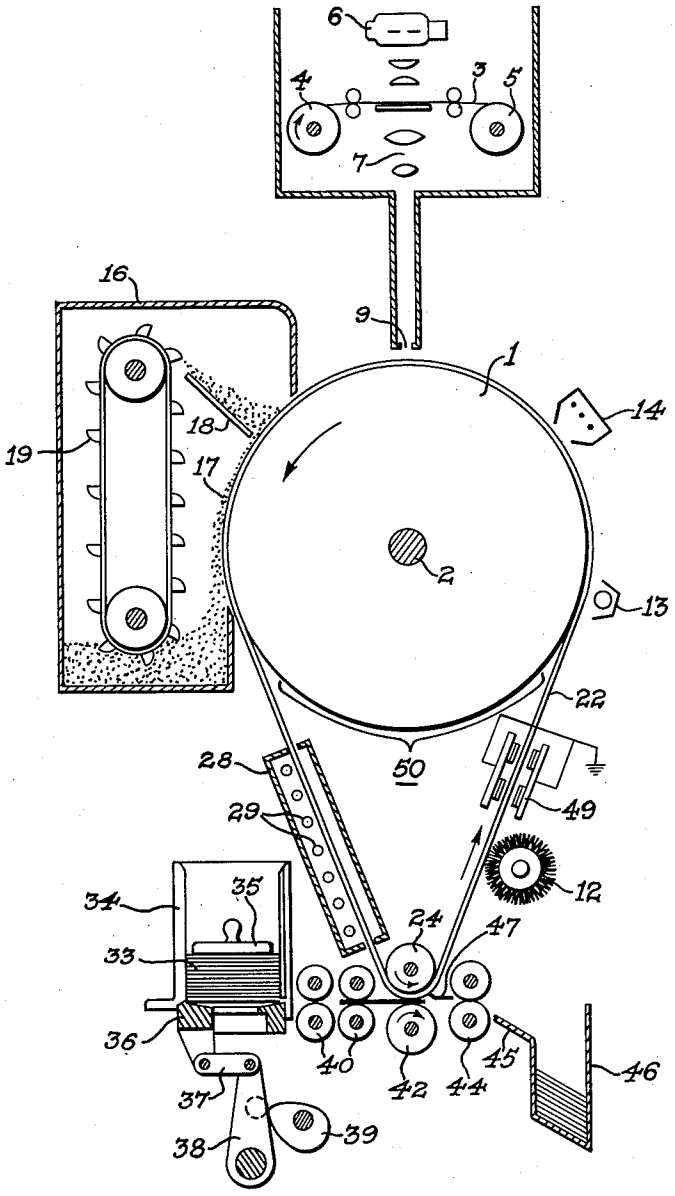
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METHOD AND APPARATUS FOR TRANSFERRING AND FIXING XEROGRAPHIC IMAGES

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METHOD AND APPARATUS FOR TRANSFERRING AND FIXING XEROGRAPHIC IMAGES

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This invention relates to the field of xerography and, particularly, to an improved method of and apparatus for transferring and fixing a xerographic powder image on a support.

More specifically, the invention relates to an improved method and apparatus for transferring and fixing xerographic powder images on support surfaces of a type which may be injured by the use of conventional xerographic image fixing techniques, or in applications in which conventional fixing techniques cannot conveniently be employed. For example, the conventional heat fusing or vapor solvent fixing techniques that are widely employed in xerographic installations cannot always be employed in applications in which there is a critical requirement to maintain a predetermined moisture content or the dimensional stability of the support material.

Such conditions occur, for example, in the formation of xerographic images on perforated record cards of the type used in punched card tabulating systems. In addition, when xerographic powder images are to be formed on metal layers such as grained zinc or aluminum lithographic plates or electroplated metal layers on plastic insulators which are used as intermediates in printed circuit manufacture, it is found that the metal layers not only are frequently damaged by heat fusion of the xerographic powder image but, also, are not well adapted to the electrostatic transfer of the xerographic powder image thereto because of their conductivity or rigidity or both. In order to apply xerographic powder images to surfaces of the type mentioned, it has been found that the powder image may be formed on a smooth-surfaced intermediate support material, tackified while in contact with the intermediate support and, while the powder image is in tackified condition, pressed against the final support surface so that the tackified image is forced into the interstices thereof and forms a firm bond therewith, whereby the powder image remains adhered to the final support surface when the final support surface is separated from the intermediate support material.

