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THERMAL REPRODUCTION

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2 Sheets-Sheet 1

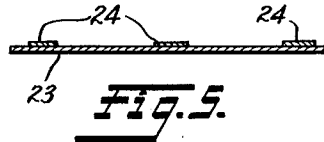
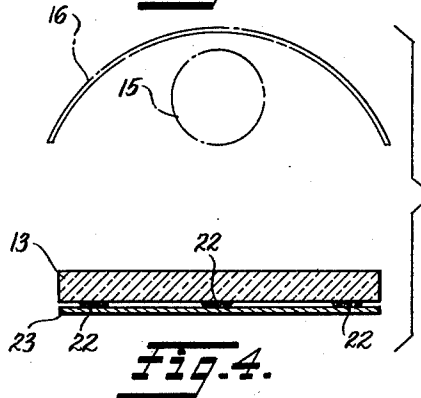
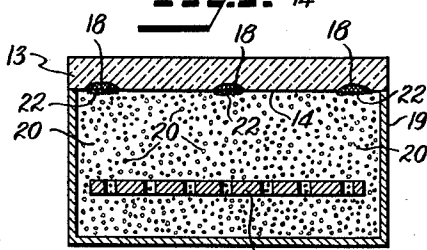
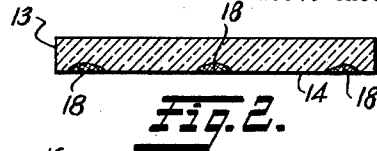
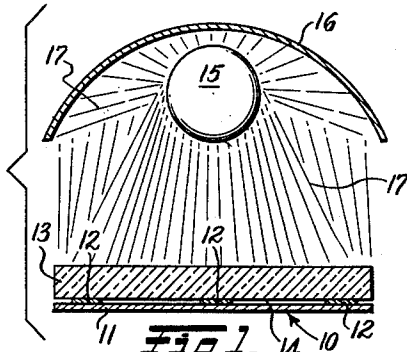
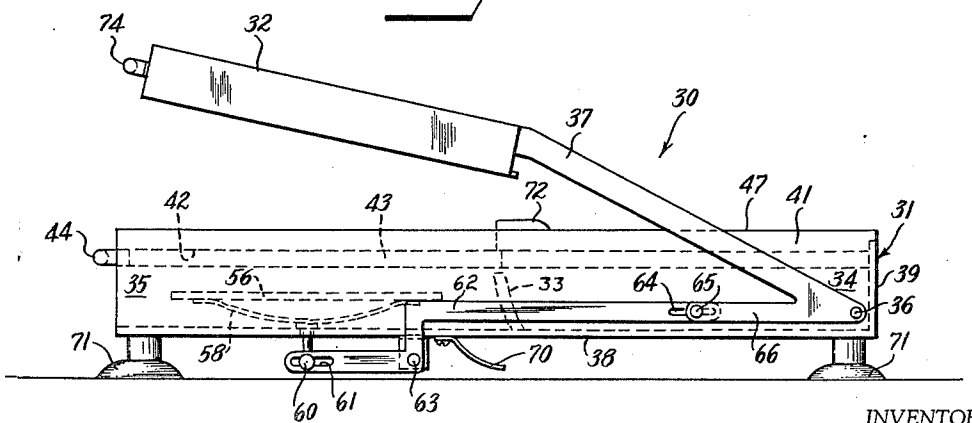


Fig. 6.



