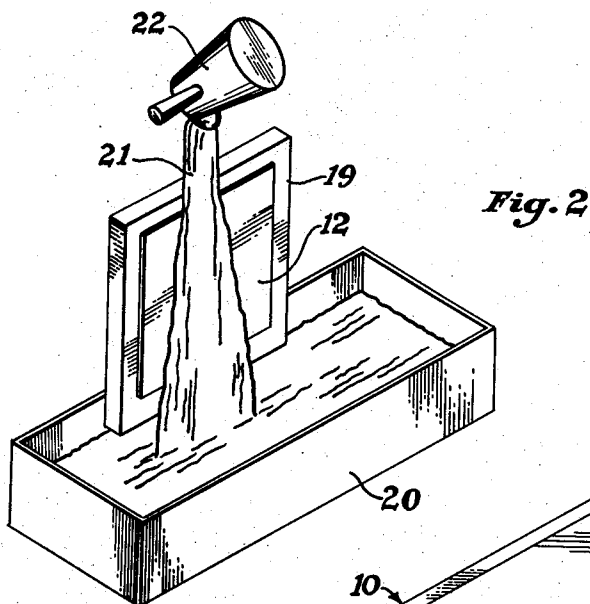


Fig. 2

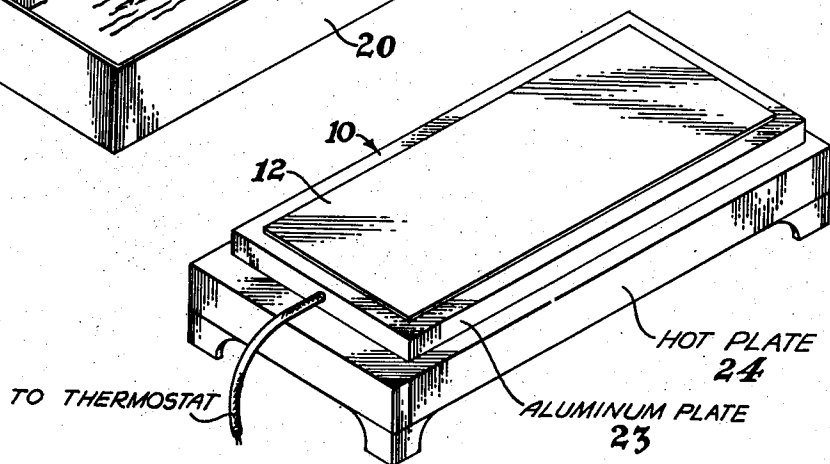


Fig. 3

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## CONTACT TRANSFER FOR XEROGRAPHY

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Application August 9, 1955, Serial No. 527,354

4 Claims. (Cl. 117—17.5)

This invention relates to xerography, and in particular to the transfer of electroscopic particles used in the developing process.

In the art of xerography as disclosed in Carlson Patent No. 2,297,691, it is usual to place an electrostatic charge on a xerographic member which is generally composed of a photoconductive layer overlying a conductive backing. This charged member is then exposed to copy to be reproduced and the electrostatic charge on the photoconductive insulating layer is selectively discharged, thereby leaving an electrostatic latent image on the photoconductive surface. This latent image may then be developed by depositing thereon electroscopic particles carrying charges opposite to those composing the electrostatic latent image. These charged particles adhere to areas of charge on the insulating layer, thereby developing an electrostatic image pattern. This image pattern may be utilized as it exists on the surface of the insulating layer, or it may be transferred to other materials. This invention deals primarily with methods, means and apparatus of transfer which improve upon past processes of transfer, and particularly with a new material for such methods, means and apparatus.

One of the usual methods of transfer is to cause particles of electroscopic material to move from the insulating surface to another surface by the use of externally applied electrostatic forces. Another is to apply adhesive to the transfer sheets and rely upon adhesion of powder to the transfer sheets for transfer of the developed image thereto. This invention is concerned with new techniques of transfer including the use of new transfer materials and contact transfer in substitution for prior art transfer procedures.

