May 7, 1963 D. A. NEWMAN 3,088,402

DUPLICATING

Original Filed May 31, 1955 2 Sheets-Sheet 1

Fig. 1

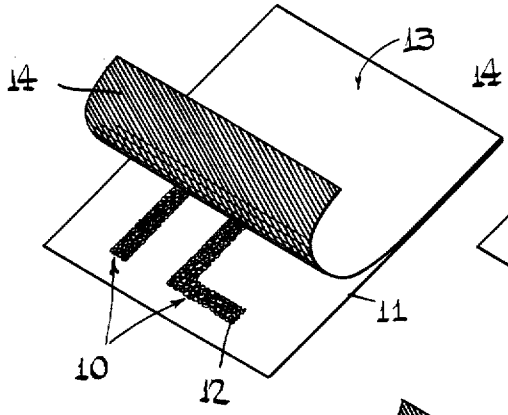
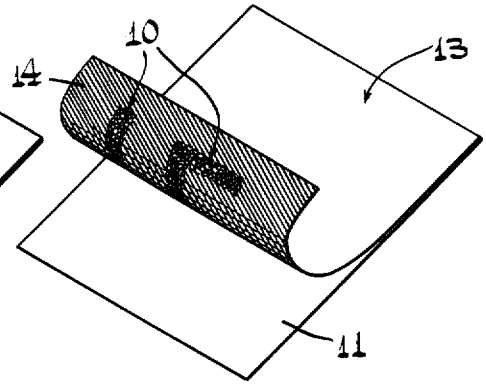



Fig. 2



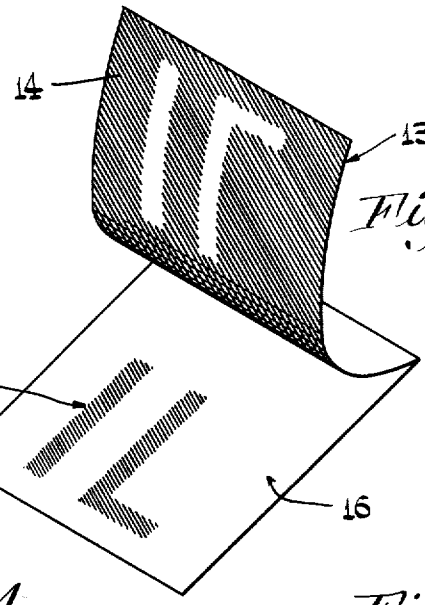




Fig. 3

Fig. 4

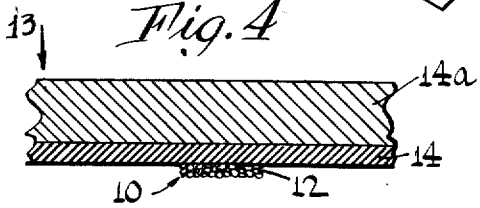



Fig. 5

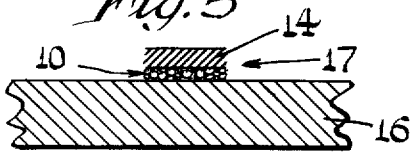
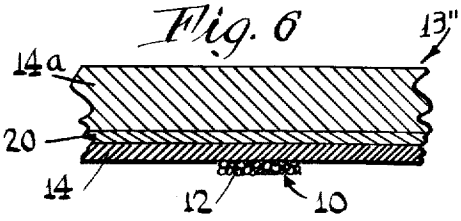



Fig. 6




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May 7, 1963 D. A. NEWMAN 3,088,402