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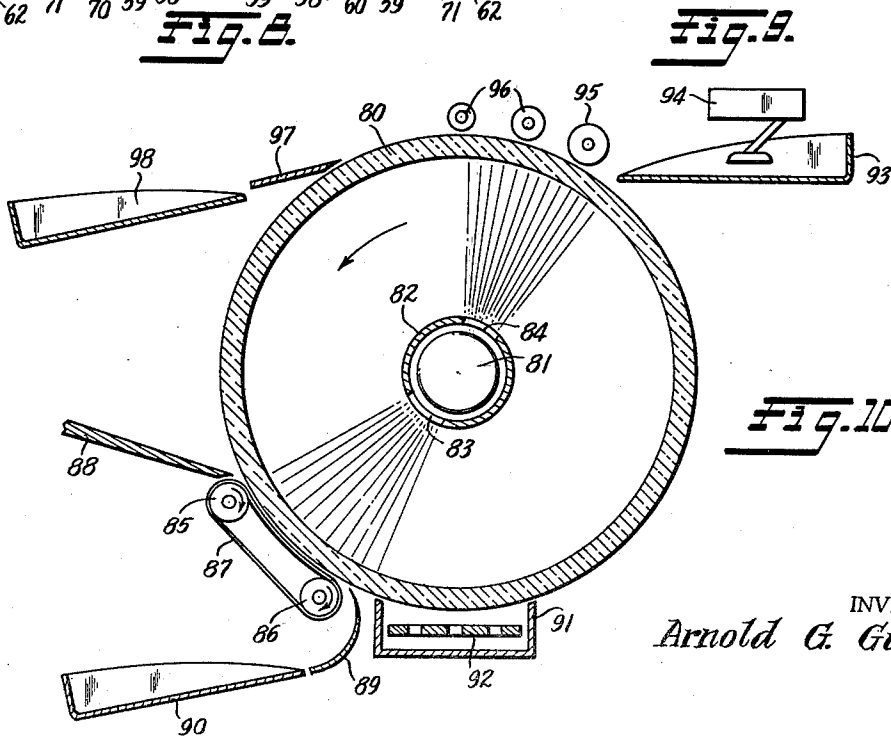
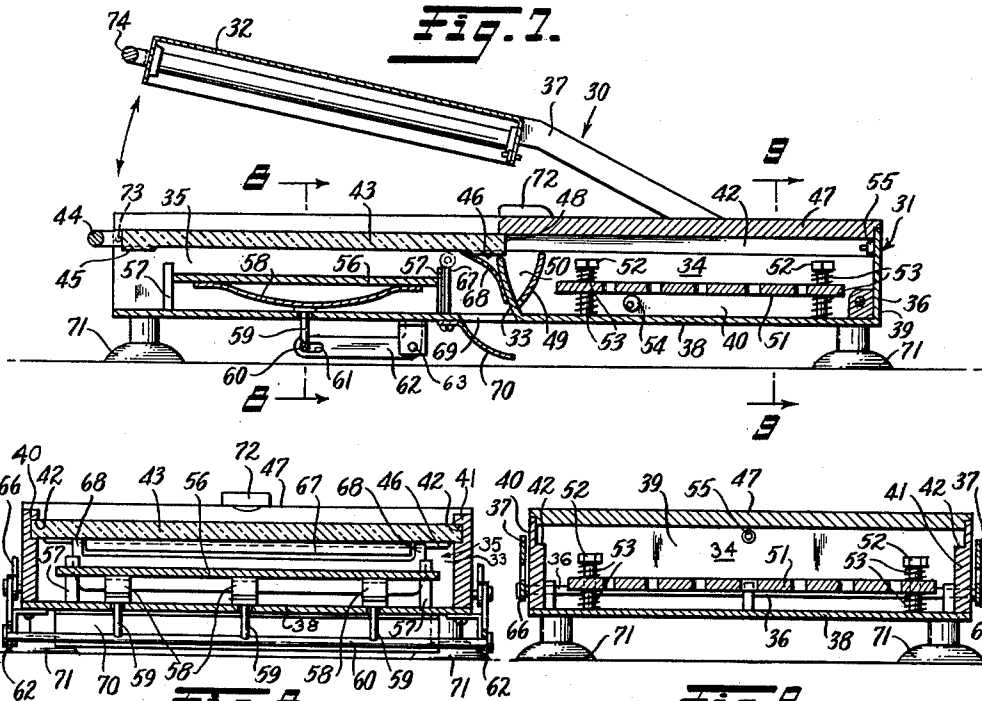
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THERMAL REPRODUCTION

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2 Sheets-Sheet 2



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THERMAL REPRODUCTION
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The present invention relates to thermal reproduction of printed matter and other copy in which the indicia on the original copy is constituted by a material which absorbs radiant energy, e.g., carbon or silver. Thus, the invention is directed to the reproduction of copy produced with carbon-containing printing ink, photographs having a silver image (particularly line or half tone copy as opposed to pictures having tone gradation) or copy produced by typewriting using a carbon-containing ribbon or carbon paper. Pencil markings and writing inks containing carbon may also be reproduced.