In the process of xerography, for example, as disclosed in Carlson Patent 2,297,691, issued October 6, 1952, a xerographic plate comprising a photoconductive insulating material on a conductive backing is given a uniform electric charge over its surface and is then exposed to the subject matter to be reproduced, usually by conventional projection techniques. This exposure discharges the plate areas in accordance with the light intensity which reaches them, and thereby creates an electrostatic latent image on or in the plate coating. Development of the image is effected with a finely-divided material such as an electroscopic powder which is brought into contact with the photoconductive insulating material and is held thereon electrostatically in a pattern corresponding to the electrostatic latent image. Thereafter, the developed xerographic image is transferred to a support material to which it may be fixed by any suitable means.

The developing material employed may be of any convenient type suitable to the requirements of a particular application. For example, in line copy applications, the developing material may be of the type disclosed in Walkup Patent 2,618,551, issued November 18, 1952, wherein a pigmented powdered resin is combined with coated glass carriers and is thereby triboelectrically charged to a polarity opposite to that of the electrostatic

latent image to be developed. Subsequently, the combined material is cascaded over the latent image whereby the resin particles are caused to adhere electrostatically to the charged portions of the image. Various other pigmented resins, usually having a polystyrene base, are available to suit specific applications. In continuous tone applications of xerography, the developing agent may also include a pigmented powdered resin but usually comprises a finely powdered carbon that is electrostatically charged and brought into surface contact with the electrostatic image on the xerographic plate. In such cases the charged carbon particles adhere to the image surfaces in differing densities depending upon the amount of charge in any given portion of the latent image.

Regardless of the type of development, the developing material particles are held to the support entirely by electrostatic attraction at this stage of the process and, thus, are subject to being smudged during handling. Therefore, whenever an electrostatic image is developed to form a xerographic powder image, and such powder image is then transferred to another support material, it is generally required that the powder image subsequently be fixed to the ultimate support material on which it is formed. The type of fixing technique that is employed depends on the requirements of any given installation. For example, the pigmented resins used for line copy and/or half-tone work may be fixed either by heat fusing or by exposing the image to an atmosphere of solvent for the particular type of resin employed. In either case, the powder particles of the image are sufficiently tackified to flow into the interstices of the support material and form a firm bond therewith. Upon cooling of the image or upon evaporation of the powder solvent, the bonded pigment forms a permanent record of the copy to be reproduced.

The term "tackified," and the several variant forms thereof used throughout the specification, is employed to define the condition of the powder particles that form the copy pattern when treated in a manner such that the individual powder particles soften and coalesce, and in which state they become sticky and readily adhere to other surfaces. Although this condition necessarily requires a flowing-together of the powder particles to effect a thorough fusion thereof, it is to be understood that the extent of such flowing is not sufficient to extend beyond the boundary of the pattern in which the particles are formed.

In the case of continuous tone work, in which a powdered carbon developing material is used, the image may be fixed to its support in any of a variety of ways. For example, the powder image may be transferred electrostatically or by mechanical pressure to an adhesive coated support that is sufficiently tacky to retain the powder, or, the image may be electrostatically transferred to a plastic coated support that is then heated sufficiently to cause the plastic coating to soften and to adhere to the powder and firmly bind it to the support on cooling, or, the image may be transferred electrostatically to a conventional paper support and then sprayed with Krylon or any other suitable lacquer which, upon drying, is effective permanently to secure the powder particles to the support.

Each of the foregoing methods of fixing xerographic images has been found to be highly suitable for many types of applications and each is in wide commercial use. However, under certain conditions, it is essential to retain dimensional stability or other physical characteristics of the support on which the xerographic image is to be formed and, also, to avoid coating such supporting material with any substance that may affect the normal utility of the support material itself.

A typical example of such a combination of conditions arises in the field of record controlled machines wherein coded perforations representing alphabetic and/or nu-

meric characters are punched in record cards and serve to control various operations of a wide variety of machines, such as accounting machines, tabulating machines, computers, etc. In this field of endeavor it has been found highly desirable to form visible xerographic images on the record cards to supplement or duplicate the perforated data indications and thereby amplify or facilitate the use of such records in their regular applications. However, it has also been found that the conventional xerographic image fixing techniques mentioned above cannot conveniently be employed under all conditions without occasionally affecting the dimensional stability of a record card. For example, the application of excessive heat or solvent vapor to fix the image can, under certain conditions, result in differential expansion or contraction of portions of the card to an extent to make it unfit for use in its normally intended operation. Similarly, the use of adhesive or platic coatings on the card could make it difficult to manipulate during card handling operations. Obviously, any change in the physical characteristics of the record cards that would affect their operability during card sensing, card feeding, or card sorting operations cannot be tolerated.