DUPLICATING

Original Filed May 31, 1955 2 Sheets-Sheet 2

Fig. 7

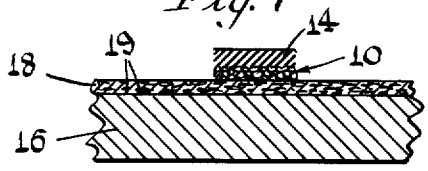



Fig. 8

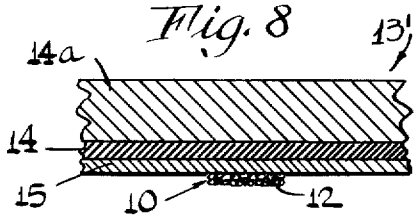



Fig. 9

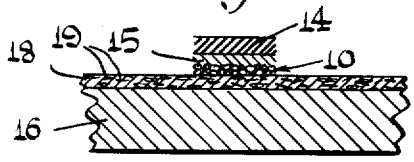



Fig. 10

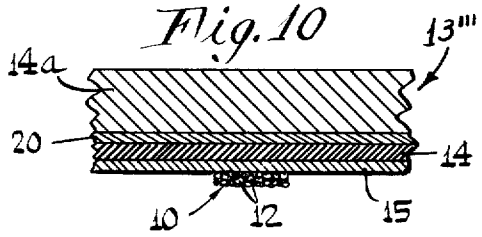



Fig. 11

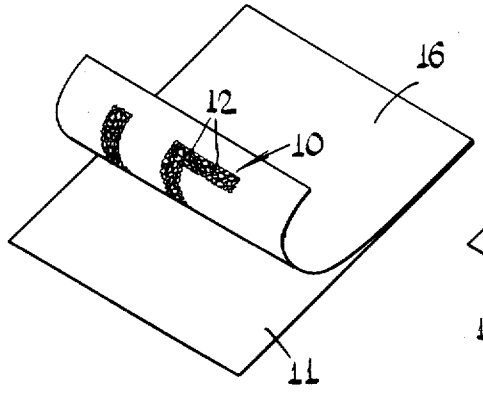
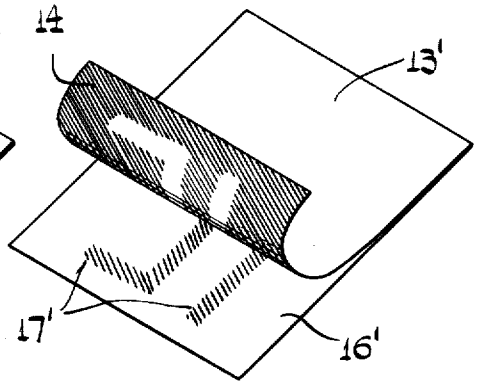



Fig. 12




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United States Patent Office

3,088,402
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3,088,402

# DUPLICATING

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Continuation of application Ser. No. 511,855, May 31, 1955. This application Mar. 31, 1960, Ser. No. 19,113

12 Claims. (Cl. 101—149.4)

This invention relates to methods of making copies by the hectograph duplicating process and more particularly to methods of producing hectograph master sheets used in such processes from an electrostatically-formed image, and also to the articles used in practicing said methods.

This application is a continuation of my application Serial No. 511,855 filed May 31, 1955, now abandoned, which in turn is a continuation of my earlier application Serial No. 437,757 filed June 18, 1954, now abandoned.

The manner of obtaining an electrostatically-imaged copy is well known in the art and may be carried out in several ways, for instance as described in U.S. Patents Nos. 2,397,691 and 2,357,809 issued to Chester F. Carlson. The method generally followed comprises (1) electrostatically charging a photoelectrically sensitive plate; (2) photographically projecting the image to be produced onto the charged plate which results in the dissipation of the charge in the exposed areas, and leaving a latent electrostatic image in the unexposed portions; (3) dusting the plate with a pigmented resin powder carrying an opposite electrostatic charge to that on the latent images whereby the powder is attracted and held in image form on the charged imaged areas; (4) superposing a copy sheet over the plate containing the developed powdered image and transferring the image from the plate to the copy sheet by mechanical or electrical means; and (5) and heating or chemically treating the copy sheet to fix the powdered image thereon.

The known method requires the above sequence of steps for each copy to be produced and results in a time-consuming and tedious operation to produce a relatively large number of copies. It is desirable, therefore, that the electrostatic image be used to make only one copy which may be utilized in the reproduction of further copies in a more simple and rapid manner such as the hectograph duplicating process.

It is accordingly an object of this invention to provide a method for the formation of a hectograph master sheet from the electrostatically-produced image so that copies may be produced therefrom by a hectograph duplicating process.

