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MANIFOLD SHEET AND PROCESS OF MAKING SAME

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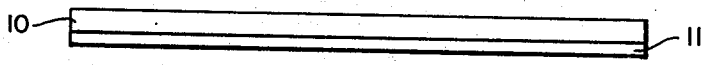


Fig. 1

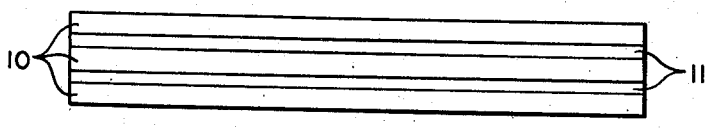


Fig. 2

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MANIFOLD SHEET AND PROCESS OF MAKING SAME

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8 Claims. (Cl. 117—36)

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This invention relates to a manifolding whereby one or more copies of writing produced on an original sheet, for example by handwriting or typing, 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 a transfer coating, carried either on the backs of the original or copy sheets, to an adjacent sheet or onto separate interleaved sheets.

It is an object of the present invention to provide a method of manifolding and the means whereby the use of carbon black or other dark coloring matter transfer surfaces with their attendant disadvantages is dispensed with.

It is an object to provide a writing sheet of paper with a transfer surface on the rear which has thereon a solid, colorless, or substantially colorless coating containing a compound which is capable of reacting with hydrogen sulfide gas to produce a dark or deep color. The coating must be capable of transfer to a contiguous paper surface at the points of impression upon the reverse side of the impacted sheet.

It is more particularly an object to provide a writing sheet whose transfer surface on the rear has thereon a solid, colorless or light colored coating containing a water-soluble lead-, silver-, stannous tin-, or bismuth-compound capable of reacting with hydrogen sulfide gas to produce a black or near black color and a water-soluble polyvalent metal salt of a certain type carboxylic acid; this coating must be capable of transfer from the rear surface of the sheet upon which the direct impression is made to the front surface of the contiguous sheet.

It is furthermore an object to provide a process of producing manifold sheets by treating the sheets with an emulsion which leaves thereon a firm coating upon drying of the components mentioned in the preceding paragraph.

It is also an object to transfer from the transfer surface onto the copy sheet colorless or light colored characters which are the duplicates of those formed upon the original sheet in a typing or writing operation, and then treat the copy sheet containing these colorless or substantially colorless characters with gaseous hydrogen sulfide to create easily legible dark colored characters.

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

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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 composition, and the mode of application and use as hereinafter described or illustrated in the accompanying drawing, or their equivalents.

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 coating applied to the underside thereof, 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 the set of manifold materials comprises a series of two or more sized sheets 10, on the rear surface of each sheet of the series (except the bottom sheet if this is undesirable as explained below) there has been provided a substantially uniform, solid, colorless or very light colored coating 11 containing a water-soluble metallic compound which is capable of reacting with hydrogen sulfide gas to produce a black, semi-black, or a brown color and a water-insoluble polyvalent metal salt of a higher fatty acid, naphthenic acid or a resin acid. Such water soluble metallic compounds are those of lead, silver, stannous tin and bismuth. This coating must be transferable from this rear surface at points of impact or pressure upon the original sheet to the top surface of a contiguous paper surface to duplicate the imprinted characters. There is no reason actually for having the rear surface of the bottom sheet contain any coating unless an extra untreated sheet is inserted below it. The transfer letters, figures, etc. are then caused to become legible by treating the copy sheets with hydrogen sulfide gas.

The explanation of the formation of the dark colored, legible characters is that the hydrogen sulfide reacts with the colorless or light colored lead silver, stannous tin or bismuth compound in the transferred characters to form lead sulfide or the corresponding other metallic sulfides.

A suitable way to produce the coated transfer surface or surfaces 11 of the sheet or sheets 10 of this manifold system is to coat the rear surface of every sheet (deducting one sheet if desired, as the bottom sheet) with an emulsion made from a lead salt dissolved in water, a water-insoluble volatile organic liquid and a water-

insoluble polyvalent metal salt of a carboxylic acid selected from the group consisting of the higher fatty acids, naphthenic acid or resin acids, which latter salts are incapable of producing a black to brown color with hydrogen sulfide. The volatile water-immiscible organic liquid should be present in an amount exceeding the total weight of the other components mentioned which form the emulsion. Such an emulsion does not penetrate or wet the sized paper to any significant depth. When applied to the surfaces of sized sheets it dries to a thin film, which is not sticky or tacky. The finished coated surface possesses a fairly solid, uniform condition and is substantially dry.

Suitable organic liquids for the aforesaid emulsion are carbon tetrachloride, benzene, toluene, etc. They are inert with respect to the other components of this emulsion.

The water-insoluble polyvalent metal salt of the higher carboxylic acids may be those of aluminum, calcium or zinc. It is preferred to use aluminum stearate or the aluminum salts of other higher fatty acids; but the aforesaid metallic salts of naphthenic or the resin acids may be used. Water-soluble lead salts giving the best results are lead nitrate or the basic acetate. When the lead salts of the higher fatty acids are employed, such as lead palmitate, it is unnecessary to employ aluminum palmitate with lead nitrate or basic lead acetate. This is likewise true for the equivalents of each as set out previously.

Bleached shellac may be added to the emulsion to alter the color and improve the texture of the coating for some varieties of paper. The more bleached shellac present the lighter the color will be. But too much will hinder the reaction. Amounts of 1–10% are usually suitable. Instead of bleached shellac other light colored natural or synthetic resins which dry to a fairly solid state can be employed.