A convenient solution to such a problem is disclosed in co-pending application S.N. 515,536, filed in the name of John H. Dessauer et al. on June 14, 1955. As disclosed in this co-pending application, it is possible to utilize the difference in potential between the residual electrostatic charge remaining on the xerographic powder image after transfer and the charge remaining on the card on which it is formed, by spraying oppositely charged particles of image fixing materials in the immediate vicinity of the xerographic powder image whereby such fixing material particles are electrostatically attracted selectively to the xerographic powder image rather than to the surface of the card. In the case of line copy applications, the image fixing materials employed may be either of the liquid solvent or low melting point solid solvent type, as desired. In the former case, the charged liquid solvent particles unite with and soften the developing material resin immediately upon contact therewith and cause the resin to bond firmly to the card. In the latter case the solid solvent particles are physically coupled to the image particles by electrostatic attraction until they are subsequently heated sufficiently to liquefy the solid solvent particles, whereupon the solvent unites with the developing material resin, as above, to cause the image to be bonded to the card. In the case of continuous tone applications, the image fixing material may be any convenient type of lacquer that functions to coat the image particles and simultaneously penetrates the surface of the card, whereby, when the lacquer solvent volatilizes, the image particles remains firmly bonded to the card.

A further solution to such a problem is disclosed in co-pending application S.N. 533,244, filed in the names of John H. Dessauer et al. on September 8, 1955. In this co-pending application the difference in potential between the residual electrostatic charge remaining on the xerographic powder image after transfer and the charge remaining on the card on which it is formed is again utilized to attract oppositely charged particles of coloring matter in solution in a volatile vehicle that are sprayed in the immediate vicinity of the xerographic powder image, whereby such charged particles are electrostatically attracted selectively to the xerographic powder image rather than to the surface of the support and wet the powder image and, by capillarity, soak into the surface of the support in the configuration of the powder image. In this manner the surface of the support is stained, in accordance with the color of the coloring material employed, to form a permanent visible reproduction of the xerographic powder image, and the powder particles of the xerographic image may be brushed off the card, if desired, as soon as the coloring material vehicle evaporates. This arrangement permits the use of a wide variety of relatively low-cost developing materials and coloring materials so that the cost of producing xerographic images in this manner is substantially reduced.

In each of the methods disclosed in the above mentioned applications, the xerographic image is fixed in a manner to form a permanent image on the support without affecting the dimensional stability thereof, and a negligible minimum of the fixing material is deposited on the support surface so that its normal utilization characteristics remain unimpaired. Although the xerographic powder image fixing techniques disclosed in the above mentioned co-pending applications are ideally suited for use in many applications, it has been found that further improvements may be made in the formation of permanent visible images by xerographic techniques whereby the dimensional stability and utilization characteristics of support material may be preserved and, at the same time, may be applied to form xerographic images on support materials of types which, heretofore, were not considered to be conveniently or practically adapted to use in xerographic systems.

For example, in co-pending application S.N. 556,326, entitled "Method and Apparatus for Transferring and Fixing Xerographic Images," filed concurrently herewith in the name of Chester F. Carlson, there is disclosed an improved method and apparatus for tranesferring and fixing xerographic powder images on specialized support surfaces wherein the xerographic powder image corresponding to a light image is transferred to an intermediate support material and is then heat tackified while in contact with the support material. Thereafter the final support material is superposed on the tackified powder image and pressed into surface contact therewith to cause the tackified powder image to adhere to the final support material. The final support material is then separated from the intermediate support material and forms a permanent image on the final support material. Although this method is highly advantageous for applications of this type, it involves a double transfer of the xerographic powder image which, under some conditions, may result in a loss of resolution of the image.

The principal object of the present invention is to provide an improved single transfer method and apparatus for transferring and fixing an xerographic powder image on a support without affecting the dimensional stability or utilization characteristics of such support. A further object is to provide an improved single transfer method and apparatus for transferring and fixing a xerographic image on a support without the requirement for specialized support material. A further object is to provide an improved single transfer method and apparatus for transferring and fixing xerographic powder images on perforated record cards, metal sheets, electroplated plastic layers, and similar types of support material. A further object of the invention is to provide an improved single transfer apparatus and method for transferring and fixing xerographic powder images in a rapid, economical and efficient manner.