In the formation of masters for use in a hectograph duplicating process a transfer sheet having a flexible foundation and a coating of transferable material comprising essentially a wax-like vehicle having suspended therein a soluble color-producing material and a master sheet are superposed and subjected to localized imaging force as applied, for instance, by a typewriter on the foundation to transfer the coating in image form onto the face of the master. Thereafter the imaged master is placed in a duplicating machine where it is treated with a fluid for the color-producing or developing material which when contacted with copy sheets in the presence of said fluid will produce a visible image on said copy sheet.

This involves typing or writing the subject matter to



be reproduced. However, with the electrostatic method of duplication it is possible to make an exact photocopy from an already existing image-bearing material. I have discovered that it is possible to make a hectograph master sheet by starting with the material to be copied, hereinafter referred to as the original, making an electrostatic image by positioning the original over a photoelectric sensitive coated, electrostatically-charged plate and photographically discharging portions of the plate through the unimaged portion of the original and leaving a latent electrostatic image on said coated plate. The plate is then dusted with an electroscopic powder consisting essentially of a latent adhesive material which results in the production of a physical image on the plate. The physical image thus formed is then utilized to produce a hectograph master sheet. According to the present invention, the color-producing material or a component thereof employed to make duplicate copies is supplied by a hectograph transfer sheet having a coating containing the color-producing material.

Tests have shown that electroscopic powders forming the image in the manner as recited above are capable, when the adhesive material is activated, of bonding with both the master sheet and the transferable color-producing layer of a transfer sheet with sufficient tenacity to overcome the cohesive properties of the transfer layer, and that when a master sheet and transfer sheet having an electrostatically-formed image on one of the sheets are superposed and bonded by the image powders, the transfer layer will transfer to the master sheet in image form when the sheets are separated.

According to the present invention, after the image is formed electrostatically with the latent adhesive image-forming material, it may be applied either to the transfer layer of a hectograph transfer sheet or to the surface of a master sheet, and in either event the two sheets are then brought together in face-to-face contact so that a bond is formed between the transfer layer on the transfer sheet, the activated adhesive image and the surface of the master sheet. The image having been made actively adhesive adheres tenaciously to the master sheet and to the transfer layer on the transfer sheet with the result that when the sheets are stripped apart, those portions of the transfer layer which are bonded by the adhesive image to the master sheet come away from the transfer sheet and remain on the master sheet, which is then ready to be used in the usual manner as a hectograph master.

In the event that it is desired first to apply the latently adhesive image to the master sheet, then it will be necesary to use a reversing lens or mirror setup in the Xerox machine so that the images formed on the selenium plate will be in positive. Upon transfer to the master sheet, the images become reversed so that direct-reading copies may be produced in the hectograph duplicating process.

After the image is picked up from the electrostatic plate by the master sheet, the adhesive may be activated before or while the master sheet and transfer sheet are brought into intimate contact. In the event the image is first applied to the transfer sheet from the electrostatic plate, a reversing lens is not necessary and the activation of the adhesive may be delayed until after the master sheet and transfer sheet are superposed.

One method of activating the electroscopic powder

resin images involves placing the resin image-carrying sheet, whether it be the master sheet or the transfer sheet, together with the respective transfer sheet or master sheet over a heating element and applying slight pressure thereto with an overlying felt cushion, sponge or the like. Pressure is maintained for a period of between about 5 and 20 seconds while the temperature is kept between about 130° and 250° F.

Another important method utilizes the fact that when conventional xerographic electroscopic powders are employed, they absorb infrared radiation and convert it to heat due to the fact that they contain pigments such as carbon black. Therefore the master sheet and the transfer sheet, one of which bears the electroscopic powder images, are brought into intimate contact and subjected to an infrared-radiation source, such as an infrared emitting bulb in a Thermo-Fax machine; in this manner, the thermoscopic images absorb the infrared radiation, convert it to heat and become tacky. At the same time, the physical heat generated by these images heats and softens the hectograph layer in contact therewith in areas corresponding to only the imaged areas. Upon removal from the radiation source and separation of the sheets, an excellent hectograph master sheet is provided. Due to the combined factor of the electroscopic powder image becoming tacky and the corresponding areas of the hectograph transfer layer becoming heat-softened, a substantial amount of the hectograph layer is picked-off the transfer sheet and adheres tenaciously to the electroscopic images which are bound firmly to the hectograph master sheet.

