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SOLVENT

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The present invention relates to solvents, and more particularly to solvents having properties adapting them for use in the transfer of designs, drawings, written and typewritten material and the like. It will be fully understood from the following description, in which illustrative examples of the invention are set forth.

In order that the properties of the solvents of the present invention may be fully understood, it will be described herein in connection with a transfer process of the general character hereinbefore referred to. In certain of these processes, a master copy is prepared in reverse by writing, typing or otherwise producing the design on a master sheet, behind which is a sheet of suitably prepared carbon paper with its carbon surface facing the master sheet. In preparing copies from this master sheet, the surface of the copy sheet is moistened with a liquid, usually water, which has a solvent action on the dyes in the ink deposited upon the master sheet from the carbon paper, and thereby a positive image of the original is reproduced upon the copy sheet. In carrying out such processes, wherein water has been the liquid employed in the transfer process, the dyes employed in the carbon paper employed have been necessarily water-soluble, and hence the range of colors available for use in such processes has been seriously limited in many directions; for example, by lack of blacks. An incidental result accruing from the utilization of solvents of the present invention is that it has rendered possible the use in transfer processes of the type just referred to, of new types of carbon papers free from the limitations in range of colors and in other directions of those previously used, as fully set forth in my copending application, filed January 24, 1935 Serial No. 3,289 now Patent No. 2,040,075.

In such processes water has been employed as the moistening liquid and solvent for the dyes in the transfer process. The solvent of the present invention is non-aqueous, and has a wide range of solubilities for dyes of types not soluble in water, thus permitting the use in transfer processes of dyestuffs hitherto not employed, and having a broader range of colors and greater fastness to light; for example, including the fatty acid salts of induline and nigrosine blacks. Said solvents are also noninflammable, with no or but very slight odor, the odor, if any, being not unpleasant. Their volatility is such as to leave the surface of the copy paper substantially dry after completion of the transfer process, and yet not so great as not to permit sufficient time for carrying out the transfer operation under the usual conditions of practical operation by comparatively unskilled attendants, and with the usual variations in temperature conditions. They do not leave any perceptible or undesirable deposits on the surface of the copy paper after use, nor upon the surface of the master sheet bearing the reverse image. They do not deleteriously affect the inks employed, and in the preferred forms of the present invention, they act to preserve the ink deposits on the master image in usable form, even on intermittent use.

In carrying out the present invention, I employ as the principal constituent of the solvent a fluorochloroethane, preferably difluorotetrachloroethane, which has a melting point of about 26.5° C. and a boiling point of about 91° C. This compound is non-inflammable and has but a slight, camphor-like odor which may be largely removed by careful refractionation. To prepare a more volatile solvent material I may employ, for example, trifluorotrichloroethane, which has a boiling point of about 46.5° C.; or for a less volatile product I may employ, for example, monofluoropentachloroethane, or I may employ mixtures of these or of two of them, or I may include therein the more volatile, more highly fluorinated chloroethanes. In general, the commercial products procurable are fractions including more than a single compound; for example, a commercially produced difluorotetrachloroethane has been found to contain from 25 to 30% of trifluorotrichloroethane and a trace of monofluoropentachloroethane. The products referred to hereinafter are such commercially procurable products.

To the fluorochloroethane, suitably difluorotetrachloroethane, I may add a minor proportion of an organic liquid miscible therewith, those most suitable being solvent liquids having a boiling point of from about 50° C. to about 135° C., thereby reducing the freezing point or congealing point of the mixture. For this purpose I have found to be suitable the lower ketones, such as acetone, ethyl-methyl ketone, and the like; chlorinated hydrocarbons, such as dichloroethane, chloroform and the like, esters of the lower fatty acids such as butyl acetate or a formate, ethyl acetate, and the like; the lower glycol ethers, such as the methyl and ethyl ethers, and the aliphatic hydrocarbons and petroleum hydrocarbon fractions in the boiling point range indicated. The proportion of the organic liquid if thus employed, may vary somewhat, say from 5 to 15%, being such, however, that the desired volatility and reduction in congealing point of the mixture is secured. It has been found that acetone is particularly suitable for this purpose in conjunction with difluorotetrachloroethane, in proportions of about 8 to 12% of the mixture for securing a congealing point in the order of 0° C.