These and other objects are attained, in accordance with the method of the invention, in conjunction with a xerographic process wherein an electrostatic charge pattern or latent image of a light image is formed on a sheet of insulating material in surface contact with a xerographic plate, and the latent image is developed with oppositely charged particles of tackifiable developing material to form a xerographic powder image corresponding to the light image, by tackifying the powder image while in contact with the insulating material, superposing a final support material on the tackified powder image, pressing the final support material into surface contact with the insulating material, and separating the final support material from the insulating material, whereby, during the separating step, the tackified image material

adheres to the surface of the final support material and is fixed thereon.

A typical arrangement for carrying out the method of the invention is shown in the accompanying drawing which is a schematic sectional view of a conventional type of xerographic processing machine adapted to perform the method of the invention and employing a smooth-surfaced plastic belt as the insulating material.

In the various embodiments of xerographic processes currently in general commercial use, the basic process is essentially the same as that disclosed in the above mentioned Carlson patent, but differs in some respects in the several materials and techniques employed, depending upon the type of copy to be reproduced. For example, in the reproduction of line copy, the xerographic plate currently in commercial use normally has a photoconductive layer of amorphous selenium deposited on a metal backing plate, usually of aluminum, although it also may be made of brass or other materials. Such a plate is usually charged by moving it relatively to a fine wire assembly held at high potential, so that corona current is emitted, whereby a uniform electrostatic charge is applied to the photoconductive surface of the plate. In the dark, this surface can accept and hold an electrostatic charge but when it is exposed to light or other form of radiation, the charge decays in an amount that is substantially proportional to the radiation. Thus, after charging and exposing to the subject matter to be reproduced, a charge pattern remains on the plate surface in the form of an electrostatic latent image of the subject. In most systems, the electrostatic image is a mirror image or reverse reading reproduction of the original subject matter. This electrostatic image is then developed by dusting it with a finely divided powder that has been given an electrostatic charge of opposite sign to the charge comprising the electrostatic latent image on the xerographic plate.

After development, the reverse reading powder image is usually transferred to a sheet of support material, by means of electrostatic transfer techniques, to form a direct reading powder particle image on the support material. This is accomplished by placing the sheet of support material over the powder particle image on the xerographic plate, and by applying corona discharge uniformly to the exposed surface of the support material to charge it to a polarity opposite to that of the charge on the particles on the powder image. This causes the powder particles to adhere electrostatically to the support material so that, when the support material is separated from the plate, substantially all of the pigmented resin particles remain on the support material. Thereafter, in most applications, the xerographic powder image is fixed on the support material either by heat fusing or by exposing the powder image to an atmosphere of solvent for the particular type of resin employed.

In the practice of the method of the present invention, an electrostatic latent image of the subject matter to be reproduced is formed on a sheet of insulating material in surface contact with a xerographic plate to form a reverse reading latent image thereon. The insulating material is preferably of such composition that it does not readily or effectively form a mechanical bond with the powdered developing material either in its dry or tackified state, but readily permits the powder material to be bonded thereto electrostatically. Preferably, such intermediate support material comprises a relatively heat insensitive transfer sheet such as Teflon or Kel-F, each of which is a fluorinated vinyl carbon material of such physical characteristics that it is substantially adhesive to dry or tackified xerographic developing materials. Other materials that are comparably adhesive, such as certain irradiated polyethylenes, glasene paper, silicone treated kraft paper, or closely woven glass fiber cloth may also be employed, if desired.

The electrostatic latent image on the insulating material is then developed, preferably by cascading with oppositely charged particles of pigmented powdered resin, whereby the powder particles are electrostatically attracted to the latent image to form a reverse reading powder image of the subject matter on the insulating material. While the xerographic powder image is electrostatically adhered to the insulating material it is tackified, either by the application of heat or solvent vapor to a degree that it becomes sufficiently sticky readily to adhere to other surfaces. While in this condition, the final support material is superposed on the tackified image and then is uniformly pressed into intimate surface contact with the insulating material. In accordance with the invention, such final support material has a relatively high bond strength with the tackified powder material by comparison with the surface of the insulating material so that the application of pressure causes the tackified powder material to flow into the interstices of the final support material and physically bond therewith, whereas relatively no bonding occurs between the tackified powder material and the surface of the insulating material.

