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MANIFOLDING TRANSFER AND METHOD OF MAKING

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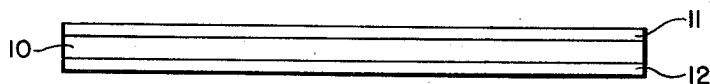


Fig. 1

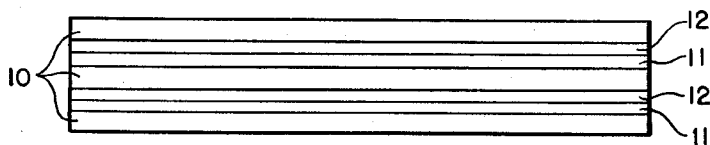


Fig. 2

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MANIFOLDING TRANSFER AND METHOD
OF MAKINGJerome G. Zimmerman, West Milton, Ohio, as-
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11 Claims. (Cl. 282—28)

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This invention relates to transfer copying materials of the kind in which one or more copies of writing produced on an original sheet, for example by handwriting or typewriting, is or are reproduced on a copy sheet or sheets placed beneath the original sheet. Normally such copies are made by the transference of coloring matter from the transfer coating carried either on the back of the original or copy sheets to an adjacent sheet or onto separate interleaved sheets.

Disadvantages of employing interleaved carbon coated tissue between the bond sheets in order to obtain multiple copies is that this increases the bulk of each set of forms and produces illegible copies in the lower forms due to spreading of the individual typed or written characters. The commercial objection to these individual carbon backed forms is the tendency of the pigmented material to rub off and soil the hands of operator or others who handle the same, and also to smudge off on other forms or correspondence when removing them from files or in general office procedure.

It is an object of the present invention to provide transfer copying materials which operate without the transfer of carbon or other deep coloring matter, and in such a manner that a substantially colorless or light colored compound, but potentially capable of forming a dark colored sulfide derivative, is transferred from the rear surface of the first sheet upon which the direct impression is made to the front surface of the second sheet; the latter carries a coating containing a compound which reacts with the transferred compound to form the said dark colored sulfide. The first sheet cannot only mean the top sheet but any sheet below it, the term being one of order where another sheet is being considered and the transfer is from the rear surface of one sheet to the top surface of the next sheet. And the second sheet cannot only mean the actual second sheet but any sheet upon which the transfer is made.

A further object of the invention is to provide transfer surfaces or coatings upon a sheet of writing paper having the advantageous features and inherent meritorious characteristics as herein mentioned.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the advantageous features, the components of the coating compositions, and the mode of application and use as hereinafter described or illustrated in the accompanying drawing, or their equivalents.

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In the accompanying drawing, which is of a diagrammatic nature,

Fig. 1 is a view of a single sheet of writing paper with the transfer surfaces or coatings applied thereto, and

Fig. 2 is a view of an assembly of superposed writing sheets forming a set of manifold record forms.

Like parts are indicated by similar characters of reference throughout the several views.

According to the present invention, there is provided a set of transfer copying materials comprising a series of two or more sized sheets of paper 10, on the face or upper side of each of which sheets is provided a non-sticky, non-tacky coating 11 which contains a light colored, water-soluble metallic sulfide, a water-insoluble polyvalent metal salt of a higher carboxylic acid, the sulfide of the metal of which is colorless, and a very small amount of water. And on the reverse surface of the same sheet there is a substantially firm, non-sticky, non-tacky coating 12, which contains a lead salt and a very small amount of water.

To prepare the upper surface, the sized sheet of paper 10 is coated with an emulsion 11 whose phases are a volatile organic water-immiscible liquid and water; in the later there is dissolved an alkali metal sulfide. The emulsifying agent is a water-insoluble polyvalent metal salt of a higher carboxylic acid incapable of forming a dark sulfide by the reaction, such as aluminum palmitate. This coated sheet is then permitted to dry.

To prepare the reverse surface, the sized sheet of paper 10 is coated with an emulsion 12 whose phases are also a volatile water-immiscible organic liquid, which may be the same as in the first emulsion, and water. Here the emulsifying agent is a water-insoluble polyvalent metal salt of a higher carboxylic acid including such lead salts, although preference is given such aluminum salts; in that situation where the salt of the long chain carboxylic acid is of a metal whose sulfide is substantially colorless, there is dissolved in the aqueous phase lead nitrate or lead acetate or other water-soluble lead salts. Higher fatty acids are the preferred higher carboxylic acids particular the solid, saturated higher fatty acids but resin acids or naphthenic acids may be used. The thus coated reverse side of the sheet is permitted to dry.