The reproduction of copy, as aforesaid, using translucent paper having a heat-sensitive coating on the underside thereof is well known. In this prior process, single copies may be made rapidly and without the mess attendant upon wet reproducing processes. Unfortunately, the special paper required is expensive, lacks body (the paper is sleazy) and remains heat-sensitive.

The present invention is directed to thermal reproduction processes which produce single or multiple copies upon the face of ordinary paper using a single exposure of the original copy. In this manner the simplicity of the thermofacsimile process is retained without its attendant disadvantages. The invention employs printing material in finely divided form, e.g., a dust, and, in this sense, it is not unlike xerography. However, the requirement for expensive and complex equipment which characterizes xerographic reproduction is largely avoided. Moreover, the particulate printing material in the invention is not electrostatically controlled.

In accordance with the invention, copy having heat absorptive material thereon (carbon or silver indicia) is placed in conductive contact with a smooth-surfaced, preferably transparent, heat-insulating layer or plate, which may be flat or arcuate as in a cylinder, and radiant heat is transmitted through the transparent layer to the copy so that the temperature of the heat absorptive material is increased and the transparent layer becomes heated wherever it is in direct contact with the hot indicia on the original copy. The copy is then removed and the transparent layer is dusted with a printing material in finely divided particulate form, some of the particles becoming tacky upon contact with the heated portions of the transparent layer and, as a result, sticking to these heated portions. The transparent layer is then placed upon a sheet of paper, desirably an absorbent alpha-cellulose paper, and pressed against the same to transfer the tacky particles which are adhered to the transparent layer from the smooth surface thereof to the paper and thereby provide a reproduction of the original copy. Heat may be used, especially radiant heat transmitted through the transparent layer, to soften the printing material at the time of transfer.

When transfer to the paper is completed, the surface of the transparent layer may be damp or hot or both wherever the printing material was removed. Thus, further copies may be made by again dusting with particulate printing matter (the same printing powder is desirably used) and further copies made by transferring to paper in the same way described previously. When the printing material contains a dye or pigment not absorptive of radiant energy, dampness must be relied upon for additional copies. When the pigment is carbon, heat may be used in addition to dampness and a greater num-

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ber of copies formed from a single exposure of the original copy. The damp surface referred to above is tacky with respect to particulate printing matter and the term "tacky" is also used herein to denote the condition of dampness which has been discussed.

The invention is illustrated in the accompanying drawings in which:

FIG. 1 is a diagrammatic cross-section which shows the first step of the process of the invention in which copy to be reproduced is placed in contact with a smooth-surfaced transparent, heat-insulating layer and radiant energy is transmitted through the layer;

FIG. 2 shows the transparent layer after the exposure step of FIG. 1 and removal of the copy;

FIG. 3 diagrammatically illustrates the dusting of the differentially heated transparent layer with printing powder which becomes tacky at elevated temperature;

FIG. 4 diagrammatically illustrates the printing step of the invention;

FIG. 5 shows in cross-section the final printed copy;

FIG. 6 is a side elevation of a preferred form of the invention showing an apparatus having a flat bed and a slidable glass plate;

FIG. 7 is a cross-section of the structure shown in FIG. 6;

FIG. 8 is a section taken on line 8—8 of FIG. 7;

FIG. 9 is a section taken on line 9—9 of FIG. 7; and

FIG. 10 is a diagrammatic cross-section of the invention as applied to cylinder operation.

Referring to FIG. 1, copy 10 constituted by a paper sheet 11 having printed indicia 12 thereof is placed in contact with a layer of glass 13 with the indicia 12 contacting the smooth surface 14 of the glass 13. The transmission of radiant energy through the glass 13 is diagrammatically shown by the infra-red lamp 15, the reflector 16 and the heat rays 17.

Immediately after the exposure step shown in FIG. 1, the copy 10 is removed providing a glass layer 13 in which portions of the surface 14 are heated as indicated by hatching 18, the heated portions 18 being those portions previously contacted by the indicia 12. The resulting structure is shown in FIG. 2 where it will be seen that the heated portions 18 are confined to their original locations by the heat-insulating character of the glass which is a known poor conductor of thermal energy.