Thereafter, the final support material with the tackified powder image adhered thereto is separated from the intermediate support material by any suitable means. During the process the tackified powder image hardens on the surface of the final support material to form a permanent bond therewith, and to provide a direct reading reproduction of the subject matter thereon. Preferably, separation is effected in timed relation to the hardening of the tackified powder image, in accordance with the type of developing material and/or insulating belt material that is employed, whereby the bonding of the powder image to the final support material may accurately be controlled.

Thus, there is provided an improved method whereby xerographic images may be transferred and fixed on final support surfaces of types which heretofore were considered impractical or inconvenient to receive images of this type. The transfer can be performed with extreme rapidity so that, when heat tackification is employed, there is very little heat transfer between the insulating material and the final support surface so that even heat-sensitive materials may be used for final support surfaces without danger of damage thereto. In the event a rigid material, such as a grained zinc or aluminum lithographic plate or an electroplated plastic sheet, is employed as the final support material, the flexibility of the insulating material allows it to conform closely to the final support surface in order to provide a complete transfer of the xerographic image. If necessary, pneumatic pressure pads or similar devices may be employed in the transfer step to obtain close conformity to curved surfaces and even to somewhat irregularly shaped surfaces as in the ornamentation of metal or china articles, or relatively rough paper or cloth.

A typical apparatus for practicing the method of the invention is disclosed in the drawing which constitutes an adaptation of a xerographic processing machine of the type disclosed in co-pending application S.N. 393,058, filed in the name of Clyde R. Mayo et al. on November 19, 1953, and which is currently in extensive commercial use under the name of XeroX Copyflo No. 1 Continuous Printer, manufactured by The Haloid Company of Rochester, New York. In this arrangement a xerographic plate having a photoconductive surface and a conductive backing is arranged in the form of a cylindrical drum 1 and is mounted for rotation on a shaft 2, that is rotated at a predetermined speed by suitable motive means (not shown). Subject matter that is to be reproduced is represented by successive frames of a microfilm 3 that is fed from a supply reel 4 to a take-up reel 5 by suitable driving mechanism which effects travel of the film at a rate proportional to the speed of the drum in accordance with the degree of magnification of the projected image. A projection system 6 is provide to direct light through microfilm 3 and project images from the film through an optical system 7 which magnifies the image and projects it through

a slit 9 against a portion of the photoconductive surface of the drum.

Overlaying a portion of the surface of the xerographic drum is an endless belt 22 that is mounted for movement with the drum and has a downwardly extending loop that rolls around a horizontally arranged roller 24. As noted above, this belt of insulating material is preferably formed of a smooth-surfaced plastic, such as Teflon or Kel-F, to which the powder image does not adhere even though tackified. The belt is tensioned by suitable means so that it is frictionally driven by movement of the drum and travels at a linear rate equal to the peripheral speed of the drum whereby opposed surfaces of the belt and drum remain in register, without slippage, throughout their period of contact.

Drum 1 and belt 22 travel in a counterclockwise direction and, during the course of their rotation, a given portion of the belt surface is first subjected to the operation of a suitable cleaning brush 12 that removes any adhering developing material, following which the photoconductive drum surface therebeneath is illuminated by a fluorescent discharge lamp 13 which insures removal of any electrostatic charges remaining on the drum and which may have been induced by the cleaning brush or other source. After passing under discharge lamp 13, the belt and drum surfaces are next subjected to corona discharge that is developed between a high voltage charging grid or electrode 14 and the conductive backing of xerographic drum 1, that is normally held at ground potential, whereby a uniform electrostatic charge is impressed on the surface of belt 22. After charging, the belt and drum surfaces are next exposed to a light image of the subject matter through slit 9 whereby the photoconductive surface of the drum is selectively rendered conductive in accordance with the light pattern which reaches it, thereby allowing electrostatic charges of polarity opposite to those on the surface of belt 22 to migrate through the photoconductive layer of drum 1 to the underside of belt 22 to form electric couples with the charges on the outer surface thereof. These electric couples are formed over the entire area subjected to light and have a negligible external field, whereas an electrostatically charged image remains on those portions of the surface of belt 22 which were not illuminated sufficiently to render the underlying photoconductive layer conductive. Thus, an electrostatic latent image corresponding to the projected subject matter is formed on the surface of belt 22.