Advantages of the new techniques are the ability to bring about a better transfer and so, as an end result, a finer xerographic reproduction than if the usual electrostatic or adhesive types of transfer were used. For example, more of the developer particles are removed from the insulating surface of the xerographic plate to the transfer surface when the techniques and transfer materials of this invention are utilized as compared with the usual transfer techniques noted above. This transfer of more developer particles is of particular value in many important instances where the image is not excessively dense. Another object, therefore, of this invention is to provide new transfer materials for these means, methods and apparatus to produce finer and more accurate and faithful xerographic transfers.

Further objects and features of the invention are to provide xerographic transfer materials which are highly effective in producing faithful images of high resolution.

Further objects and features of the present invention are to provide xerographic transfer materials suitable for methods, means and apparatus of transfer of xerographic images onto a transfer surface by contact and pressure, and in which the transfer surfaces do not have conventional adhesive properties previously thought necessary for effecting efficient transfers.

As further objects and features, this invention contem-

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plates the utilization of resins overcoated onto a different resinous base coating on paper or some other backing material to provide a desirable transfer surface onto which the image on the xerographic element may be effectively transferred by contact under pressure.

The base coating according to the practice of this invention is a resin material adapted to be compatible both with the support base and the overcoating resin. Its physical properties are selected so as to assure a maximum of softness and ready deformation under stress in the layer. It is the ready deformation of this base coating of resin under the pressure exerted upon it during transfer that permits the overcoating resin to contact the developer particles of the image more uniformly over the whole area of contact between the overcoating resin and the photoconductive xerographic member at relatively low transfer forces (compared with contact transfer materials or members without such a base coating).

Resins presently found suitable for overcoating resins of the invention are polyethylenes of low molecular weight and polyamides of medium molecular weight. These resins are available commercially, one polyethylene, Bakelite DYGT, a product of the Bakelite Company of New York and one polyamide, General Mills Polyamide 94, a product of General Mills, Inc., of Minneapolis, Minnesota, having been utilized effectively in the practice of this invention.

Base coating resins found suitable are natural or synthetic rubber materials. One particularly suitable such material is a polyisobutylene which is commercially available under the name Vistanex B-100, a product of the Enjay Company, Inc., New York, New York. Vistanex B-100 has been utilized as a base coating resin both alone and also as a blend with Bakelite DYGT, a polyethylene herein named as an overcoating resin. Bakelite DYNH, a polyethylene of high molecular weight and a product of the Bakelite Company, New York, New York, also has been utilized as a base coating resin.

Where the overcoating resin is a polyethylene, such as Bakelite DYGT, a base coating of any one of the following three materials may be utilized in practice of this invention: a polyisobutylene, such as Vistanex B-100, a blend of a polyethylene, such as Bakelite DYGT, with a polyisobutylene, such as Vistanex B-100, and a polyethylene, such as Bakelite DYNH. Where the overcoating resin is a polyamide, such as General Mills Polyamide 94, the base coating resin may be a synthetic rubber, such as Vistanex polyisobutylene B-100.

In practicing the invention, base material such as papers which are coated with the resins of the types herein mentioned preferably are white papers such as baryta papers ordinarily used as base stock of photographic papers, or similar white papers that will receive and retain a coating of the resins mentioned. An example of such similar white papers is a high quality printing paper (regular printing, not photographic printing) which has a smooth, glossy finish and which generally is a clay coating with a casein binder. Such paper is known commercially as Kromekote paper, a product of The Champion Paper and Fibre Company, Hamilton, Ohio.

The transfer members used for practicing the invention are prepared by coating one of the papers mentioned with the base or undercoating resin and subsequently with the overcoating thermoplastic resins of the character mentioned and thereafter effecting contact transfer to such transfer members by use of controlled amounts of pressure. A characteristic feature of the transfer members is that adhesion, as such, is not a characteristic relied upon for effecting transfer to such members.

Other objects and features of the invention will become apparent from the following specification and the accompanying drawings, wherein:

Fig. 1 shows an isometric view of a transfer member; Fig. 2 and Fig. 3 are diagrammatic views of means and apparatus of successive steps in preparing the transfer member;

Fig. 4 is a diagrammatic view showing one means and method for the transfer of a developed image pattern to a transfer member; and

Fig. 5 is a diagrammatic view of one means and method for fixing a transferred image on the transfer member.

