

Sept. 2, 1941.

A. L. HESS ET AL

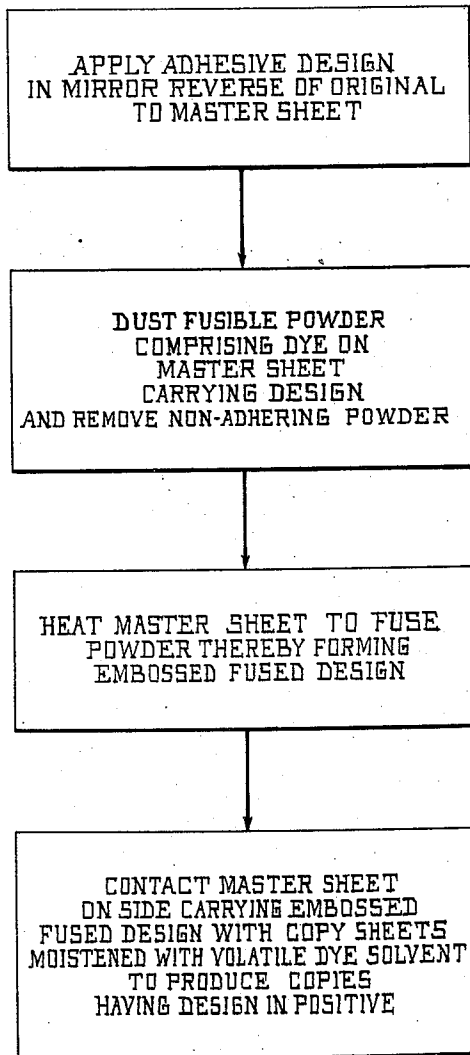
2,254,483

DUPLICATING PROCESS AND PREPARATION OF MASTER COPIES FOR USE THEREIN

Filed June 29, 1939

2 Sheets-Sheet 1

Fig. 1.



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2 Sheets-Sheet 2

Fig. 2.

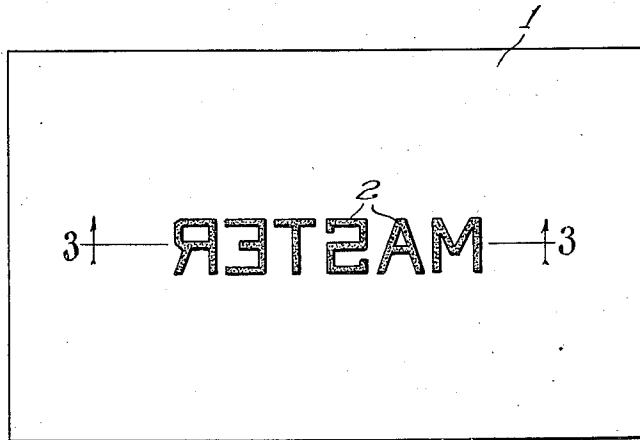


Fig. 3.

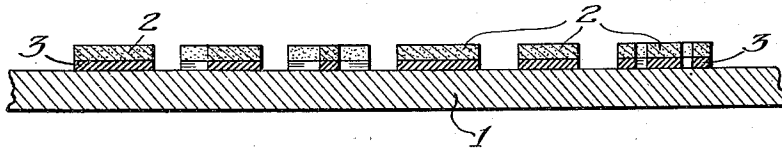
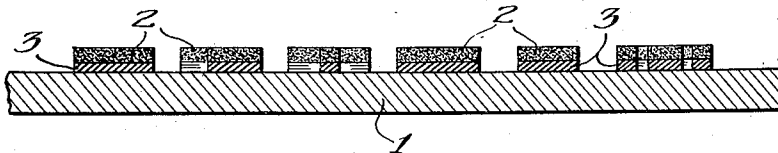


Fig. 4.