After exposure, the belt surface passes through a developing chamber consisting of a housing 16, located adjacent the surface of belt 1 and extending from side to side thereof, forming a closed and substantially sealed chamber wherein development of the electrostatic image takes place. Development is effected by cascading oppositely charged particles of pigmented resin material 17 over the surface of the belt, in transit. The developer particles are projected into contact with the belt by means of a slide 18, and the excess particles fall to the bottom of the developing chamber from which they are elevated by a bucket type conveyor mechanism 19 and returned to the upper end of slide 18 for reuse. Suitable means may be provided to replenish the developing material as it is expended on the drum surface.

By this arrangement, the charged developing material particles are caused to flow over the entire exposed area of belt 22 whereby they are electrostatically attracted to the oppositely charged latent image thereon but are unaffected by the uncharged portions thereof. Thus, the developing material particles adhere to the latent image to form a xerographic powder image of the subject matter that remains electrostatically bonded to the surface of belt 22.

After development, the xerographic powder image on belt 22 passes into a tackifying or fusing chamber 28, which may be of the heat or vapor type, wherein the powder image is tackified. In the arrangement shown, there is disclosed a tackifier 28 of the heat fusing type wherein resistance wires 29 are energized to a degree to emit sufficient radiation to cause the powder particles to soften and coalesce to form a sticky surfaced image of the subject matter to be reproduced, in which condition the powder image emerges from the tackifying chamber and begins to pass over horizontal roller 24.

In order to superpose the final support surface on the tackified powder image the apparatus includes, by way of illustration, a record card feeding apparatus of the type commonly employed in perforated card controlled machines. Briefly, in this device record cards are placed in a card magazine and are passed seriatim to suitable feed rolls whereby they are advanced to be engaged between belt 22, as it passes over roller 24, and a pressure roll that presses them against the tackified powder image on the belt surface to effect the image transfer, and are then passed to a receiving magazine. Specifically, the record cards 33, or comparable types of final support surface, are placed in a magazine 34 in which they are urged into contact with a card feeding mechanism by means of a suitable weight 35. The cards are advanced, one at a time, by a picker knife 36 that is guided for reciprocating movement in suitable ways and is actuated, through a link 37 and pivotally mounted crank 38, by a cyclically operated cam 39 to advance cards in timed relation to the projection of images on belt 22.

As each card 33 is passed from magazine 34 it is gripped by conventional card feed rolls 40 that engage the edges of the card and move it downwardly to a position in which it is pressed against the surface of belt 22 by a pressure roll 42. Preferably, roll 24 and pressure roll 42 are each provided with a resilient surface whereby the card is pressed into intimate surface contact with the tackified powder image on the surface of belt 22. The pressure applied at this point and the time of pressure application are such that the tackified powder image is caused to flow into the interstices of the record card surface and bond thereto. As each card emerges from engagement with pressure roll 42 and belt 22 it is gripped by suitable ejector rolls 44 that are continuously rotating and serve to pass the card onto a deflecting chute 45 whereby it is fed into a receiving magazine 46. If required, suitable guide means 47 may be provided to assist in separating the card from belt 22 and guiding it into engagement with ejector rolls 44.

Obviously, horizontal pressure roll 24 may be heated, if desired, to insure that the tackified powder image remains in a sufficiently sticky state to permit its adhesion to the record card during the pressure applying step. In addition, such heating facilitates the removal of the tackified powder image from the surface of belt 22 in the event the belt is formed of a material to which the tackified powder image may have any tendency to adhere. Although pressure rolls 24 and 42 are adequate to effect a proper flowing of the tackified powder images for conventional developing materials and the type of belt material described above, there may be conditions in which it is desirable to apply pressure for a longer period of time. In such cases rollers 24 and 42 may conveniently be replaced by opposed pressure applying belts or combinations of rollers whereby pressure may be applied for a longer period.

In the event residual electrostatic charge tends to accumulate on belt 22, suitable means may be employed to discharge the belt during each cycle of operation. For example, a pair of grounded alpha particle emitters 49 may be arranged on either side of belt 22 for this purpose. Emitters 49 may conveniently be in the form of metal plates coated with polonium or other radioactive material as described in Carlson Patent 2,701,764, issued February 8, 1955. Alternatively, a pair of A.C. corona discharge wires, supplied from a suitable high voltage source may also be employed to discharge the belt.