Referring to the drawings, in Fig. 1, a transfer member, generally designated as 10, is shown. The transfer member 10 is generally composed of a two layered thermoplastic resin coating 11a and 11b on a base material 12. The base coating 11a generally is one of the resins hereinbefore mentioned, such as a natural rubber or synthetic rubber material, a polyethylene material or the like. It is characterized by sponginess or compressibility (ease of deformation under light or moderate pressure) to cause the composite member to be more readily adapted to receive image material and is compatible with the overcoating 11b. Generally, the coating 11b is one of the thermoplastic resins mentioned, or a combination of such resins that has low melt viscosity, which property is desirable and necessary only to permit the heat fixing of a transferred image in the coating and which coating has very little, if any, tackiness at ordinary room temperatures (60°–80° F.). In addition, these resins generally have melting points between 150° F. and 300° F., or at least below the decomposition temperature of the base material 12 used. Included in the group of thermoplastic resins meeting these requirements are polyethylenes, polyamides, polystyrenes and other resins of the kind hereinabove specifically mentioned. Also included are other thermoplastic resins having characteristics meeting the foregoing requirements.

Any material capable of being coated with a resin of the character described is a suitable base material 12. This includes (but is in no way limited to) paper, film, glass, cloth, synthetic materials, and the like. A preferred type of base material 12 is white paper such as baryta coated paper similar to the base stock of photographic papers. Included are 5.5 mil, 3.5 mil, and other baryta coated papers of intermediate thicknesses. In practice, the preferred paper is 5.5 mil baryta coated paper which is whiter and less apt to wrinkle during transfer than other papers. Furthermore, the baryta surface of this paper is very smooth and apparently prevents bubbling of the resin of the coating 11 that may be encountered when other papers are used.

One arrangement for preparing a transfer member 10 is illustrated diagrammatically in Figs. 2 and 3. Therein a sheet 12 of base material is stretched taut by fastening its corners to a frame 19 positioned vertically over a shallow pan, tray or container 20. A liquid solution 21 of the resin in appropriate solvent is poured from a container 22 onto the vertical sheet 12 and allowed to flow down its surface. The excess or runoff liquid is collected in the pan 20 for re-use. It is preferable when applying the solution 21 to effect an even number of coatings by pouring the solution over sheet 12 alternately from its opposite ends. The frame 19 is inverted after each pouring. This procedure produces more uniform thickness of the coatings as compared with a single pouring of the solution.

The coated sheet is then dried. For example it may be deposited on a plate 23 heated by an appropriate heating device 24 to a controlled temperature ranging from approximately 60° C. to 80° C. to evaporate the solvent in the coating on sheet 12. In the alternative, radiant heat may be directed against sheet 12 to evaporate the solvent. Next, the base-coated sheet is similarly coated with the overcoating resin. The resulting product is the transfer member 10 of Fig. 1 in which the resin coatings

11a and 11b are smooth and uniform and range in thickness from about 1/4 mil to 1 mil, or any other desired thickness depending upon the number of pourings and the concentration of the solution used.

Other methods of applying the resin coatings to the sheet 12 of base material may be utilized. A conventionally known extrusion lamination process commonly utilized commercially for applying coating to base sheet material may be utilized in preparing the transfer member 10. The methods of transfer member preparation described herein are merely exemplary and are not to be construed as being included by way of limitation.

A transfer member 10 provided as hereinabove described or in other ways may have developed xerographic image patterns of a xerographic plate or element transferred to it in a manner now to be described.

A developed xerographic image is composed of many small particles which remain in position due to electrostatic forces. Often they are located on the original xerographic plate element. However, they may be on another surface, as for example, one to which they have been transferred through the use of electrostatics. Either while on an original plate or on such a surface where they are held in place due to electrostatic forces, they may be transferred to a thermoplastic resin coated transfer member 10 of this invention.

To effect such transfer, the member 10 is placed with its resin coating 11 including both coating 11a and coating 11b against the developed xerographic image 25 carried on an image bearing surface 26 of for example a xerographic plate 27, as is shown in Fig. 4. These assembled components are deposited on a transfer table 28 and the surface 26 and the transfer member 10, while in contact are firmly pressed together between pressure and driven rolls 29 and 30 to cause the image body 25 to be pressed on and attached to the coating 11 of the transfer member 10. The amount of pressure used at the rolls will depend on many factors as, for example, the height of the raised image 25, the thickness of the coating 11 and of the base material 12 and the like.