The differentially heated glass layer 13 is then dusted with finely divided heat-sensitive printing material. This is desirably effected by placing the glass layer 13 in a dust chamber 19 in which finely divided heat softenable resin particles 20 filled with pigment are maintained in a state of agitation. This is desirably effected by a perforated plate 21 which is agitated or vibrated to bring the resin particles 20 into contact with the surface 14 of the glass layer 13. As will be seen in FIG. 3, some of the particles 20 contact the heated portions 18 and becoming tacky because of the heat, stick to form printing portions 22.

The glass layer 13 with the printing portions 22 adhered thereto is then contacted with a sheet of absorbent paper 23 as shown in FIG. 4. Pressure is desirably employed to force the printing material into the paper. Optionally, heat may be used to enhance absorption as indicated in phantom.

The finished reproduction is shown in FIG. 5 where the numeral 24 designates the transferred printing portions.

As will be appreciated, those areas on the surface 14 of the glass layer 13 which were covered by printing portions 22 will be moistened or damp immediately following the transfer or printing step of FIG. 4. The damp areas are attractive to the particles 20. Accord-

ingly, if the layer 13 shown in FIG. 4 is returned to the dusting box 19, new printing portions 22 may be formed and additional copies made therefrom. If heat is used in FIG. 4 and particularly if the particles 20 contain a carbon pigment, dampening of the surface 14 is accentuated and the heat in portions 18 is increased thus facilitating the formation of multiple copies.

As will also be appreciated, the process of the invention is made more effective with increasing speed of operation since this facilitates retention of high temperature and/or dampness and assists in confining the heated portions 18 in their original locations.

A preferred simplified form of the invention is shown in FIGS. 6, 7, 8 and 9 in which a flat bed type reproducing device having a slidable glass plate is depicted. The device of FIGS. 6-9 is particularly adapted for use in small offices or businesses in which one or several copies of various papers must be quickly and easily reproduced.

The flat bed device of FIGS. 6-9 is identified by the numeral 30 and comprises a cabinet 31 and a lamp housing 32. The cabinet 31 is divided by means of transverse partition 33 into a dust box 34 and an exposure and printing enclosure 35. The lamp housing 32 is pivoted to the cabinet 31 by means of pivot 36 and supporting arm 37 and is positioned to overlie the enclosure 35 when in closed position.

The cabinet 31 comprises a bottom 38, rear end wall 39 and side walls 40 and 41. The side walls 40 and 41 are formed with longitudinal grooves 42 within which is fitted a glass plate 43.

As will be seen in FIG. 7, the glass plate 43 is dimensioned to be approximately one-half as long as the length of cabinet 31. At its forward end, glass plate 43 is provided with a handle 44. The under surface of the glass plate 43 is flat and smooth with the exception of the forward and rearward ends thereof which are provided with downwardly-extending bosses 45 and 46. The bosses 45 and 46 are centrally positioned on the glass plate 43 and do not extend into the grooves 42.

The partition 33 extends between the side walls 40 and 41 and reaches upwardly from the bottom wall 38 to a point slightly beneath the grooves 42. The bosses 45 and 46 are intended to seal against the upper surface of the partition 33 which does not otherwise contact the under surface of the glass plate 43, at least along the central portion thereof.

The dust box 34 is formed by the bottom wall 38, the end wall 39, the partition 33 and a top wall 47 which terminates above the partition 33 to form an opening 48 which is defined between the under surface of the top wall 47 and the upper surface of the partition 33. The bosses 45 and 46 are configured to mate with and seal the upper surface of partition 33.

Referring more particularly to dust box 34, the grooves 42 are desirably positioned immediately below the top wall 47 thus preventing dust within the box 34 from depositing on the upper surface of plate 43 when plate 43 is thrust into the dust box 34. To minimize leakage of dust from the dust box through the opening 48, a baffle plate 49 is desirably employed to form a well 50 adjacent the rear of partition 33. Mounted within the dust box 34 is means to agitate the printing powder when desired. In the form of the invention illustrated a perforated plate 51 is mounted above the bottom wall 38 on headed bolts 52 and supported by springs 53 for vertical reciprocation by means of the eccentric 54 which is rotated by a motor not shown.

Mounted on the end wall 39 is a contact button 55 which is positioned in the path of the plate 43. When the plate 43 is fully inserted in the dust box 34, contact button 55 is depressed and eccentric 54 actuated. In this manner the printing powder is agitated into contact with the under surface of plate 43 when this is desired.