In the arrangement thus far described, the electrostatic

charge pattern is formed on the insulating belt **22** by charging and exposing the belt directly while it is in surface contact with xerographic plate **1**. Obviously, the same result may be achieved by charging and exposing the photoconductive surface of the xerographic plate directly before the insulating belt is overlaid thereon. Referring to the drawing, such a result may conveniently be achieved by arranging discharge lamp **13**, charging grid **14**, and exposure slit **9**, in that order, between the downwardly extending portions of belt **22**, i.e., in the area generally designated by reference character **50**, whereby these instrumentalities are effective to perform their respective functions, as described above, directly against the surface of the xerographic plate. In such an arrangement, the electrostatic latent image is formed directly on the photoconductive surface of the xerographic plate and remains thereon as the plate continues its movement and is covered by insulating belt **22**. The electrostatic latent image thus formed on the plate creates a corresponding electric field on the superposed surface of belt **22** which, as it passes the developing mechanism **16**, is developed to form a xerographic powder image thereon, as described above.

Although the method and apparatus of the invention are described, by way of illustration, as applied to the transfer and fixing of fusible xerographic images of line copy to perforated record cards, it is apparent that they are equally applicable for transferring and fixing continuous tone fusible images, and that they may readily be applied for transferring and fixing such types of images to various other types of final support material. For example, by employing a similar type of support surface feeding device, xerographic images may readily be applied to relatively rigid support surfaces such as grained zinc or aluminum lithographic plates, or to electroplated plastic sheets such as are employed in the manufacture of printed circuits. In addition, by employing different types of support surface feeding means, the method and apparatus of the invention may readily be applied to transferring xerographic powder images to photographic film for the purpose of film titling, or to plastic film which may subsequently be covered by a plastic sheet, as for forming unalterable identification badges.

Since many changes could be made in the above construction and many apparently widely different applications of the method of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In the process of xerography wherein an electrostatic charge pattern corresponding to a light image is formed on a sheet of insulating material in surface contact with a xerographic plate and the charge pattern is developed with oppositely charged particles of tackifiable developing material to form a xerographic powder image on the insulating material corresponding to the projected image, and wherein the powder image is transferred to a support material and is fixed thereon, the improvement in transferring and fixing the powder image to a support material comprising the steps of tackifying the powder image while in contact with the insulating material, superposing the support material on the tackified powder image, pressing the support material into surface contact with the insulating material, and separating the support material from the insulating material.

2. In the process of xerography wherein an electrostatically charged sheet of insulating material in surface contact with a xerographic plate is exposed to a projected image to form an electrostatic latent image on the insulating material corresponding to the projected image and the latent image is developed with oppositely charged particles of tackifiable developing material to form a xerographic powder image corresponding to the projected image, and wherein the powder image is transferred to a support material and is fixed thereon, the improvement in transferring and fixing the powder image to a support material comprising the steps of tackifying the powder image while in contact with the insulating material, superposing the support material on the tackified powder image, pressing the support material into surface contact with the insulating material, and separating the support material from the insulating material.

3. In the process of xerography wherein an electrostatically charged xerographic plate is exposed to a projected image to form an electrostatic latent image on the plate corresponding to the projected image and the plate is overlaid with a sheet of insulating material whereby to form an electrostatic latent image on the insulating material corresponding to the projected image and the latent image on the insulating material is developed with oppositely charged particles of tackifiable developing material to form a xerographic powder image on the insulating material corresponding to the projected image, and wherein the powder image is transferred to a support material and is fixed thereon, the improvement in transferring and fixing the powder image to a support material comprising the steps of tackifying the powder image while in contact with the insulating material, superposing the support material on the tackified powder image, pressing the support material into surface contact with the insulating material, and separating the support material from the insulating material.

4. An apparatus for transferring and fixing a xerographic powder image to a support surface comprising, in combination, a cylindrical xerographic plate mounted for rotation about a horizontal axis, a belt of insulating material overlying a portion of said plate, means for forming an electrostatic charge pattern corresponding to a light image on the surface of a portion of the insulating material in contact with said plate, means for developing the charge pattern with tackifiable electrostatically attractable powder to form a xerographic powder image of the light image on the insulating material, means for tackifying the xerographic powder image formed on the insulating material, means for superposing and pressing a support material on the tackified powder image on the insulating material surface, and means for separating the support material from the insulating material.