A suitable way to produce these contiguous surfaces of sized paper 10, one of which surfaces carries a coating 11 containing a light colored lead salt and the other surface a coating 12 con-

taining a colorless water-soluble sulfide will now be explained. One surface of a sized sheet of paper 10 is coated with an emulsion 11 composed of potassium sulfide dissolved in water, carbon tetrachloride and aluminum palmitate. The reverse side of the sheet 10 is coated with an emulsion 12 composed of lead nitrate dissolved in water, carbon tetrachloride and aluminum palmitate. These respective emulsions do not penetrate the sized paper. These respective emulsions when applied to the surfaces of the sized sheets as a thin coating dry to a thin film. The respective finished coated surfaces possess a fairly solid or firm condition and are not sticky or tacky. Possibly very small amounts of water may be retained or exist. It is necessary to have some water in the coatings because the chemical reaction that produces the copy is brought about by ionization and this is impossible without water.

The emulsions can be used interchangeably on the face and reverse side of the paper.

The sized sheets cannot be coated simply with water-solutions of a sulfide and lead salt respectively. For one thing such aqueous solutions would be taken up by the paper, and then become dry, leaving the sulfide in a dry condition upon one surface and the lead salt in a dry condition upon the reverse side. Dry portions of an alkali metal sulfide will not react with dry portions of a lead salt. Moreover since the paper would, after the application of the two solutions, be wet, it would allow the two chemicals to react at once by penetrating into the paper, causing the formation of a dark colored metallic sulfide, such as lead sulfide.

An example of a suitable emulsion formula in terms of proportions to be applied as a coating 12 to one surface of the sized sheet, wherein the quantities are given in terms of percentage by weight, is as follows:

	Per cent
1. Volatile organic liquid (carbon tetrachloride) -----	62.3
2. Water-insoluble polyvalent metal salt of a higher fatty acid (aluminum palmitate) -----	5.2
3. Water-soluble inorganic lead salt (lead nitrate) -----	3.8
4. Water -----	28.2

The immiscible liquid may be any suitable volatile organic liquid, such as carbon tetrachloride, benzene, toluene, etc.

The polyvalent metal salt of the higher carboxylic acid which preferably is aluminum palmitate, but aluminum stearate, calcium-, magnesium-, zinc stearates, and other polyvalent metallic salts of the higher fatty acids, resin acids, or naphthenic acids may be used.

Suitable water-soluble lead salts are lead nitrate and basic lead acetate.

If lead palmitate or lead stearate is used in place of aluminum palmitate or other of the above polyvalent metal salts of higher carboxylic acids, the sulfide of the metal of which is colorless no other lead salt is required. This would be true for other lead salts of the higher carboxylic acids. In that case the emulsion would be formed of lead palmitate, the volatile organic liquid such as carbon tetrachloride and water.

Bleached shellac or other resins may be added to the emulsion to alter the color and improve the texture of the coating for some varieties of paper. Amounts within the range 1-10% may be used. The more bleached shellac there is present the lighter the color the emulsion coating composi-

tion will be. However, too much will hinder the reaction between the lead salt and the soluble sulfide when the transfer is attempted. It is customary to dissolve the shellac in methanol or other solvent therefor before adding to the other constituents.

An example of the other emulsion 11, which is to be applied to the opposite surface of the sized sheet, will have components 1, 2 and 4 supra, in that approximate ratio, but the third component will be a water-soluble sulfide, such as sodium sulfide or potassium sulfide. This alkali metal sulfide and the soluble lead salt are present in the ratio of their chemical equivalents.

The formula for the emulsion 12 which I prefer is composed of carbon tetrachloride, aluminum palmitate, and either basic lead acetate or lead nitrate, and water. The percentage by weight of carbon tetrachloride should exceed that of water. The constituents should be well mixed to secure an emulsion before the application thereof to the sized paper. The formula for the emulsion 11 would have water-soluble sodium sulfide instead of the lead acetate or the lead nitrate, and in the ratio of their chemical equivalents; otherwise it is the same. A somewhat greater ratio of volatile organic liquid to water is the optimum ratio.