Several other important features of this invention, which will be more fully pointed out below, concern the provision of novel and improved transfer sheets particularly adapted for use in the above process, and also certain improvements in the master sheets to be used in the above process which are directed to the end that the relative adhesion and cohesion of the respective parts is such that efficient and effective transfer and bonding is obtained.

Additional features and advantages will hereinafter appear as the description proceeds.

In the drawing:

FIGURE 1 is a diagrammatic perspective illustrating the electroscopic powder image formed on a plate with a transfer sheet being placed thereon.

FIG. 2 is a diagrammatic perspective illustrating the electroscopic powder image adhered to the transfer sheet when the transfer sheet is separated from the plate.

FIG. 3 is a diagrammatic perspective illustrating the completed image including the transfer layer bonded thereto on the master sheet after the transfer sheet has been stripped from the master.

FIG. 4 is a diagrammatic section of the transfer sheet illustrating the electroscopic powders in image form adhering to the transfer layer.

FIG. 5 is a diagrammatic section illustrating the completed image including the transfer layer bonded to the master sheet.

FIG. 6 is a diagrammatic section of a transfer sheet similar to FIG. 4, but showing an undercoating between the transfer layer and the foundation of the transfer sheet.

FIG. 7 is a diagrammatic section similar to FIG. 5, but illustrating a master sheet having a coating to which the completed image is adhered.

FIG. 8 is a diagrammatic section of a transfer sheet similar to FIG. 4, but having an overcoating on the transfer layer to which the electroscopic powder image is adhered.

FIG. 9 is a diagrammatic section similar to FIG. 5, but illustrating a master sheet having a coating to which the completed image, when formed using a transfer sheet as in FIG. 8, is adhered.

FIG. 10 is a diagrammatic section, similar to FIG. 4, of a transfer sheet having an undercoating between the foundation and transfer layer and an overcoating on the transfer layer to which the electroscopic powder image is adhered.



FIG. 11 is a diagrammatic perspective of another form of the invention illustrating an arrangement in which the electroscopic powder image formed on a plate is removed therefrom by a master sheet placed thereon.

FIG. 12 is a diagrammatic perspective illustrating the transfer layer being removed in image form from the transfer sheet and bonded to the electroscopic powder image on the master sheet.

Referring more particularly to the drawings in which like reference numbers refer to the same parts, the several views, and to FIGS. 1 and 2, the visible electrostatic image **10** is formed on a plate **11** having an electrically-charged latent image thereon by dusting an electroscopic powder **12** on the plate which is attracted to the charged portion to develop the image in the known manner. A transfer sheet **13** having a layer of soluble dye-carrying composition **14** hereinafter referred to as a transfer layer is then superposed over the electrostatically-formed image on the plate and subjected to an electric charge to attach the powders in image form thereto as seen in FIGS. 2 and 4, the surface of the transfer layer and the image being compatible to the extent that the imaged portion will adhere to the surface of the transfer layer and be removed therewith when the transfer sheet is separated from the plate, as shown in FIGS. 3 and 5.

The compatibility of the electroscopic powders for the transfer coating is due in part to the adhesive characteristics of the powders which are thermoadhesive resins such as rosin, gum copal, gum sandarac, cumarone-indene resin, the treated pine resin sold under the trademark "Vinsol" resin, ethyl cellulose or Egyptian asphalt, or any other material which has the required electroscopic properties. Furthermore, the above-named materials in the presence of an activating agent such as heat or a solvent will become tacky and bond to the transfer layer of the transfer sheet.

Under some circumstances it is desirable that the compatibility of the image powders for the copy composition transfer layer be improved to insure a proper transfer. In the present invention this may be accomplished by providing a transfer sheet **13'** or **13'''** in which the transfer layer **14** is provided with an overcoating **15** (FIGS. 8 and 10) which has a special affinity for the electroscopic image powders. The overcoating comprises a vehicle which forms a protective film and is so formulated or applied that it will not intermingle with the transfer layer and may include the same resins as the electroscopic powders and may optionally include lamelliform particles such as bronze powders.