5. An apparatus for transferring and fixing a xerographic powder image to a support surface comprising, in combination, a cylindrical xerographic plate mounted for rotation about a horizontal axis, a belt of translucent insulating material overlying a portion of said plate, means for applying electrostatic charge to the surface of a portion of the insulating material in contact with said plate, means for exposing the charged surface of the insulating material to a light image of subject matter to be reproduced to form an electrostatic latent image of the subject on the insulating material, means for developing the latent image with tackifiable electrostatically attractable powder to form a xerographic powder image of the subject on the insulating material, means for tackifying the xerographic powder image formed on the insulating material, means for superposing and pressing a support material on the tackified powder on the insulating material surface, and means for separating the support material from the insulating material.

6. An apparatus for transferring and fixing a xerographic powder image to a support surface comprising, in combination, a cylindrical xerographic plate mounted for rotation about a horizontal axis, a belt of translucent insulating material overlying a portion of said plate and movable therewith, means for applying electrostatic charge to the surface of an uncovered portion of the xerographic plate, means for exposing the charged surface of the xerographic plate to a light image of subject matter to be reproduced to form an electrostatic latent image of the subject on the plate, means for rotating

the xerographic plate to cause the latent image on the plate to be overlaid by the insulating material, whereby a charge pattern corresponding to the latent image is formed on the surface of the insulating material, means for developing the charge pattern on the insulating material with tackifiable electrostatically attractable powder to form a xerographic powder image of the subject on the insulating material, means for tackifying the xerographic powder image formed on the insulating material, means for superposing and pressing a support material on the tackified powder image on the insulating material surface, and means for separating the support material from the insulating material.

7. An apparatus for transferring and fixing a xerographic powder image to a support surface comprising, in combination, a cylindrical xerographic plate mounted for rotation about a horizontal axis, a belt of insulating material overlying a portion of said plate, means for forming an electrostatic charge pattern corresponding to a light image on the surface of a portion of the insulating material in contact with said plate, means for developing the charge pattern with tackifiable electrostatically attractable powder to form a xerographic powder image of the light image on the insulating material, means for tackifying the xerographic powder image formed on the insulating material, means for advancing support material into superposing relationship with the tackified powder image on the insulating material, means for pressing the support material into surface contact with the tackified powder image on the insulating material surface, and means for separating the support material from the insulating material.

8. An apparatus for transferring and fixing a xerographic powder image to a support surface of the perforable record card type comprising, in combination, a cylindrical xerographic plate mounted for rotation about a horizontal axis, a belt of insulating material overlying a portion of said plate, means for forming an electrostatic charge pattern corresponding to a light image on the surface of a portion of the insulating material in contact with said plate, means for developing the charge pattern with tackifiable electrostatically attractable powder to form a xerographic powder image of the light image on the insulating material, means for tackifying the xerographic powder image formed on the insulating material, card feeding means for advancing a record card into superposing relationship with the tackified powder image on the insulating material, means for pressing the record card into surface contact with the tackified powder image on the insulating material surface, and means for separating the record card from the insulating material.

9. An apparatus for transferring and fixing a xerographic powder image to a support surface comprising, in combination, a cylindrical xerographic plate mounted for rotation about a horizontal axis, a belt of insulating material overlying a portion of said plate, said insulating material being substantially adhesive to tackified xerographic developing material, means for forming an electrostatic charge pattern corresponding to a light image on the surface of a portion of the insulating material in contact with said plate, means for developing the charge pattern with tackifiable electrostatically attractable powder to form a xerographic powder image of the light image on the insulating material, means for tackifying the xerographic powder image formed on the insulating material, means for advancing support material into superposing relationship with the tackified powder image on the insulating material, means for pressing the support material into surface contact with the tackified powder image on the insulating material surface, and means for separating the support material from the insulating material.

10. An apparatus for transferring and fixing a xerographic powder image to a support surface of the perforable record card type comprising, in combination, a cylindrical xerographic plate mounted for rotation about a horizontal axis, a belt of insulating material overlying a portion of said plate, said insulating material being substantially adhesive to tackified xerographic developing material, means for forming an electrostatic charge pattern corresponding to a light image on the surface of a portion of the insulating material in contact with said plate, means for developing the charge pattern with tackifiable electrostatically attractable powder to form a xerographic powder image of the light image on the insulating material, means for tackifying the xerographic powder image formed on the insulating material, card feeding means for advancing a record card into superposing relationship with the tackified powder image on the insulating material, means for pressing the record card into surface contact with the tackified powder image on the insulating material surface, and means for separating the record card from the insulating material.

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