One means of exerting the pressure is shown in Fig. 4. The pressure roll shaft 31 is supported by a lever arm 32 which is fulcrumed at 33 from a support member 34 carried by the base 28. Selected weights 35 of determined amounts are suspended from the lever arm 32 to exert pressure on roll 29 toward roll 30 in an amount sufficient to press the raised image 25 onto the resin surface 11 of the transfer member 10 when the latter and the xerographic plate 27 pass between rolls 29 and 30. The pressure exerted by roll 29 may be varied by changing the number and size of the suspended weights 35. Other means for exerting and varying the pressure may be employed. The rolls 29 and 30 may be composed of many substances, for example, steel.

Pressure also may be applied by manually rolling a rubber covered roller across the assembly of the transfer member and the image carrying surface lying on a flat table. However, in such event great care must be exercised to apply uniform pressure during rolling because uneven pressures may bring about uneven transfers of the xerographic image pattern 25 to the transfer sheet and thus poor reproduction of the original image. In general, a mechanized application of pressure is preferable because of the uniformity of pressure that can be exerted. After pressure has been applied as described, the transfer member 10 is removed from contact with the surface 26 and will carry on its resin layer 11 the image pattern 25. At this point transfer is complete.

The transfer member 10 may then be subjected to further treatment to permanently fix the image 25 thereon. For example, the transfer member 10 bearing the image 25 on its resin coating 11 may have the transferred image 25 heat fixed to it as by heating the member 10 until the resin coating melts and absorbs all the powder of the transferred image 25. The heating is followed by cool-

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ing. This is accomplished easily as illustrated in Fig. 5 by drawing the uncoated face of the base material 12 over a curved metal surface 40 heated above the melting point of the thermoplastic resin in the coating 11. The time required to fix the image 25 by such conduction heating is only a few seconds. Higher temperatures on a larger surface area 40 will decrease fixing time. With relatively thick resin coatings 11 on thick base material, more fixing time is required.

On the basis of present experimental results, the following conditions are believed to be most useful for the preparation and the utilization for the transfer of images of transfer members, often referred to as double coated or two-layer construction transfer members, which in general consist of a paper base material on which is coated a base layer or coating of one of the resins or resinous materials herein named as suitable base coating resins, over which is coated a layer of one of the resins or resinous materials herein named as overcoating resins:

**Base paper 12:**

|                                                      |                                                 |
|------------------------------------------------------|-------------------------------------------------|
| Type                                                 | Baryta-coated.                                  |
| Thickness                                            | 3.5 to 5.5 mils.                                |
| Method of applying both coatings 11a and 11b         | Solution.                                       |
| Thickness of base coating 11a to base paper 12       | 0.10 to 1.0 mil.                                |
| Thickness of overcoating 11b                         | 0.10 to 1.0 mil.                                |
| Transfer roll 29:                                    | Stainless steel.                                |
| Material                                             | 6 inches.                                       |
| Length                                               | 0.75 inch.                                      |
| Diameter                                             | 60 to 300 pounds.                               |
| Force applied                                        | 10 to 50 pounds per linear inch of roll length. |
| Equivalent pressure                                  |                                                 |
| Velocity of transfer member 10 during image transfer | 2 to 4 inches per second.                       |

*Examples*

**Example I.**—Baryta coated papers ranging in thickness from 3.5 mils to 5.5 mils were precoated with polyisobutylene as follows:

A polyisobutylene composition available as herein described under the name of Vistanex B-100 was dissolved in trichloroethylene to form a solution containing about 3 to 10 percent by weight of the polyisobutylene. The polyisobutylene is slowly and difficultly soluble and preparation in relatively concentrated solution is time-consuming. A coating of this material was placed on the baryta paper by the solution method of Fig. 2 (and dried by removing the solvent by means of a radiant heat source) to produce relatively uniform polyisobutylene coatings ranging from ¼ to 3 mils in thickness. Because of the slow rate of solution of the polyisobutylene in the solvent, the thus coated paper was adapted to receive a second (coating) or overcoating (of a different resinous material) by solution methods without substantial removal or distortion of the polyisobutylene undercoating.

