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TRANSFER PROCESS AND COPY PAPER
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West VirginiaNo Drawing. Application March 6, 1939,
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The invention relates to an improvement in transfer processes for effecting reproduction or transfer of designs from an original or master copy, and includes copy sheets particularly adapted for use in the process.

The invention is based on my discovery that paper having a wetting agent suitably distributed on its surface when contacted with a configuration of a water or alcohol soluble dye on a gelatinous hectograph mass will receive and retain 10 the configuration in much higher color intensity than if untreated paper is used.

The wetting agent is preferably applied to the paper by a tub sizing operation in which the un- 15 sized paper is dipped into an aqueous dispersion containing the wetting agent and other ingredients which may be desired, as ordinary sizing materials such as casein, glue, rosin, alum, or fade resisting agents such as bentonite and silica gel. Complete impregnation of the paper results 20 with the usual thin coating of the material on the surface, on the fibres and through the pores of the paper.

The wetting agent may also be applied to the paper, particularly when cards are used, by 25 brushing the surface. Preferably, even in this case, the wetting agent is allowed to penetrate considerably below the surface.

In any event the wetting agent is so distributed in the sheet and on its surface that it is avail- 30 able for contact with the dye transferred to the copy sheet by a hectograph or like duplicating process.

After the application of the wetting agent to the paper, whether it be by tub sizing, machine 35 sizing, or coating, the paper sheet containing the wetting agent may be calendered.

The amount and concentration of wetting agent in the paper and on its surface is made 40 such that substantial increased color intensity of applied dye characters is attained over that attained with untreated paper. Preferably, however, the coating on the paper should not be so heavy as to completely cover all the fibres on the surface of the paper.

Where liquid or semi-solid wetting agents are used care is taken that the amount of wetting agent throughout the paper is not so great as 45 to make the paper too soft and weak for commercial use.

Furthermore, the concentration of the wetting agent should not be such as to cause "feather- 50 ing." By increasing or decreasing the amount of solid non-wetting agents such as fillers in the paper in admixture with the wetting agent the

wetting or spreading effects of the dyes can be regulated for various types of wetting agents so that "feathering" is practically eliminated.

By including bentonite, silica gel or other face 5 resisting agents in the paper with the wetting agent fade resistance of the color impressions applied to the paper is enhanced.

In the practice of the invention a large number of wetting agents have been tried and found 10 suitable. The conclusion has been reached that the determining factor in the invention is the use of wetting agents as a class. These substances are recognized in the art as a class of materials which decrease surface tension a substantial amount and improve spreading, penetra- 15 tion and adhesion of liquids to solids, probably as a result of reduction of interfacial tension.

In general suitable wetting agents are composed of a hydrocarbon chain of varying length 20 which is more or less strongly hydrophobic in character, depending on the chain length, with the addition of one or more groups of strongly hydrophilic nature which act as solubilizing groups for the compound.

In the present invention the wetting agents seem to improve color intensity of the copy de- 25 signs by enhancing spreading of the dye so that it fills out microscopic uncovered spaces which ordinarily exist in the design. Because of the much greater area covered by the dyestuff when wetting agents are present in the paper the optical impression to the eye is one of greatly enhanced copy strength. Also there may be greater removal of the dye from the gelatinous mass. 30 Some wetting agents also act as mordants by an action not understood and cause the design on the copy sheet to be water resistant as well as of high color intensity. Other factors may enter into the action of the wetting agents. It is to be understood, however, that my invention is not limited to any theory as to the mechanism of the action.

The wetting agents contemplated by the invention include the common soaps which in general 45 are the least effective of the wetting agents.

Suitable wetting agents for practicing this invention are:

A. The various wetting agents derived from fatty sources—specifically—

50 (1) Soaps, viz. sodium stearate;
(2) Fatty alcohol sulphates, viz. lauryl sulfate;

(3) Sulfated fatty acid esters, viz. sulfonated castor oil ("Monosulph");

(4) Sulfated fatty acid amides, viz. sodium salt

of sulfonated lauryl and myristyl colamide ("In-tramine").

B. The more truly synthetic surface active compounds including—

(1) Secondary alcohol sulphates ("Tergitol Penetrant 4, 7");

(2) Sulfated esters of higher alcohols and dibasic acids;

(3) Alkyl aryl sulfonates, viz. alkyl naphthalene sulfonate (Aerosol OS);

(4) Sulfonated esters of alcohols and dibasic acids, viz. dioctyl ester of sodium sulfosuccinate (Aerosol OT).