It has been found suitable to employ an emulsion to coat the sized paper made from a formula of the following type, each of which components must be of a light color:

	Per cent by weight
1. Volatile organic liquid	77.5
2. Water-insoluble polyvalent metal salt (Al), other than lead, of a higher fatty acid	3.1
3. A water-soluble lead salt	3.9
4. Water	15.5

This emulsion, when applied to the back of sized paper and permitted to dry, yields sheets 10 coated on one surface with a substantially solid, uniform coating 11 which is not sticky or tacky.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following examples which are given merely to illustrate the invention and are not to be construed in a limiting sense, all parts being given by weight:

Example 1

	Per cent
Carbon tetrachloride	77.5
Aluminum palmitate	3.1
Lead nitrate	3.9
Water	15.5

The lead nitrate was first dissolved in water, whereupon these other ingredients were well mixed with this solution to form an emulsion. This was applied to the rear surface of the selected sized paper. The treated paper was then

permitted to dry. The paper had a coating which was substantially white in color and solid to touch and was not sticky or tacky. A series of these forms was placed in a typewriter arranged with the coated surface at the rear of each sheet in the series; a plain, untreated sheet was below the last of the series. There was then typed out designated words and figures, the set of forms receiving the type blows from the typewriter, thus causing the light-colored coating to be transferred from the reverse side of the sheet at the point of percussion to the underneath sheets. The sheets, with the exception of the top sheet which carried the original, were then removed from the typewriter and exposed to dry hydrogen sulfide gas whereupon the previously practically invisible characters and figures became legible because of the chemical reaction. These were semi-black, clear, distinct and non-smudging.

In the above example bleached shellac can be substituted up to 10% for the corresponding ratios of the other three components, carbon tetrachloride, aluminum palmitate and water. Methanol can be used to put it in solution.

Example 2

	Per cent
Carbon tetrachloride	77.5
Lead palmitate	6.9
Water	15.6

These three components were well mixed. The resulting emulsion was applied to the rear surface of the sized, selected sheets, and the other operations set out in the previous example carried out as there explained. The typed characters which were a dull black after the reaction with dry hydrogen sulfide gas were likewise clear, visible and substantially non-smudging.

It will be understood that, whereas certain specific examples have been described in the foregoing exposition of the invention, the present invention is not limited to these but is susceptible to various modifications and adaptations, as will be apparent to those skilled in the art, without departing from the scope of the invention as stated in the appended claims. In the claims the term "colorless" is used to embrace light colored shades as well as white. In both the specification and claims the term "higher carboxylic acid" or "higher fatty acid" denotes an acid of eight or more and preferably twelve or more carbon atoms. Where "fatty acids" are referred to there is meant those higher fatty acids present as glycerides in fatty oils and fats.

I claim:

1. A manifold sheet of sized paper on one side of which is a substantially uniform and solid, non-tacky, non-sticky, thin coating, which is colorless, containing as major components a water-soluble metallic compound selected from the group consisting of lead, silver, stannous tin and bismuth which compound is capable of reacting with hydrogen sulfide gas to produce a dark color, and a water-insoluble polyvalent metal salt of a carboxylic acid selected from the group consisting of the higher fatty acids, naphthenic acid and resin acids, which latter salt is incapable of reacting with this gas, the amount of these two metallic components being sufficient to provide a pressure transferable coating, the said coating being formed by the steps of claim 3.

2. A manifold sheet of sized paper on one side of which is a substantially uniform and solid,

non-tacky, non-sticky, thin coating, which is colorless, containing as major components a water-soluble lead compound and an aluminum salt of a carboxylic acid selected from the group consisting of the higher fatty acids, naphthenic acid and resin acids, the amount of these two metallic components being sufficient to provide a pressure transferable coating, the said coating being formed by the steps of claim 4.

3. In the process of producing a manifold sheet comprising the steps of coating a surface of a sized sheet of paper with a colorless emulsion containing a substantially inert water-immiscible organic liquid which is volatile at room temperature, water, a water-soluble metallic compound selected from the group consisting of lead, silver, stannous tin and bismuth which compound is capable of reacting with hydrogen sulfide gas to produce a dark color, and a water-insoluble polyvalent metal salt of a carboxylic acid selected from the group consisting of the higher fatty acids, naphthenic acid and resin acids, which latter salt is incapable of producing a dark color with this gas, the said organic solvent being present in an amount by weight exceeding that of all the other components in the emulsion, then causing this coated sheet to dry, the amount of deposited metallic compounds being sufficient to provide a pressure transferable coating.

4. In the process of producing a manifold sheet comprising the steps of coating a surface of a sized sheet of paper with a colorless emulsion containing a substantially inert water-immiscible organic liquid which is volatile at room temperature, water, a water-soluble lead compound and an aluminum salt of a carboxylic acid selected from the group consisting of higher fatty acids, naphthenic acids and resin acids, which latter salt is incapable of producing a dark color with this gas, the said organic solvent being present in an amount by weight exceeding that of all the other components in the emulsion, then causing this coated sheet to dry, the amount of deposited metallic compounds being sufficient to provide a pressure transferable coating.

5. The process set out in claim 3, wherein a light colored resin is present in the emulsion.

6. A coated sheet of sized paper set out in claim 5.

7. The process set out in claim 4, wherein a light colored resin is present in the emulsion.

8. A coated sheet of sized paper set out in claim 7.

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