The thus precoated papers were coated again by the solution method of Fig. 2 with a 3 to 10 percent by weight solution of low molecular weight (7000) polyethylene (Bakelite DYG) in trichloroethylene, the solution being heated above 60° C. to produce coated paper sheets with smooth, uniform overcoatings of polyethylene about ½ mil to 1 mil thick. The polyethylene solution poured over the sheets of paper gelled almost immediately as it cooled below 60° C. The coated sheets then were heated in the apparatus of Fig. 3 at a temperature of from 60° C. to 80° C. (or by means of radiant heat source) to evaporate the solvent of the coatings.

Transfer members 10 produced as just described were then utilized to transfer an image 25 thereto by the method and means of Fig. 4. During transfer pressures on the roll 29 of approximately 10 to 100 pounds per linear inch of transfer roll length were employed. Velocity of the assembly during transfer was from 2 to 4 inches per second. Subsequently, the transferred image

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was fixed to the transfer members 10 by heating the curved surface 40 to approximately 250° to 700° F. and drawing the transfer members 10 across said surface at a rate of from 2 to 6 inches per second. Thus, the fixation time (of for example, a 4 inch by 4 inch image area) is of the order of a few seconds or less. Higher temperatures or larger surface area of contact between the transfer member and heating surface will decrease fixing time, while relatively thicker coatings on thicker paper require more fixing time. This is referred to as heat fixing of images by conduction.

Images transferred to transfer members 10 also were heat fixed conveniently by radiation, wherein a transfer member bearing an image was moved across and a few inches away from the opening of the radiant heat source at a rate of from 1 to 3 inches per second.

Baryta papers provided with relatively thin polyethylene overcoatings, i.e., less than 1 mil thick, were found to produce very desirable results.

There is, however, a lower limit to the useful thickness of polyethylene coatings when utilized as overcoatings on a base coating of polyisobutylene Vistanex B-100 alone on a base material of paper. When the polyethylene overcoating is made too thin, there is insufficient material to cover the inherently adhesive surface of the polyisobutylene base coating, so that in such a case a very thin polyethylene overcoating may begin to show some tackiness, in the sense of adhesive power. The use of such a transfer member then no longer involves the principle and method of contact transfer to transfer an image, but would involve the method of adhesive transfer and with it the disadvantages inherent with all adhesive transfer materials.

In one instance a baryta coated base paper 3.5 mils thick base coated with 1.0 mil of Vistanex B-100 polyisobutylene with 0.2 mil of 7000 molecular weight polyethylene (Bakelite DYG) produced satisfactory transfer with a pressure of 25 pounds per linear inch applied to a bare steel roll ⅝ of an inch in diameter and 6 inches in length. Velocity during transfer was about 2 inches per second. Heat fixation of the image was effected by passage of the image in front of a radiant heater at a velocity of 2 inches per second.

**Example II.**—Baryta paper 5.5 mils in thickness was first base coated to a thickness of ¼ mil with a blend of resins consisting of 90 percent by weight polyisobutylene Vistanex B-100 with 10 percent by weight polyethylene Bakelite DYG by the solution coating method of Fig. 2 followed by radiant heat drying. This precoated paper was then coated again by the solution method with polyethylene Bakelite DYG to a thickness of ¼ mil and radiant heat dried. The double coated transfer member so produced was utilized to transfer an image 25 thereto by the method and means of Fig. 4 using a bare stainless steel transfer roll 29, 1½ inches in diameter and 6 inches in length under a force of 300 pounds, which is 50 pounds pressure per linear inch of roll length. The satisfactory transfer that resulted was fixed by the radiant heat fixing method.

**Example III.**—The procedure of Example II for base coating and overcoating baryta paper 3.5 mils in thickness was repeated. In this instance, however, pure Vistanex B-100 polyisobutylene 3½ mils in thickness was used as the base coating and a ½ mil coating of General Mills Polyamide 94 was used as the overcoating resin.

A satisfactory image transfer resulted by utilizing this transfer member by the method and means of Fig. 4, wherein a bar stainless transfer roll 29, which was 6 inches in length and ⅝ inch in diameter, was utilized under a force of 150 pounds or 25 pounds per linear inch of transfer roll length. Radiant heat fixing of the image resulted in a satisfactorily fixed image with a relatively hard and glossy surface.