The preferred wetting agents from the point of view of causing least trouble in avoiding "feathering" are Turkey red oil (sulfonated castor oil) sulfonated olive oil, and mahogany soap (sulfonated naphthenic acids derived from petroleum). Wetting agents such as sodium lauryl sulfate and sulfonated tertiary butyl naphthalene require considerable regulation of concentration of the wetting agent in the sheet material by admixture with fillers and the like before "feathering" can be eliminated so that the copy sheet can be written on with an ordinary pen.

To more clearly set forth the practice in accordance with this invention and to more specifically point out the nature of the composition contemplated thereby, several specific, illustrative examples are hereinafter set forth, it being understood that these examples illustrate several embodiments which have given satisfactory results and are not intended to restrict the invention thereto.

Example I

	Parts by weight
"Monosulph" oil (National Oil Products Co.) (a sulfonated castor oil)	5
Water	24
28% ammonium hydroxide	5

This composition was applied to an unsized sulphite sheet of high rag content by means of tub-sizing. Copies taken on this paper by the hectograph process were much brighter than copies similarly taken on any untreated paper.

Example II

	Parts by weight
Bentonite	10
Water	200
Monosulph oil (Nat. Oil Products Co.) (a sulfonated castor oil)	10
28% ammonia	10

This composition was applied to uncoated insurance cards by brushing thereon. Copies taken by the hectograph process on these cards were much brighter than copies similarly taken on any untreated cards.

Example III

Turkey red oil	g-- 10
Water	cc-- 90

The composition is thoroughly mixed with or without heat and applied to a paper surface by any known means.

Example IV

Turkey red oil	g-- 10
Water	cc-- 85
Ammonium hydroxide (concd)	cc-- 5

The composition is thoroughly mixed with or without heat and applied to a paper surface by any known means.

Example V

Mahogany soap (sulphonated naphthenic acids from petroleum)	g-- 10
Bentonite	g-- 5
Water	cc-- 90

The composition is thoroughly mixed with or without heat and applied to a paper surface by any known means.

Example VI

Mahogany soap (sulphonated naphthenic acids from petroleum)	g-- 10
Water	cc-- 90

The composition is thoroughly mixed with or without heat and applied to a paper surface by any known means.

Example VII

Ivory soap (ordinary laundry soap)	g-- 4
Water	cc-- 100

The composition is thoroughly mixed with or without heat and applied to a paper surface by any known means.

Example VIII

	Parts by weight
Bentonite	12
Sulphonated castor oil	20
Water	68

This composition is made by adding the bentonite to the aqueous solution of sulfonated castor oil. It was applied to uncoated insurance cards by brushing them. Copies taken by the hectograph process on these cards were much brighter than copies similarly taken on any untreated cards and also were of good fade resistance.

The copy sheets of this invention are particularly adapted for use in a hectograph type duplicating process. An original master copy sheet is prepared by typing on a sheet of ordinary typewriter paper using an ink of a water or alcohol soluble dye such as methyl violet. The surface of the sheet containing the typewritten matter in the form of a configuration of the dye is contacted with a moistened gelatinous hectograph mass, the dye and configuration being largely transferred thereto in reverse. Copies are then made by applying the copy sheet of this invention to the hectograph mass, each sheet receiving a proportion of the dye to form a copy of the writing on the master sheet.

The copy sheets are also useful in stencil duplication. In this process the master copy is a stenciled sheet made by typing or writing through one of the common stencil sheets known to the art. Copies are made from this stenciled sheet by inking through the openings of the sheet onto the copy sheet of this invention. Enhanced brightness of copies is obtained.

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

I claim:

1. In a hectograph process of duplication, the step of contacting a hectograph copy mass having on its surface a design of a water soluble dye

with a copy paper containing a water soluble wetting agent distributed on the contact surface of the copy paper, said wetting agent being distributed on the surface of the copy paper without completely covering all the fibers on the surface of the paper and extending a substantial distance beneath the surface.

2. In a hectograph process of duplication, the step of contacting a hectograph copy mass having on its surface a design of a water soluble dye with a copy paper containing a sulfonated type wetting agent distributed on the contact surface of the copy paper, said wetting agent being distributed on the surface of the copy paper without completely covering all the fibers on the surface of the paper and extending a substantial distance beneath the surface.

3. In a hectograph process of duplication, the step of contacting a hectograph copy mass hav-

ing on its surface a design of a water soluble dye with a copy paper containing a sulfonated mineral oil distributed on the contact surface of the copy paper, said sulfonated mineral oil being distributed on the surface of the copy paper without completely covering all the fibers on the surface of the paper and extending a substantial distance beneath the surface.

4. In a hectograph process of duplication, the step of contacting a hectograph copy mass having on its surface a design of a water soluble dye with a copy paper containing a sulfonated castor oil distributed on the contact surface of the copy paper, said sulfonated castor oil being distributed on the surface of the copy paper without completely covering all the fibers on the surface of the paper and extending a substantial distance beneath the surface.

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