It will be understood that if only two sheets were treated it will be unnecessary to treat the top surface of the overlying sheet with one emulsion or the under side of the only underlying sheet with the other emulsion. But in making up transfer paper for manifold commercial or industrial use the conventional process would be to treat the two surfaces of each sheet of sized paper with the two different emulsions respectively to form on one surface a fairly firm coating which is non-sticky or -tacky, containing a lead salt plus a very small amount of water and on the reverse surface a fairly firm coating which is likewise non-sticky or -tacky, containing a light colored water-soluble metallic sulfide, a water-insoluble polyvalent metal salt of a higher carboxylic acid, the sulfide of the metal of which is colorless, and a very small amount of water. The coating on the other side to which reference has been made contains a metallic higher carboxylate salt which may be the lead salt or a polyvalent metallic salt, the sulfide of the metal of which is colorless. If it is a lead salt of a higher carboxylic acid, then as mentioned previously no other lead salt is required.

The emulsions or dispersions herein described may be applied to various weights and qualities of sized paper having a surface which will take and hold the coatings; a suitable sized paper is tub sized (starch) paper. They may be applied in any suitable manner, such as spraying, brushing, and various coating methods. The thickness will be governed partly by the economical consideration but an even, thin coating should be secured, which will dry to a thin non-sticky, non-tacky film containing some water.

The present invention finds utility in the making of copies or transfers wherein not alone imprints by pencil, pen and typewriter are employed, but also for use with printing telegraph machines, stencil machines, and the like.

In the specification and claims the term "higher carboxylic acids" denotes any carboxylic acid of eight or more carbon atoms and preferably twelve or more. The term "higher fatty acids" denotes those carboxylic acids normally present as glycerides in fatty oils and fats. Preferably the poly-

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valent metal soaps are of the higher fatty acids, wherein fatty acids may be unsaturated as well as saturated types but the latter being preferred.

The expression emulsion or dispersion as employed in the specification and in the claims is used in a broad sense to include colloids, suspensions, emulsions, and emulsoids. It is believed that in the type of emulsion for both the face and reverse side of the sheet water is the dispersed phase, but I am not bound by this theory. This is because the metallic soaps employed are hydrophobic emulsifiers, which are known to form water-in-oil emulsions. Also in both the specification and claims the term "light colored" embraces white as well as the light colored shades unless otherwise qualified.

While specific materials, proportions have been described herein, it will be understood that various changes and modifications may be made without departing from the spirit and scope of the invention. Accordingly I do not intend that my invention shall be limited to such embodiment and examples, except as hereinafter described in the appended claims.

I claim:

1. In manifolding, superimposed contacting sized sheets, the contacting surfaces being provided respectively with a substantially firm, non-sticky, non-tacky coating carrying therein a very small amount of water and a light colored lead salt of a higher carboxylic acid, and a substantially firm, non-sticky, non-tacky coating carrying a light colored water-soluble sulfide and a water-insoluble polyvalent metal salt of a higher carboxylic acid the sulfide of the metal of which is colorless, and a very small amount of water.

2. The method of forming transfer papers comprising the steps of coating one surface of a sheet of sized paper with an emulsion containing a lead salt of a higher carboxylic acid, a volatile water-immiscible organic liquid and a lesser amount of water, coating the reverse side of the sheet with an emulsion containing a light colored sulfide dissolved in water, a light colored water-insoluble polyvalent metal salt of a higher carboxylic acid the sulfide of the metal of which is colorless, and a volatile water-immiscible organic liquid the percentage of the latter to that of the water being substantially greater, causing the coatings to dry, whereby there is left on each of the said surfaces a substantially firm, non-sticky, non-tacky coating but containing a very small amount of water.

3. The method of forming transfer papers comprising the steps of coating one surface of a sheet of sized paper with an emulsion containing a lead salt dissolved in water, a polyvalent metal salt other than lead of a higher carboxylic acid the sulfide of the metal of which is colorless, and a volatile organic liquid, coating the reverse side of the sheet with an emulsion containing a light colored sulfide dissolved in water, a light colored polyvalent metal salt of a higher carboxylic acid the metal of which does not form dark colored sulfides, and a volatile organic liquid wherein there is more organic liquid than water in each emulsion, causing the coatings to dry, whereby there is left on each of the said surfaces a substantially firm, non-sticky, non-tacky coating but containing a very small amount of water.