The vehicle is usually a wax of harder consistency than that of the transfer layer, and when it includes the lamelliform particles the latter disperse along the interface to form an impervious barrier and prevent dilution of the color-producing material in the transfer layer. When an overcoating composed of wax as set forth above is used, it is applied by hot melt methods.

Another form of overcoating which may be used under some circumstances, especially where hot melt methods are not desirable, may include essentially a resin such as ethyl cellulose, in which event the latter may be dissolved in a suitable solvent and applied in solution to the transfer layer and form a thin protective film thereover when the solvent evaporates.

The overcoating when it is applied to a transfer sheet, in addition to rendering the transfer sheet cleaner in handling, prevents undue dye migration onto a user's hands, and also appears to improve the compatibility of the electroscopic powders for the surface of the transfer sheet. The included lamelliform particles also appear to improve the electrostatic properties of the transfer sheet and the adherence of the image to the transfer layer.

After the image **10** has been transferred from the plate **11** to the transfer sheet **13**, it is then ready to be trans-

ferred along with the transfer layer in image form to the master sheet **16** (FIG. 3). In order to achieve this transference, I have found that it is necessary that a bond be created by the image powders between the surface of the master sheet and the transfer layer which has a greater tenacity than either the cohesive properties of the transfer layer or the bond between the transfer layer and the transfer sheet. The bonding may be accomplished by activating the material of the powdered image to render it tacky either before or ather superposing the transfer sheet carrying the image powders onto the surface of a master sheet in intimate face-to-face relationship.

A suitable activating means to bring out the adhesive bonding properties of the electroscopic powders is the use of infrared radiation. Such radiation does not generate heat unless and until it is absorbed by a foreign body. It has been found that the electroscopic powders of the present invention, particularly when used in their commercially-available form containing pigment such as carbon black and the like, absorb infrared radiation and convert it to heat whereas the conventional hectograph transfer sheets are relatively immune to such radiation. This is due to the fact the conventional dyestuffs of the rhodamine, safranine and triarylmethane families do not absorb substantial amounts of infrared radiation.

In carrying out this mode of the present invention, the electrostatic image is transferred to either the master sheet or the hectograph transfer sheet in the manner set forth hereinbefore and exemplified by FIGS. 2 and 11 of the drawing. The sheet bearing the electroscopic powder image is then preferably, but not necessarily, treated in a vapor chamber with small amounts of solvent such as trichloroethylene or with heat to fuse or set the resin images in place and provide ease in handling. This sheet is then placed in intimate surface contact with the corresponding transfer sheet or master sheet and subjected to infrared radiation treatment, as by passing the combination through a Thermo-Fax machine. Under the effect of the radiation, the electroscopic resin images become tacky due to the absorption thereof and fuse to the master sheet and the hectograph transfer layer in contact with the images. Due to the heat generated by these images, the underlying transfer layer melts in the corresponding areas, and upon removal from the radiation source and separation of the sheets, an excellent hectograph master sheet is provided as exemplified by FIG. 5 of the drawing.

Above it was mentioned that for ease of use it is best to fuse the image to the hectograph sheet. However, if a master set is used so that the master sheet can be folded back under the hectorgraph transfer sheet when the electrostatic powders are applied, very little distortion of the image will occur on handling because on removal of the electrostatic plate the master sheet can then be folded back over the powdered image and kept rigid so that the dry powder can be fused at the same time that the transfer act is taking place.

Another suitable activating means is the use of overall heat as for instance provided by a hot plate, heated rollers or heat lamps. According to this aspect of the present invention, the heat provided should be sufficiently high to soften the electroscopic resin images and fuse them to the hectograph layer, but not sufficiently high to melt the hectograph layer itself. In general, temperatures within the range of 120°–250° F. are satisfactory. However, the higher temperatures are preferred, for instance in excess of about 190° F., in order to render the resin images very tacky and enhance their adhesive attraction for the transfer layer. Where such higher temperatures are used, the transfer layer of the transfer sheet is preferably of the cellulose ether non-melt type as described and claimed in my copending application, Serial No. 852,612, filed November 13, 1959. Where it is attempted to use the conventional hot melt hectograph transfer sheets at these temperatures, the results are unsatisfactory in that the entire transfer layer melts and blocks off to the master sheet causing overall unintentional staining thereof.