**Example IV.**—On the basis of other experimental

work, wherein Baryta paper was coated only with a blend of high molecular weight polyethylene and microcrystalline wax in which the polyethylene and the wax were blended in the proportions of approximately 60 percent by weight of polyethylene and 40 percent by weight of microcrystalline wax and utilized as a transfer member, it is proposed to coat a polyisobutylene base coated baryta paper with a  $\frac{1}{4}$  to a  $\frac{1}{2}$  mil coating of a blend of a high molecular weight polyethylene, such as Bakelite DYNH and a refined microcrystalline wax in the proportions of 60 percent by weight of high molecular weight polyethylene and of 40 percent by weight of refined microcrystalline wax. It is believed that a transfer member of such composition will be substantially equal in performance to transfer members prepared according to Examples I, II, and III.

Although in many respects this invention resembles transfer of the adhesive type, in actuality it differs therefrom since the transfer coating surface 11 has substantially no adhesive properties at usual room temperatures. With adhesive transfer, particles of the image pattern are retained by actual adhesion to the tacky surface. In the practice of this invention, however, the electroscopic particles of the image pattern appear to become attracted to and held on the resinous coating 11 of transfer member 10 by means of an electrostatic force of attraction possibly generated by friction or contact while under the pressure exerted during the transfer step.

It appears that the image particles are transferred in this manner in the practice of this invention rather than by the phenomenon of true adhesion.

With adhesive transfer, often the adhesive coating of a transfer member will adhere to the developed image bearing surface rather than to the base material of the transfer member and create breaks or holes in the final product. With transfers of the instant invention, this problem does not exist. Where adhesive transfer surfaces are utilized, they frequently flake off the photoconductive layers of xerographic elements during transfer steps by adhesion. This problem likewise does not occur with the practice of the instant invention where contact transfer is effected.

This invention is of particular value where high quality reproductions are required, for example, in continuous tone xerography. The presently preferred developed continuous tone image often may be of low density and the transfer of such an image must be substantially complete. To produce a valuable final product in the case of continuous tone images, substantially all of the developed image must be transferred, and the particles making up the image must remain in their proper positions on the transfer material. This is accomplished by practicing the instant invention.

It is apparent that in practicing the instant invention a preferred transfer member embodies a paper base material provided with a coating of a resin or resinous material that is readily deformable, which deformation is preferred to be elastic rather than plastic, under the pressure exerted upon it during image transfer, said coating referred to as the base coating itself is provided with an overcoating, of a resin or resinous material of different composition than the base coating, said overcoating having very little if any tackiness or adhesive power at usual room temperatures of from 60° to 80° F., said base coating and overcoating materials having properties to permit ready coating of them upon paper to thicknesses ranging from a fractional mil to several mils.

The resinous coatings of the transfer member may be applied to transparent or translucent base materials instead of paper where badges or similar articles are to be manufactured. Where the base material is one of the papers herein mentioned, whiteness, brightness and smoothness of the product are noteworthy attributes.

The image transferred according to the practices of this invention, namely by the method of contact transfer and

utilizing double coated transfer materials can be rendered (i.e. caused to become) a permanent image by various means of fixing. A preferred method or means is that of heat fixing. Thus by utilizing thermoplastic resinous materials as overcoating materials in the preparation of double coated transfer members, images transferred to the surface of such thermoplastic overcoatings may be fixed permanently, rapidly and conveniently by heating such an overcoating to and usually slightly above its fusing temperature whereupon the image particles are absorbed by the overcoating and are held rigidly upon cooling and solidification of the overcoating. Thermoplastic resinous materials, such as those resinous materials described herein as satisfactory in practicing of this invention generally have fusing temperatures within the range of 150° F. to 300° F. or other temperatures at least below the decomposition temperature of the base material used, for example paper. The image so fixed by heat is a permanent image. An overcoating of a thermoplastic resin material herein described provides a reasonably hard glossy transparent and permanently finished surface in which the powder particles are embedded and fixed. The surface is relatively hard as compared with latex or gelatin or tacky compound surfaces and is long lasting and wear resistant. While there is no apparent necessity for overcoating the transferred image with spray fixatives or other protective coverings as means of fixing the image, such means of fixing and others may be utilized if they may be found advantageous in satisfying the end use requirements of present and proposed applications of xerography, that may involve the transfer and fixing of images, especially continuous tone images. As an example of still other means of fixing that may be utilized, an image, transferred to the surface of a double coated transfer member provided with an overcoating of such a resinous material as General Mills Polyamide 94, has been found to be fixed satisfactorily in a matter of seconds at the usual room temperatures by subjecting the image bearing surface of such a transfer member to an atmosphere of saturated solvent vapor.