Referring more particularly to the enclosure 35, the forward end and top of this enclosure are open, the top

being closed when the lamp housing 32 is depressed or lowered into operating position above plate 43. Beneath plate 43 is an elevatable platform 56 which is guided for vertical movement by the guide posts 57. Platform 56 is mounted upon leaf springs 58 which are raised and lowered by the flanged rods 59. The rods 59 are interconnected by transverse bar 60 which is supported in a slot 61 at the forward end of lever 62 which is pivoted at 63. The rear end of the lever 62 is formed with a slot 64 which engages a pin 65 positioned at the forward end of a lever arm 66 formed integral with the supporting arm 37.

The structure just referred to is best seen in FIG. 6 where it will be observed that levers 62 and 66 interconnect the lamp housing 32 with the platform 56 so that when lamp housing 32 is lowered, the platform 56 is elevated. Leaf springs 58 provide a resilient support for platform 56 to accommodate stacks of paper of various thicknesses.

When lamp housing 32 is lowered, platform 56 will thrust a stack of paper against the under surface of plate 43. When lamp housing 32 is elevated, platform 56 will be lowered to free plate 43 for sliding movement in the grooves 42.

During the printing operation the top sheet of the stack of paper on platform 56 may stick to plate 43. Thus, when plate 43 is thrust forwardly into dust box 34, the copy which is produced is carried with it. Optionally, a presser element 67 may be provided to squeeze the copy against the plate 43. The presser element 67 is diagrammatically shown and would be manipulated into and out of presser position as needed either manually or automatically.

The partition 33 as can be seen in FIG. 7, slopes forwardly and carries a pair of doctor elements 68 which bear against the under surface of plate 43 adjacent the margins of the paper. Thus, when plate 43 is thrust forwardly with a paper sheet adhered thereto, this paper sheet may be pressed into firm contact with plate 43 by means of a presser element 67 and removed by the doctors 68. The bottom plate 38 is apertured as indicated at 69 and a deflector 70 is positioned beneath the aperture so that paper removed from the plate 43 will be ejected beneath the dust box 34.

Cabinet 31 is mounted upon suction cup legs 71 to elevate the cabinet 31 and provide room for the deflector 70 and the lever 62. The suction cups anchor the cabinet when plate 43 is moved.

The lamp housing 32 and platform 56 are balanced or spring biased so that the lamp housing 32 is normally elevated as shown in FIGS. 6 and 7. Element 72 is a lock timer and the machine is wired so that, when lamp housing 32 is depressed and is locked in lowered position by the lock timer 72, the lamps within the housing 32 are automatically lit and, after a predetermined time, the lamp housing 32 is released breaking the electrical circuit to the lamp therein.

The electric circuit required is not illustrated since this is conventional and well known. Lock timers of the type contemplated are also well known. Moreover, automatic operation, as indicated is not essential though it is desirable.

Operation of the device pictured in FIGS. 6-9 will now be described. It is desired to point out that actual manipulation of the device is far simpler than the explanation which follows.

At the start of operation, plate 43 is moved into dust box 34. Paper is then stacked on platform 56 and the copy to be reproduced is positioned atop the stack of paper. During preparations, as indicated, lamp housing 32 is elevated and platform 56 is depressed as shown in FIG. 7 and plate 43 is manipulated by handle 44.

It will be observed that the forward movement of plate 43 is limited by resiliently-mounted stop member 73. In this manner when handle 44 is pulled forwardly, plate 43

is automatically positioned above platform 56. If desired, stop member 73 may be depressed and plate 43 removed either completely or in part for cleaning.

With plate 43 properly positioned above platform 56, lamp housing 32 is lowered (a handle 74 being provided for this purpose) until lamp housing 32 locks in lowered position against lock timer 72. When this is done, the heat lamps in housing 32 are automatically lit for a predetermined period after which lamp housing 32 is released and moves upwardly lowering the platform 56 with the paper and copy thereon.

Plate 43 is then thrust into dust box 34 and pressed against button 55 to actuate eccentric 54 and agitate the printing powder which sticks to heated portions of the under surface of the plate to form printing portions thereon. Desirably, the plate 43 is moved into the dust box immediately upon termination of the exposure period to prevent dissipation of heat. While plate 43 is in dust box 34, the operator removes the copy to be reproduced.