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UNITED STATES PATENT OFFICE

2,254,483

DUPLICATING PROCESS AND PREPARATION
OF MASTER COPIES FOR USE THEREIN

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Application June 29, 1939, Serial No. 281,764

13 Claims. (Cl. 41—31.6)

The invention relates to the art of duplicating. More particularly the invention relates to improvements in hectograph and the so-called liquid or spirit reproduction processes, and to the preparation of master copies for use therein.

In reproduction processes heretofore known which involve the transfer of designs formed of water or alcohol soluble dyes, difficulties have been encountered in obtaining a sufficiently heavy dye ink deposit. Large amounts of ink tend to fill in the fine characters whereas small amounts of ink give masters of insufficient lasting and copying qualities.

One embodiment of this invention is a master copy sheet having a design thereon formed by fusing a powdered dye composition. The master sheet, depending upon whether the design formed thereon is a positive or mirror-reverse, may be used either as a hectograph master or a liquid process master. In either case an improvement in the number and sharpness of copies is obtained over that procured by ordinary masters.

Other objects and advantages of the invention will become apparent as the following detailed description progresses, reference being had to the accompanying drawings, in which

Fig. 1 is a diagrammatic flow sheet of the process of this invention involving the use of volatile solvents;

Fig. 2 is a plan view of the master copy sheet for use in the process of this invention illustrated in Fig. 1;

Fig. 3 is a section taken along the line 3—3 of Fig. 1, showing the master sheet with the design thereon prior to fusing the powdered dye composition;

Fig. 4 is a similar view to Fig. 2, showing the embossed characters after fusion of the dye composition.

Referring to the drawings, the reference character 1 indicates a sheet to be used as a master copy sheet, having thereon an embossed design formed of a layer 2 of a fused dye composition and a layer 3 of an adhesive composition.

The master copy comprising the sheet 1 and fused embossed design is prepared by applying the adhesive design 3 in reverse on the sheet 1. This may be done by printing on the sheet 1 with type in positive form instead of mirror-reverse form as is customary, using slow drying ink or other suitable composition of tacky or adhesive nature which will transfer to the sheet 1. The adhesive design 3 may also be applied in reverse to the sheet 1 by using a pressure or impact type transfer sheet similar to a carbon sheet, except

that the transfer composition including the adhesive, is generally free from carbon or other pigment. In applying the design by means of such transfer sheets, the sheet 1 is placed against the coated surface of the transfer sheet (not shown) and the material to be reproduced is impressed on the exposed surface of the sheet 1 by drawing, writing, typing or the like. Such impressing results in the formation on the other surface of the sheet 1 of a mirror-reverse copy represented by deposited adhesive (shown in 3) due to the transfer of a portion of the adhesive from the transfer sheet to the sheet 1.

As soon as the adhesive representation has been deposited on the surface of the sheet 1 hereinafter called the master copy sheet, a fusible powder comprising a soluble dye is dusted over the adhesive design. Surplus powder which does not stick to the design may be readily removed by brushing, blowing or other fashion.

The master sheet carrying the design of fusible powder indicated by 2 of Fig. 3 is then exposed to sufficient heat to melt the powder. The powder will then flow together to form fused raised characters of considerable thickness as shown in 2 of Fig. 4.

The master copy sheet carrying the embossed heat flowed design is then contacted with copy sheets moistened with a volatile solvent for the dye of the design, thereby transferring a portion of the dye to the copy sheets to form the design thereon in positive characters. By successively contacting and removing copy sheets in this manner, a large number of copies having excellent sharpness of character may be obtained.

In carrying out the process of the invention, the character of the fusible powder is important. Generally we prefer to employ a powder from which the finest particles have been removed, for example by sifting. A fairly uniform particle size, say between 50 and 200 mesh, generally gives the best results. The powder should contain a substantial proportion of soluble dye and must fuse or melt at a temperature below the decomposition temperature of the dye. In order to decrease the melting point of the composition, the dye is mixed with another fusible material. It may be mixed with a fusible substance in which it does not dissolve to form a mechanical mixture, but preferably it is mixed with a fusible substance in which it will dissolve to form a solid solution. It is contemplated that the powdered composition may consist of the dye alone where the dye itself is capable of fusing or melting without decomposing. Preferably,

however, the dye is associated with another fusible substance either as a mechanical mixture or in solution.