4. In manifolding, superimposed contacting sized sheets, the contacting surfaces being provided respectively with a substantially firm, non-sticky, non-tacky coating carrying therein a very small amount of water, a light colored lead salt

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of a higher fatty acid, and a substantially firm, non-sticky, non-tacky coating carrying an alkali metal sulfide, a very small amount of water and an aluminum salt of a higher fatty acid.

5. In manifolding, superimposed contacting sized sheets, the contacting surfaces being provided respectively with a substantially firm, non-sticky, non-tacky coating carrying therein a very small amount of water, bleached shellac, a light colored lead salt of a higher fatty acid, and a substantially firm, non-sticky, non-tacky coating carrying bleached shellac, an alkali metal sulfide, a very small amount of water and an aluminum salt of a higher fatty acid.

6. The method of forming transfer papers comprising the steps of coating one surface of a sheet of sized paper with an emulsion containing a lead salt dissolved in water, an aluminum salt of a higher carboxylic acid and a volatile organic liquid, coating the reverse side of the sheet with an emulsion containing an alkali metal sulfide dissolved in water, an aluminum salt of a higher carboxylic acid and a volatile organic liquid, wherein there is more organic liquid than water in each emulsion, causing the coatings to dry, whereby there is left on each of the said surfaces a substantially firm, non-sticky, non-tacky coating but containing a very small amount of water.

7. The method of forming transfer papers comprising the steps of coating one surface of a sheet of sized paper with an emulsion containing a lead salt dissolved in water, an aluminum salt of a higher carboxylic acid, bleached shellac, and a volatile organic liquid, coating the reverse side of the sheet with an emulsion containing an alkali metal sulfide dissolved in water, an aluminum salt of a higher carboxylic acid, bleached shellac, and a volatile organic liquid, wherein there is more organic liquid than water in each emulsion, causing the coatings to dry, whereby there is left on each of the said surfaces a substantially firm, non-sticky, non-tacky coating but containing a very small amount of water.

8. The method of forming transfer paper comprising the steps of coating one surface of a sheet of sized paper with an emulsion containing a lead salt of a higher fatty acid, a volatile water-immiscible organic liquid and a lesser amount of water compared to the organic liquid, coating the reverse side of the sheet with an emulsion containing an alkali metal sulfide dissolved in water, an aluminum salt of a higher fatty acid and a volatile water-immiscible organic liquid, the latter being substantially greater than the amount of water, whereby there is left on each of said surfaces a substantially firm, non-sticky, non-tacky coating, and causing said coating to dry.

9. In manifolding, superimposed contacting sized sheets, the contacting surfaces being provided respectively with a substantially firm, non-sticky, non-tacky, light colored coating carrying therein a very small amount of water, a water-soluble lead salt, and a light colored water-insoluble polyvalent metal salt of a higher carboxylic acid the sulfide of the metal of which is colorless, and a substantially firm, non-sticky, non-tacky coating carrying therein an alkali metal sulfide, a light colored water-insoluble polyvalent metal salt of a higher carboxylic acid the sulfide of the metal of which is colorless, and a very small amount of water.

10. In manifolding, superimposed contacting sized sheets, the contacting surfaces being provided with a substantially firm, non-sticky, non-

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tacky, light colored coating, which coating is characterized by the presence of a higher fatty acid radical in the form of a water-insoluble salt, and lead as an element in a salt, and further characterized in that when said lead is combined as a salt which is water-soluble, the said fatty acid radical is combined as a salt of a polyvalent metal the sulfide of whose metal is colorless, and a substantially firm, non-sticky, non-tacky light colored coating including a water-soluble metallic sulfide and a polyvalent metal salt of a higher fatty acid, the sulfide of the metal of which is colorless, and a very small amount of water being present in each of the respective coatings.

11. In manifolding, superimposed contacting sized sheets, the contacting surfaces being provided respectively with a substantially firm, non-sticky, non-tacky, light colored coating, which coating is characterized by the presence of a higher carboxylic radical in the form of a water-insoluble salt, and lead as an element in a salt,

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and further characterized in that when said lead is combined as a salt which is water-soluble, the said carboxylic radical is combined as a salt of a polyvalent metal the sulfide of whose metal is colorless, and a substantially firm, non-sticky, non-tacky light colored coating including a water-soluble metallic sulfide and a polyvalent metal salt of a higher carboxylic acid, the sulfide of the metal of which is colorless, and a very small amount of water being present in each of the respective coatings.

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