Plate 43 is then pulled forwardly to the stop 73 and lamp housing 32 is again lowered into contact with timer 72. When lamp housing 32 is again released by the lock timer, a single sheet of paper sticks to the under surface thereof and presser element 67 may be moved into pressing position and plate 43 is then slid back into dust box 34.

As will be evident, the paper sticking on plate 43 is removed therefrom by doctors 68 and is ejected through aperture 69. In this way the first copy has been produced and further copies may be made if desired.

A second copy is made by pressing plate 43 against button 55 to agitate the printing powder thereby forming new printing portions on plate 43. Plate 43 is then returned to the stop 73 and lamp housing 32 lowered again. When lamp housing 32 elevates, and plate 43 is returned to dust box 34, a further copy is removed by doctors 68 and ejected through aperture 69. This process may be repeated as often as required and until the legibility of the copy produced is no longer acceptable.

The invention is also adapted for continuous rotary operation as is illustrated diagrammatically in FIG. 10 in which a cylinder machine is pictured.

The cylinder machine shown in FIG. 10 comprises a glass cylinder 80 within which is mounted a heat lamp 81 which is surrounded by a shield 82 having an exposure aperture 83 and a print softening aperture 84. On the forward underside of the glass cylinder 80 are feed rolls 85 and 86 about which is trained a belt 87. A chute 88 is desirably provided to facilitate feeding of copy to be reproduced into the nip formed by the roller 85 and cylinder 80. A doctor-baffle 89 is positioned beyond roller 86 to remove the copies to be reproduced by deflecting the same into tray 90. The direction of rotation of cylinder 80 and rollers 85 and 86 is indicated by arrows. Beyond the doctor-baffle 89 is a dust box 91 having a vibrating perforated plate 92 mounted therein so that the heated portions of cylinder 80 are dusted with printing powder.

At the upper rear of the cylinder 80 is a tray 93 which supports a stack of paper and a mechanism indicated generically by the numeral 94 is employed to feed paper from tray 93 into the nip between cylinder 80 and roller 95. Presser rolls 96 are desirably present to press the paper supply against the printing portions which have been deposited on the cylinder 80. Suitable timing relays are also provided so that, when copy to be reproduced is slid down the chute 88, the cylinder 80 will be rotated, the lamp 81 turned on, the vibrator 92 operated and the paper supplying device 94 actuated at the proper moment.

The printed copy is removed from roller 80 by a doctor 97 and deposited in in a tray 98.

It will be appreciated that the present invention is adapted to various other devices, the two specifically

set forth herein being representative of preferred constructions.

Various heat sensitive printing powders may be employed and these may be pigmented or dyed in various ways to provide a printing medium. The preferred pigment is carbon black which is desirably dispersed in a mixture of low molecular weight polymers and a liquid plasticizer which is preferably a reactive plasticizer.

This, a preferred printing dust in accordance with the invention is an intimate admixture of 60 parts by weight of a copolymer of 87 weight percent vinyl chloride with 13 weight percent vinyl acetate and having a molecular weight of about 6000 with 40 parts of dibutyl phthalate plasticizer and 25 parts of dispersed carbon black. The mixture is desirably ground to very fine particle size, preferably all of the powder passing through a 200 mesh screen. The printing dust desirably becomes tacky at about 160° F.

A further illustration of a preferred printing powder is the dust produced by dispersing 30 parts of carbon black in melted gelatin, dispersion being desirably effected in a ball or roller mill. The dispersion so produced is permitted to cool and solidify and is then ground until all of the powder passes through a 200 mesh screen. Paraffin may be used in place of gelatin. Similarly, polyethylene may be employed in place of gelatin or paraffin. As is well known, polyethylene may be provided as polymers of various molecular weight, the lower molecular weight materials becoming tacky at progressively lower temperatures. Accordingly, by varying the molecular weight of the paraffin or polyethylene employed and also by varying the nature and proportion of pigment, printing powders which become tacky and adherent at various pre-selected temperatures may be prepared. The sharpness of the copy which is produced is partially dependent upon the fineness of the particle size of the printing material which is employed. Accordingly, the printing material should be ground or micronized to as fine a particle size as is feasible, there being no limit to the finess of the particle size which may be used.