As examples of mechanical mixtures which have been found satisfactory, the following are given:

Example I

	Parts by weight
"Standard Santo resin"—a hydrocarbon resin sold by the Monsanto Chemical Company, obtainable by polymerization from cracked gasoline under influence of aluminum chloride in accordance with Thomas and Hochwalt Patent 1,836,629	50
Crystal violet	50

Example II

	Parts
"Nuba No. 1"—a resinous hydrocarbon pitch sold by the Neville Company	30
Methyl violet	70

Example III

	Parts
Burgundy pitch	40
Crystal violet	60

Example IV

	Parts
Burgundy pitch	20
Gum dammar	20
Beeswax	5
Crystal violet	60

The ingredients of the above formulae are intimately mixed together and made into a fine powder. The ingredients may be mixed together by stirring the dye in powdered form into the heated fluid resin. The mixture is allowed to cool and the cake thus obtained is powdered or granulated and preferably sifted to produce fine particles of fairly uniform size and substantially free from dust.

As an example of solid solutions suitable for the practice of this invention, the following are given:

200 parts of urethan are melted in a water bath and 250 parts of crystal violet are added. On cooling the mix solidifies and becomes brittle and easily pulverizable. It is then comminuted by means known to the art so as to produce a powder or granulation of say between 50 and 250 mesh and substantially free from dust. The powder thus obtained is dusted on printed copies while the characters are still adhesive, or in other words while the ink is still wet. The sheets are warmed so as to fuse the powder and produce embossed characters. From masters thus obtained more than one hundred and fifty very strong copies are obtainable in each run by the application of moistened copy sheets as in the usual wet process reproduction.

It has been found that the urethans when heated above their melting point have the property of giving highly viscous solutions of aqueous or alcohol soluble dyes such as those commonly used in hectograph and liquid process duplication. These solutions harden to extremely brittle and easily pulverizable solids when cooled to room temperature, and therefore are particularly suitable in the practice of this invention.

Other suitable solutions for the aqueous or alcohol soluble duplicating dyes are the normally solid alkyl cyclo hydrocarbons.

A suitable solid solution which is made similar to the urethan compositions and which gives similar results is composed of 30 parts by weight

of trimethyl cyclo propane and 70 parts by weight of crystal violet.

Among the dyes contemplated for use in this invention are the hectograph and spirit process duplicating dyes mentioned in Hoskins Patent 2,088,417, and the less commonly used dyes described in Brower 2,040,075. The solvents likewise may be any of the solvents used in liquid process duplication, including those mentioned in Brower 2,040,075 and 2,077,874, and in the co-pending application of Bjorksten, Serial No. 244,055, filed December 5, 1938.

The adhesive composition for retaining the powdered dye composition may be of any desired composition so long as it is suitable for the purpose intended. It may be colorless or have dye incorporated therein. It may be any of the slow drying inks used in printing such as, for example, one of the linseed oil type printing inks. When a transfer sheet is used to produce the adhesive design, an adhesive composition such as described in Neldich Patent 2,095,075, made up of a combination of beeswax and rosin in proportion of 100 parts of beeswax to 8 parts of rosin, is suitable.

The masters produced according to this procedure can be used for hectograph duplication processes, as well as for the liquid process duplication primarily contemplated in the above examples.

While there have been shown and described certain embodiments of the invention, it is to be understood that it is capable of many modifications. Changes, therefore, may be made without departing from the spirit and scope of the invention as described in the appended claims, in which it is the intention to claim all novelty inherent in the invention as broadly as possible, in view of the prior art.

We claim:

1. In a reproduction process wherein a solvent is used to transfer a design on a master sheet to a plurality of copy sheets, the step which consists in subjecting to heat sufficient to flow into a coherent mass a fusible powder in the form of a raised design on the master sheet, said powder including an alcohol soluble dye and urethan.