By the present invention it has been found that the porosity of the master sheet may be a factor in the fusing of the imaging powders and the resulting transfer of the hectograph duplicating material from the transfer sheet in image form.

It has been found that if the air porosity of the master sheet, as determined on a W. and L. E. Gurley Paper Porosity Tester, is maintained to permit 100 cc. of air at 78° to pass through between a range of 2 minutes to 60 minutes, excellent fusion of the imaging powders and transfer of the transferable materials from the transfer sheet to the master sheet is achieved within two minutes. The desired porosity of the master sheet may be achieved by the selection of the paper stock used and/or by adjusting and controlling the paper-treating coatings as, for instance, by reducing the weight of the sizing coating or lowering the binder ratio of this coating.

In selecting a master sheet it is also desirable that the sheet have an affinity for the resinous electroscopic image-forming powders in order to attain a proper bond and though conventional master sheets as described above have proved satisfactory, the affinity may be improved by treating a master sheet to render the surface highly polished and smooth, or by providing it with a coating **18** (FIGS. 7 and 9) containing an adhesive material, such a common rosin, hydrogenated rosin, polyethylene or a polybutene (such as "Vistanex"), which is attractive to the image-forming powders. Treating the master in the above manner results in a superior bond which has a greater affinity for the electroscopic powders than conventional untreated masters. Furthermore, an overcoating of the above composition has the additional advantage of providing a more permanent bond by preventing the slow migration of oils through the base of the master which undermines and weakens the bond between the image and master sheet. It is to be understood that should the characteristics of the master sheet prove satisfactory, the overcoating may be omitted.

After the image on the surface of the transfer sheet has become sufficiently tacky, the transfer and master sheets are brought together in intimate contact to form an adherent bond between the imaged portion of layer **14** and the master sheet **16** so that a completed master image **17** will remain on the master sheet when the transfer sheet is stripped therefrom as illustrated in FIG. 3. The force applied over the entire image area is great enough to eliminate air pockets between the master sheet and the imaged portions of the transfer layer which, if allowed to remain, would create a weak adhesive bond or even total lack of adhesive bond between the master sheet and the image.

It is also within the realm of this invention to form the bond between the imaged portion of the transfer layer and the master sheet in the absence of mechanically applied pressure. This is acomplished by providing the unimaged master sheet with a magnetic material which has magnetic properties in a sufficient degree to cooperate with a magnetic force (e.g. as provided by an electromagnetic platen) to draw the transfer layer into intimate bonding contact with the master sheet. A material suitable for this purpose is magnetic iron oxide which may be included in a separate coating as illustrated by reference character **19**, or incorporated in the paper itself.

While the magnetic particles are most conveniently provided in the master sheet or a coating thereon, it will be understood that the desired result can be produced with equal effect by including the particles in the transfer sheet or one of its coatings.

The transfer sheet which is used in this process may be formed in a conventional manner and comprises a flexible foundation **14***a* such as paper or a non-adsorptive homogeneous sheet, as for instance cellulose acetate, and a coating **14** on one surface thereof composed of a color-pro-

ducing material dispersed in a binder and plasticizer to form a transferable layer which may be separated therefrom in image form and bonded to the master.

Or, if desired, the transfer sheet may comprise a cellulosic non-melt hectograph layer as described hereinbefore. Such layers are applied as lacquers dissolved in a suitable solvent such as toluol. For instance, a cellulose ether such as ethyl cellulose together with a non-volatile, non-solvent material such as lanolin or mineral oil, are dissolved in the solvent and hectograph dyestuff is added thereto in approximately the following proportions:

| | Parts by weight |
|---|---|
| Ethyl cellulose | 5.0 |
| Mineral oil | 17.6 |
| Lanolin | 3.2 |
| Hectograph dye material (Du Pont Spirit Black #3) | 19.2 |
| Solvent (toluol or the like) | 55.0 |
| | 100.0 |

The mixture is spread evenly on a suitable foundation and allowed to set by evaporation of the solvent.