While specific materials, namely thermoplastic resins for use as base and overcoating resins, have been described herein as useful in practicing of this invention, there is no intention, therefore, of limitation to the class of resins generally referred to as thermoplastic resins.

The thermoplastic property of a resin is of interest and advantage only in respect to offering a convenient and rapid method of fixing permanently an image of electroscopic particles transferred to the resinous surface of a material, herein referred to as a transfer member, by heating the resinous surface to its fusing temperature, whereupon the image particles are absorbed by the resinous coating and are fixed in place permanently upon cooling and solidification of the resinous coating.

Whether or not a resinous component of a transfer member is thermoplastic, is not to be construed as affecting the practice of this invention in respect to either the preparation of transfer members, consisting of a base coating of a resin on a support material which coating is then overcoated with a different resin, or the utilization of such transfer members in receiving images of electroscopic particles by the method herein described as contact transfer.

In preparing and utilizing transfer members, the use of resins, which may be rendered less thermoplastic or even completely nonthermoplastic by means of various agents, such as heat, light, chemicals and nuclear radiation, either before or after the transfer of electroscopic image particles to the surface of such a transfer member, is considered possible and is contemplated.

Thus the utilization of thermoplastic resinous materials as overcoating materials in the construction or preparation of double coated transfer members is advantageous in the practice of this invention in so far as such materials have the noteworthy attribute of acting both as an image

transfer medium and as an image fixing medium without the need for any auxiliary materials by application of merely two forms of energy, namely pressure energy for image transfer and heat energy for image fixation.

While specific methods, means and examples of materials useful in practicing the invention have been described herein, variations in any or all thereof within the scope of the appended claims are possible and are contemplated. There is no intention, therefore, of limitation to the exact details of disclosure as herein made.

What is claimed is:

1. In the xerographic process comprising placing an electrostatic charge on the surface of a photoconductive insulating layer, exposing the electrically charged photoconductive insulating layer to a pattern of light and shadow to be reproduced to create thereon an electrostatic image corresponding to the pattern of light and shadow, contacting the electrostatic image with electrostatically charged powder particles to create on the photoconductive insulating layer a deposit of powder particles corresponding exactly to the electrostatic image and transferring the powder image in image configuration to a transfer member, the improvement comprising affecting transfer of the powder image by providing a transfer member comprising a base sheet coated with an elastically deformable resinous interlayer overcoated with a resinous material substantially non-tacky at room temperature selected from the group consisting of polyethylene and polyethylene blended with wax, contacting the resin coating of said transfer member with the powder image on a photoconductive insulating layer and pressing said coating and image together to thereby transfer said powder image to said resin coating at substantially room temperature and removing said base member with its coating from contact with said photoconductive layer whereby transfer of the powder particles in image configuration is achieved without the necessity of depositing electrostatic charges on said transfer member, the pressure producing said transfer being substantially less than that needed when the transfer member omits said interlayer.

2. In the xerographic process comprising placing an electrostatic charge on the surface of a photoconductive insulating layer, exposing the electrically charged photoconductive insulating layer to a pattern of light and shadow to be reproduced to create thereon an electrostatic image corresponding to the pattern of light and shadow, contacting the electrostatic image with electrostatically charged powder particles to create on the photoconductive insulating layer a deposit of powder particles corresponding exactly to the electrostatic image and transferring the powder image in image configuration to a transfer member, the improvement comprising affecting transfer of the powder image by providing a transfer member comprising a base sheet coated with an elastically deformable rubber interlayer overcoated with a resinous material substantially non-tacky at room temperature selected from the group consisting of polyethylene and polyethylene blended with the microcrystalline wax, contacting the resin coating of said transfer member with the powder image on a photoconductive insulating layer and pressing said coating and image together to thereby transfer said powder image to said resin coating at substantially room temperature and removing said base member with its coating from contact with said photoconductive layer whereby transfer of the powder particles in image configuration is achieved without the necessity of depositing electrostatic charges on said transfer member, the pressure producing said transfer being substantially less than that needed when the transfer member omits said interlayer.