It will be appreciated that the above printing powder is merely illustrative of various printing materials which may be employed, the only requirement for the printing material being that it be finely divided and become tacky upon contact with the heated portions of the transparent layer which is used. The preferred printing dust set forth will leave, upon removal of the paper sheet, a damp film of plasticizer upon the transparent layer. This is particularly true when heat is employed immediately prior to removal of the paper copy. Moreover, the preferred printing dust contains carbon black and absorbs heat so that the portions of the transparent layer covered by the printing dust are selectively heated during the printing operation.

The invention is defined in the claims which follow.

I claim:

1. A method of reproducing copy comprising dusting a smooth-surfaced layer of heat-insulating material having portions of the said surface thereof heated to elevated temperature in a pattern corresponding to the pattern of the copy to be reproduced with finely divided particles of printing material which becomes tacky when in contact with said heated portions, pressing a sheet of material against said surface in contact with said adhered printing material and stripping said sheet from said layer to transfer said printing material from said layer to said sheet.

2. A method of reproducing copy comprising dusting a smooth-surfaced layer of heat-insulating material having portions of the said surface thereof heated to elevated temperature in a pattern corresponding to the pattern of the copy to be reproduced with finely divided particles of printing material which becomes tacky when in contact with said heated portions to adhere printing material to

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said heated portions, pressing a sheet of absorbent material against said surface in contact with said adhered printing material, stripping said absorbent sheet from said layer to transfer said printing material from said layer to said sheet and provide tacky areas on said surface where said printing material was removed, again dusting said layer with finely divided particles of printing material to adhere printing material to the tacky areas thereof, pressing another sheet of absorbent material into contact with said adhered printing material and stripping said last-named sheet from said layer to transfer said printing material from said layer to said sheet.

3. A method of reproducing copy comprising dusting a smooth-surfaced layer of heat-insulating material having portions of the said surface thereof heated to elevated temperature in a pattern corresponding to the pattern of the copy to be reproduced with finely divided particles of carbon-containing printing material which becomes tacky when in contact with said heated portions to adhere printing material to said heated portions, said heated portions of said surface being heated by exposure of an original copy in contact therewith to radiant heating, said original copy having printing material thereon which is absorptive of said radiant heating while the substrate of said original copy is, with respect to said printing material, reflective of said radiant heating, pressing a sheet of paper against said surface in contact with said adhered printing material, radiantly heating said printing material to soften the same and reheat the portions of said layer in contact therewith, stripping said paper from said layer to transfer said printing material from said layer to said paper, again dusting said layer with finely divided particles of printing material which becomes tacky when in contact with said heated portions to adhere printing material thereto, pressing another sheet of paper into contact with said adhered printing material and stripping said last-named sheet of paper from said layer to transfer said printing material from said layer to said sheet.

4. A method of reproducing copy comprising dusting the smooth undersurface of a transparent layer of heat-insulating material having portions of said undersurface heated to elevated temperature in a pattern corresponding to the pattern of the copy to be reproduced with finely divided particles of printing material which becomes tacky when in contact with said heated portions to adhere printing material to said heated portions, said heated portions of said surface being heated by exposure of an original copy in contact therewith to radiant heating, said original copy having printing material thereon which is absorptive of said radiant heating while the substrate of said original copy is, with respect to said printing material, reflective of said radiant heating, pressing a sheet of paper against said surface in contact with said adhered printing material and stripping said paper sheet from said layer to transfer said printing material from said layer to said paper.

5. A method is recited in claim 4 in which said printing material is particles of thermoplastic resin containing carbon.

6. A method as recited in claim 4 in which said printing material is particles of thermoplastic resin in admixture with plasticizer and containing carbon dispersed therein.

7. A method of reproducing copy surfaced with indicia which absorbs radiant heat, said copy, with respect to said indicia, reflecting radiant heat, comprising contacting a layer of smooth-surfaced, transparent, heat-insulating material with the indicia surface of said copy, transmitting radiant heat through said layer to said indicia to heat said indicia and thereby raise the temperature of the portions of the surface of said layer in thermal conductive contact with said indicia, removing said copy from said layer, dusting the heated surface of said layer with finely divided particles of printing material which

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becomes tacky when in contact with said heated portions to adhere printing material to said heated portions, pressing a sheet of absorbent material against said layer in contact with said adhered printing material and stripping said absorbent sheet from said layer to transfer said printing material from said layer to said sheet.