I have found it to be desirable to include in the mixture a small proportion, in general not over 3 to 4%, of an oily, miscible liquid that is

non-volatile or of very low volatility, such as castor oil or other oils or high boiling miscible solvents such as the monobutyl ether of diethylene glycol. Such substances prevent or check the tendency which the solvent mixture frequently develops, of forming a cloudy or crystalline film on evaporation. In the case of the transfer process hitherto referred to, the formation of such a film is particularly objectionable, since it appears to materially delay evaporation. It is my belief at the present time that the formation of this film is due to the presence of minute amounts of impurities in the fluorochloroethane, such as the difluorotetrachloroethane, which is preferably used in preparing a solvent in accordance with this invention. I have found castor oil to be particularly effective in this connection, although other fatty oils, the butyl ethers of diethylene glycol and other miscible organic solvent liquids of little or no volatility may be employed. The minute proportions of substantially non-volatile liquids thus used with the selected fluorochloroethane thus has the effect of aiding in the effective evaporation of the solvent mixture.

When the solvent mixture is employed in carrying out the transfer process of the character described above, the presence of the minute amount of essentially non-volatile liquid in the solvent mixture has the further effect of aiding in the preservation of the master copy and in preventing the drying out of the ink, particularly when the latter is subjected to intermittent use.

A specific composition prepared in accordance with the present invention which I have found particularly satisfactory in use consists of a mixture containing about 10% acetone, 88% difluorotetrachloroethane and 2% castor oil. This mixture does not congeal until a temperature of about 25° C. lower than the freezing point of the difluorotetrachloroethane is reached; evaporates readily and without perceptible deposits, and is particularly advantageous in reproduction processes of the character hereinbefore referred to. If so great a lowering of the congealing point is not desired the proportion of acetone may be decreased, or it may be eliminated entirely; or if desired, it may be increased, say to 15% or even somewhat higher. The proportion of the castor oil may also be varied, as hereinbefore indicated.

I claim:

1. A solvent mixture for dissolving ink in a process of transferring designs, drawings, written and typewritten material comprising a major proportion of a fluorochloroethane, and a small proportion of a substantially non-volatile miscible organic liquid capable of preventing the formation of a surface film during evaporation.

2. A solvent mixture for dissolving ink in a process for transferring designs, drawings, written and typewritten material comprising a major proportion of a fluorochloroethane, and a small proportion up to about 4% of a substantially non-volatile miscible organic liquid capable of preventing the formation of a surface film during evaporation.

3. A solvent mixture for dissolving ink in a process for transferring designs, drawings, written and typewritten material comprising a major proportion of difluorotetrachloroethane and a small proportion of a substantially non-volatile miscible organic liquid capable of preventing the formation of a surface film during evaporation.

4. A solvent mixture for dissolving ink in a process for transferring designs, drawings, written and typewritten material comprising a major proportion of difluorotetrachloroethane and a small proportion of castor oil adapted to prevent the formation of deposits on evaporation.

5. A solvent liquid for dissolving ink in a process for transferring designs, drawings, written and typewritten material comprising a major proportion of a fluorochloroethane, a minor proportion of a miscible organic liquid boiling between about 50° and 135° C., and a small proportion of a miscible organic liquid of low volatility adapted to prevent the formation of deposits on evaporation.

6. A solvent liquid for dissolving ink in a process for transferring designs, drawings, written and typewritten material comprising a major proportion of difluorotetrachloroethane, a minor proportion of acetone as a freezing point depressant, and a small proportion of castor oil adapted to prevent the formation of deposits on evaporation.

7. A solvent liquid for dissolving ink in a process for transferring designs, drawings, written and typewritten material comprising difluorotetrachloroethane and containing about 10% of acetone and about 2% of castor oil adapted to prevent the formation of deposits on evaporation.

8. The method of preventing the formation of surface film during the evaporation of a transfer ink used in a process for transferring designs, drawings, written and typewritten material which comprises employing as a solvent for said transfer ink a composition comprising a major proportion of a fluorochloroethane and a small proportion of a miscible organic liquid of low volatility.

9. The method of preventing the formation of surface film during the evaporation of a transfer ink used in a process for transferring designs, drawings, written and typewritten material which comprises employing as a solvent for said transfer ink a composition comprising a major proportion of a fluorochloroethane and a small proportion of castor oil.

10. The method of preventing the formation of surface film during the evaporation of a transfer ink used in a process for transferring designs, drawings, written and typewritten material which comprises employing as a solvent for said transfer ink a composition comprising a major proportion of difluorotetrachloroethane and a small proportion of castor oil.

11. The method of preventing the formation of surface film during the evaporation of a transfer ink used in a process for transferring designs, drawings, written and typewritten material which comprises employing as a solvent for said transfer ink a composition comprising a major proportion of a fluorochloroethane and a small proportion not over about 4% of castor oil.

12. The method of preventing the formation of surface film during the evaporation of a transfer ink used in a process for transferring designs, drawings, written and typewritten material which comprises employing as a solvent for said transfer ink a composition comprising a major proportion of difluorotetrachloroethane and a small proportion not exceeding about 4% of castor oil.

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