2. In a reproduction process wherein a solvent is used to transfer a design on a master sheet to a plurality of copy sheets, the step which consists in subjecting to heat sufficient to flow into a coherent mass a fusible powder in the form of a raised design on the master sheet, said powder including an alcohol soluble dye and trimethyl cyclo propane.

3. The process of duplicating which comprises contacting the side of a master sheet carrying a design formed of a fused dye composition with a copy sheet moistened with a volatile solvent for the dye of said composition, said dye composition comprising an alcohol soluble dye and a binder which fuses at below the decomposition temperature of the dye.

4. The process of duplicating which comprises contacting the side of a master sheet carrying a design formed of a fused solid solution of an alcohol soluble dye composition with a copy sheet moistened with a volatile solvent for the dye of said composition, said solid solution having the property of fusing at below the decomposition temperature of the dye.

5. The method of preparing a master copy sheet which comprises producing on a master sheet a copy of the matter to be reproduced, said copy

being represented by deposited adhesive, applying a fusible powdered dye composition containing sufficient alcohol soluble dye for multiple reproduction in admixture with a substance which fuses at a temperature lower than the decomposition temperature of the dye to the surface of the master sheet having the adhesive representation thereon so that the powdered dye composition adheres to the representation, removing the surplus powdered dye composition and subjecting the master sheet to heat sufficient to cause the powdered composition to fuse together and form embossed characters corresponding to the adhesive representation.

6. The method of preparing a master copy sheet which comprises producing on a master sheet a copy of the matter to be reproduced, said copy being represented by deposited adhesive, applying a powdered fusible solid solution of an alcohol soluble dye stuff which solid solution fuses at below the decomposition temperature of the dye stuff to the surface of the master sheet having the adhesive representation thereon so that the powdered dye composition adheres to the representation, removing the surplus powdered dye composition and applying heat to the master sheet to cause the powdered composition to fuse together and form embossed characters corresponding to the adhesive representation.

7. The method of preparing a master copy sheet which comprises producing on a master sheet a copy of the matter to be reproduced, said copy being represented by deposited adhesive, applying a powdered fusible dye composition comprising an alcohol soluble dye and urethan to the surface of the master sheet having the adhesive representation thereon so that the powdered dye composition adheres to the representation, removing the surplus powdered dye composition and applying heat to the master sheet to cause the powdered composition to fuse together and form embossed characters corresponding to the adhesive representation.

8. The method of preparing a master copy sheet for use in multiple reproduction processes which comprises producing on a master sheet a copy of the matter to be reproduced, said copy being represented by deposited adhesive, applying a powdered fusible dye composition comprising an alcohol soluble dye and trimethyl cyclopropane to the surface of the master sheet having the adhesive representation thereon so that the powdered dye composition adheres to the representation, removing the surplus powdered dye composition and applying heat to the master sheet to cause the powdered composition to fuse together and form embossed characters corresponding to the adhesive representation.

9. A master copy sheet for use in duplication comprising a sheet having a design thereon formed of a fused solid solution of an alcohol soluble dye stuff, said solid solution having the property of fusing at below the decomposition temperature of the dye.

10. A master copy sheet for use in duplication comprising a sheet having a design thereon formed of a fused solid solution of an alcohol soluble dye stuff in a substance selected from the group consisting of urethans and cycloparaffines.

11. A master copy sheet for use in duplication comprising a sheet having a design thereon formed of a fused solid solution of an alcohol soluble dye stuff in urethan.

12. A master copy sheet for use in duplication comprising a sheet having a design thereon formed of a fused solid solution of an alcohol soluble dye stuff in trimethyl propane.

13. A master copy sheet for use in duplication comprising a sheet having a design thereon formed of a fused dye composition containing sufficient alcohol soluble dye to effect multiple reproduction, in admixture with a normally solid substance which fuses at below the decomposition temperature of the dye.

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