8. A method as recited in claim 7 in which said layer is a sheet of glass.

9. A method as recited in claim 7 in which said printing material absorbs radiant heat and radiant heat is transmitted through said layer to heat said printing material which is adhered thereto and thereby facilitate transfer of said printing material to said sheet.

10. A method of printing a plurality of copies from a single exposure of original copy surfaced with indicia which absorbs radiant heat, said copy, with respect to said indicia, reflecting radiant heat, comprising contacting a layer of smooth-surfaced, transparent, heat-insulating material with the indicia surface of said copy, transmitting radiant heat through said layer to said indicia to heat said indicia and thereby raise the temperature of the portions of the surface of said layer in thermal conductive contact with said indicia, removing said copy from said layer, dusting the heated surface of said layer with finely divided particles of printing material which becomes tacky when in contact with said heated portions to adhere printing material to said heated portions, pressing a sheet of absorbent material against said layer in contact with said adhered printing material, stripping said absorbent sheet from said layer to transfer said printing material from said layer to said sheet and provide tacky areas on said surface where said printing material was removed, again dusting said layer with finely divided particles of printing material to adhere printing material to the tacky areas thereof, pressing another sheet of absorbent material into contact with said adhered printing material and stripping said last-named sheet from said layer to transfer said printing material from said layer to said sheet.

11. A method as recited in claim 7 in which said printing material is heated to facilitate transfer thereof to said sheet.

12. A method of printing a plurality of copies from a single exposure of original copy surfaced with indicia which absorbs radiant heat, said copy, with respect to said indicia, reflecting radiant heat, comprising contacting a layer of smooth-surfaced, transparent, heat-insulating material with the indicia surface of said copy, transmitting radiant heat through said layer to said indicia to heat said indicia and thereby raise the temperature of the portions of the surface of said layer in thermal conductive contact with said indicia, removing said copy from said layer, dusting the heated surface of said layer with finely divided particles of carbon-containing printing material which becomes tacky when in contact with said heated portions to adhere printing material to said heated portions, pressing a sheet of absorbent material against said layer in contact with said adhered printing material, transmitting radiant heat through said layer to said adhered printing material, stripping said absorbent sheet from said layer to transfer said printing material from said layer to said sheet, again dusting said layer with finely divided particles of said printing material to adhere printing materials to portions of said layer corresponding to said indicia, pressing another sheet of absorbent material into contact with said adhered printing material and stripping said last-named sheet from said layer to produce another copy of said original copy.

13. A method as recited in claim 12 in which said layer is glass and said sheet is paper.

14. A method of printing copies from a single exposure of original copy surfaced with indicia which absorbs radiant heat, said copy, with respect to said indicia, reflecting radiant heat, comprising elevating said original copy with said indicia on its upper surface into

contact with the underside of a plate of glass, transmitting radiant heat downwardly through said glass to said indicia to heat said indicia and thereby raise the temperature of the undersurface of said glass in contact with said indicia by conduction of heat therefrom, laterally moving said glass plate into a dust box containing suspended particles of printing material which becomes tacky when in contact with said heated portions to adhere printing material to the heated portions of the undersurface of said plate, laterally moving said plate out of said dust box back to its original position, elevating a sheet of absorbent material against the undersurface of said plate and then returning said plate to said dust box to remove said sheet from said plate.

15. A method as recited in claim 14 in which radiant heat is transmitted downwardly through said glass to

said printing material while said absorbent sheet is elevated against the undersurface of said plate and said printing material is thermoplastic resin containing carbon.

16. A method as recited in claim 15 in which said steps of laterally moving said plate, elevating a sheet of absorbent material and radiantly heating said printing material are repeated to produce a plurality of copies.

References Cited in the file of this patent

UNITED STATES PATENTS

2,503,758	Murray	Apr. 11, 1950
2,616,961	Groak	Nov. 4, 1952
2,629,671	Murray	Feb. 24, 1953
2,844,489	Gemmer	July 22, 1958