In the case of the non-melt solvent type of hectograph, it has been found expedient but not necessary to apply a supercoating which is a meltable, clear wax base. When heat is made for the transferring action the whole supercoating melts and transfers along with the image matter. In the case of the conventional hot-melt type hectograph, however, it has not proven advantageous since the adhesive action of the electrostatic powder to its surface is not particularly good. One improvement will be found by using a pigmented light colored supercoating over the non-melt type cellulosic layer because any extraneous electrostatic powder that might form in the non-copying areas is then readily discernible and can be brushed away.

The color-producing material in either case may be a soluble dye material which of itself has a color value as in conventional hectograph transfer sheets, or it may be a material of latent color value which is soluble and which will only develop color on the copy sheets when subjected to a complementary reagent in the duplicating process. For instance, hydroxyl-substituted aromatic compounds such as gallic acid, tannic acid or logwood extract may be used as the color donor material on the master sheet while the copy sheets individually carry a complementary chemical compound such as an iron or copper salt as described in my United States Patent No. 2,872,863.

In the event a paper foundation is used to form the transfer sheet, in some instances the bond between the transfer layer and the paper foundation sheet due to the porous and rough surface characteristics thereof is equal to or greater than the bond between the master sheet and the imaged portion of the transfer layer when the sheets are superposed, so that when the sheets are separated the transfer layer in image form cleaves at an intermediate plane within the layer, resulting in only a portion of the transfer layer transferring in image form to the master sheet. Accordingly, a master sheet having only a portion of the transfer layer transferred will not produce as many copies as when a substantially complete separation of the transfer layer occurs at the interface between the transfer layer and its foundation. In order to overcome this difficulty and to achieve maximum transfer, I have found that it is preferable to employ a transfer sheet **13″** or **13‴** having an undercoating **20** (FIGS. 6 and 10) between the foundation sheet **14*a*** and the transfer layer **14**. The undercoating may comprise a film-forming plastic such as cellulose acetate or a film-former bonding member such as "Vinylite" resin of the polyvinyl butyral series, lacquer or varnish, and may optionally contain insoluble unctuous particles such as for instance leafing bronze powders or graphite dispersed therein. When the insoluble unctuous particles are used in the film-former they appear to distribute along the surface to form a weakened plane in the coating, and it has been found that when a master sheet **16** and transfer sheet **13″** or **13‴** having an undercoating **20**, bonded together by the image-forming powders, are later separated, the transfer layer will separate in image form from its foundation at the interface of the undercoating **20** and the transfer layer **14**.

It is, of course, to be understood that if the flexible foundation **14*a*** is a non-adsorptive sheet such as cellulose acetate, the problem of the bond between the transfer layer and the foundation sheet is not present, and the undercoating **20** may be eliminated.

As pointed out above, the adhesive image powders may be initially applied to either the transfer sheet, **13**, **13′**, **13″** or **13‴**, or to master sheet **16**, and referring particularly to FIGS. 11 and 12, which illustrate the latter form, the image is formed upon a plate carrying an electrostatically-charged latent image by dispersing the electroscopic powders thereover in the known manner to develop an actual image. The master sheet **16** is then positioned over the plate **11** carrying the image and subjected to an electric charge to transfer the powdered image **10** from the plate to the master sheet. The image **10** on the master sheet is then ready to be subjected to an activating agent which will render the image-forming powders tacky and capable of bonding. In this situation, also, the activating agent such as heat or a solvent, as for instance perchloro- or trichloroethylene, which will render the powders tacky, is applied to the image powders on the master sheet directly and when the powders have become sufficiently adhesive, a transfer sheet **13** is superposed thereon in intimate contact so that the image will bond to the transfer layer **14**; or the agent may be applied after the image-carrying master sheet **16** and transfer sheet **13** are superposed. When the bond between the transfer layer and the image master sheet has set, the transfer sheet is stripped therefrom leaving the completed image **17** including a portion of the transfer material in image form on the master sheet as shown in FIG. 12.

In carrying out the formation of the master sheets as illustrated in FIGS. 11 and 12, under some circumstances it may be preferable to provide the master sheet with a coating **18** as illustrated in FIGS. 7 and 9 to provide a greater affinity for the electroscopic image-forming powders in order that a better bond may be formed.