3. In the xerographic process comprising placing an electrostatic charge on the surface of a photoconductive insulating layer, exposing the electrically charged photoconductive insulating layer to a pattern of light and

shadow to be reproduced to create thereon an electrostatic image corresponding to the pattern of light and shadow, contacting the electrostatic image with electrostatically charged powder particles to create on the photoconductive insulating layer a deposit of powder particles corresponding exactly to the electrostatic image and transferring the powder image in image configuration to a transfer member, the improvement comprising affecting transfer of the powder image by providing a transfer member comprising a base sheet coated with an elastically deformable polyisobutylene interlayer selected from the group consisting of polyisobutylene of relatively high molecular weight and a blend of a polyisobutylene of relatively high molecular weight with a polyethylene of a relatively low molecular weight, said interlayer being overcoated with a resinous material substantially non-tacky at room temperature selected from the group consisting of polyethylene and polyethylene blended with microcrystalline wax, contacting the resin coating of said transfer member with the powder image on a photoconductive insulating layer and pressing said coating and image together to thereby transfer said powder image to said resin coating at substantially room temperature and removing said base member with its coating from contact with said photoconductive layer whereby transfer of the powder particles in image configuration is achieved without the necessity of depositing electrostatic charges on said transfer member, the pressure producing said transfer being substantially less than that needed when the transfer member omits said interlayer.

4. In the xerographic process comprising placing an electrostatic charge on the surface of a photoconductive insulating layer, exposing the electrically charged photoconductive insulating layer to a pattern of light and shadow to be reproduced to create thereon an electrostatic image corresponding to the pattern of light and shadow, contacting the electrostatic image with electrostatically charged powder particles to create on the photoconductive insulating layer a deposit of powder particles corresponding exactly to the electrostatic image and transferring the powder image in image configuration to a transfer member, the improvement comprising affecting transfer of the powder image by providing a transfer member comprising a base sheet of baryta paper ranging in thickness from 3.5 to 5.5 mils, coating said base sheet with an elastically deformable polyisobutylene interlayer ranging in thickness from about 0.10 to about 1.0 mil selected from the group consisting of polyisobutylene of relatively high molecular weight and a blend of a polyisobutylene of relatively high molecular weight with a polyethylene of a relatively low molecular weight, said interlayer being overcoated with a resinous material ranging in thickness from about 0.10 to 1.0 mil, said resinous material being substantially non-tacky at room temperature and selected from the group consisting of polyethylene and polyethylene blended with microcrystalline wax, contacting the resin coating of said transfer member with the powder image on a photoconductive insulating layer and pressing said coating and image together to thereby transfer said powder image to said resin coating at substantially room temperature and removing said base member with its coating from contact with said photoconductive layer whereby transfer of the powder particles in image configuration is achieved without the necessity of depositing electrostatic charges on said transfer member, the pressure producing said transfer being substantially less than that needed when the transfer member omits said interlayer.

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UNITED STATES PATENT OFFICE  
Certificate of Correction

Patent No. 2,886,464

May 12, 1959

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 56, for "valve" read —value—; column 5, lines 20 to 35, inclusive, should read as shown below instead of as in the patent:

Base paper 12:

|                                                         |                                                    |
|---------------------------------------------------------|----------------------------------------------------|
| Type                                                    | Baryta-coated.                                     |
| Thickness                                               | 3.5 to 5.5 mils.                                   |
| Method of applying both coatings 11a and 11b            | Solution.                                          |
| Thickness of base coating 11a to base paper 12          | 0.10 to 1.0 mil.                                   |
| Thickness of overcoating 11b                            | 0.10 to 1.0 mil.                                   |
| Transfer roll 29:                                       |                                                    |
| Material                                                | Stainless steel.                                   |
| Length                                                  | 6 inches.                                          |
| Diameter                                                | 0.75 inch.                                         |
| Force applied                                           | 60 to 300 pounds.                                  |
| Equivalent pressure                                     | 10 to 50 pounds per linear<br>inch of roll length. |
| Velocity of transfer member 10 during image<br>transfer | 2 to 4 inches per second.                          |

Signed and sealed this 29th day of March 1960.

[SEAL]

Attest:

KARL H. AXLINE,  
Attesting Officer.

ROBERT C. WATSON,  
Commissioner of Patents.