Furthermore, when it is found advantageous, a transfer sheet **13′** or **13‴** may be used in which the transfer layer is provided with an overcoating **15** as shown in FIGS. 8 and 10 so that the image powders when tackified or made adhesive may more readily bond with the transfer layer.

In order to assure the complete separation of the transfer layer from its foundation sheet and achieve maximum copy reproduction, a transfer sheet **13″** or **13‴** may be used in which an undercoating **20** is provided, formulated as set forth above, between the transfer layer **14** and its foundation **14*a*** to produce a less cohesive separation plane than that within the transfer coating itself.

From the foregoing description it can be seen that by providing an electrostatically-formed image with a copying composition and transferring the resulting image to a hectograph master sheet, a greater number of copies may be produced per unit of time than if the copies were to be made by the known electrostatic method alone.

The term "hectograph duplicating process" as used herein and the term "hectograph" in the claims is intended to include all processes for making duplicate copies by the bringing together of a medium having an image in the form of dye or color-producing material in a suitable base as discussed hereinbefore, and copy sheets in the presence of an activating or developing agent for

the materials to reproduce the image on successive copy sheets.

The terms "hectograph transfer sheet" and "hectograph master sheet" are intended to define elements used in the hectograph processes as defined above.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. A method of producing an imaged hectograph master on a flexible master sheet by use of a transfer sheet coated with a transferable layer of copy-producing material including the steps of:

(*a*) producing on a plate a latent electrostatic image of the copy to be reproduced;

(*b*) developing said latent image on said plate with an electroscopic powder tackifiable by heat to form a powder image of said copy;

(*c*) transferring said powder image from said plate to one of said sheets;

(*d*) superposing said sheets so that the powder image is in intimate contact with the master sheet and the transferable layer of the transfer sheet and heating the sheet and the powder image thereon to a temperature sufficiently high to render the powder image tacky;

(*e*) permitting the tackified powder image to solidify and bond to the master sheet and to the transferable layer of the transfer sheet; and

(*f*) stripping the sheets apart; whereby those portions of the transferable layer which have been bonded to the solidified image on the master sheet are separated from the transfer sheet to produce an imaged hectograph master.

2. The method as defined in claim 1 in which the master sheet is the sheet to which said powder image is transferred from said plate.

3. The method as defined in claim 1 in which the transfer sheet is the sheet to which said powder image is transferred from said plate.

4. The method of claim 1 in which the transfer sheet is previously provided with a coating over the coating of transfer material, said overcoating having an adherent affinity for the said powder image.

5. The method of claim 1 in which the transfer sheet is previously provided with a coating under the coating of transfer material releasably attaching the transfer coating to the transfer sheet.

6. The method of claim 1 in which the transfer material of the transfer sheet comprises a cellulose ether and imaging material.

7. A method of producing an imaged hectograph master on a flexible master sheet by use of a transfer sheet coated with a transferable layer of copy-producing material including the steps of:

(*a*) producing on a plate a latent electrostatic image of the copy to be reproduced;

(*b*) developing said latent image on said plate with an electroscopic powder tackifiable by exposure to infra-red radiation to form a powder image of said copy;

(*c*) transferring said powder image from said plate to one of said sheets;

(*d*) superposing said sheets so that the powder image is in intimate contact with the master sheet and the transferable layer of the transfer sheet and subjecting the powder image to infra-red radiation to render it tacky;

(*e*) permitting the tackified powder image to solidify and bond to the master sheet and to the transferable layer of the transfer sheet; and

(*f*) stripping the sheets apart; whereby those portions of the transferable layer which have been bonded to the solidified image on the master sheet are separated from the transfer sheet to produce an imaged hectograph master.

8. The method as defined in claim 7 in which the master sheet is the sheet to which said powder image is transferred from said plate.

9. The method as defined in claim 7 in which the transfer sheet is the sheet to which said powder image is transferred from said plate.

10. The method of claim 7 in which the transfer sheet is previously provided with a coating over the coating of transfer material, said overcoating having an adherent affinity for the said powder image.

11. The method of claim 7 in which the transfer sheet is previously provided with a coating under the coating of transfer material releasably attaching the transfer coating to the transfer sheet.

12. The method of claim 7 in which the transfer material of the transfer sheet comprises a cellulose ether and imaging material.

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