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PRESSURE SENSITIVE TRANSFER SHEET

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This invention relates to a new method of preparing transfer sheets and to the novel transfer sheets prepared by this method.

In the transfer paper industry, conventional carbon paper is the most widely used at present. This carbon paper is manufactured by what is known as the hot melt process in which conventional paper is coated with a hot melt of wax and carbon black pigment which is spread in a layer over the paper foundation while still in molten condition.

This process is the most common at present even though it is recognized that it involves many problems. One serious problem arises from the fact that hot melt wax is very light and oily and has penetrating powers far in excess over solidified wax. Therefore, when the hot wax and pigment is coated on paper, a large amount penetrates the paper and is not available for transfer purposes.

Another disadvantage resides in the cost and supervision required by the heating apparatus. The machinery is bulky and the temperature of the wax must be closely controlled.

Therefore, it is an object of this present invention to prepare transfer media such as webs, strips, sheets and ribbons without the necessity of applying the transfer coating as a wax melt.

It is another object of the present invention to prepare transfer media which do not absorb the pressure-transferable layer to any extent and therefore have substantially all of the pressure-transferable material available for transfer purposes.

It is a further object of the present invention to prepare transfer media of the carbon paper type which are cleaner to the touch and which pressure-release images which are more smudge-resistant than those heretofore known by the hot melt process.

These and other objects are accomplished by the method hereinafter described.

According to the present invention it has been found that conventional pressure-transferable waxes carrying pigment may be applied to a water-resistant base as a water dispersion rather than a hot melt. Upon evaporation of the water there remains a pressure-transferable composition at the surface of the paper completely available for imaging.

It has been found important that the foundation sheet be substantially water-resistant. Otherwise, of course, the foundation would be impregnated with the water dispersion of the wax and pigment which would then not be available for transfer purposes. In this regard it has been found that any water-resistant paper foundation may be used such as conventionally sized paper, paper treated with wet-strength agents or paper coated with water-resistant materials such as ethyl cellulose, vinyl resin such as vinyl chloride-vinyl acetate copolymers, polyvinyl acetate or polyvinyl butyral, etc. The water-resistant plastic foundations such as cellophane, cellulose acetate, polyethylene terephthalate (Mylar), polyvinylidene chloride (Saran), polyvinyl chloride, vinyl chloride-vinyl acetate copolymer (Vinylite VYHH), and others may also be used in place of treated paper.

In carrying out the manufacture of carbon paper according to the present invention, a mix is prepared by

stirring finely divided wax into water which is preferably warmed somewhat for the purpose. In addition, it is preferred to add a conventional emulsifying agent. Fatty acid soaps may be used which are derived by reaction between a fatty acid having 22 or less carbon atoms and an alkali metal such as sodium or potassium. Sulfur-containing emulsifiers such as the alkyl sodium sulfonates, sodium glyceryl monolaurate sulfate and dioctyl sodium sulfosuccinate may be used. The non-ionic emulsifying agents such as the ethylene oxide polymers also provide good results. A mixture of fatty acid and alkali has been found most suitable since it aids in the formation of a more perfect suspension of the wax and water and also tends to soften and plasticize the waxy coating which ultimately results. However, a suitable suspension may be obtained by continuous beating of the wax-water dispersion. Suitable coloring matter is added to the mix, preferably by first dispersing the same in a quantity of water which is then mixed with the wax-water dispersion. The whole is then preferably passed through a ball or colloid mill to render the dispersion smooth and uniform.

When the coating mix is completed, it is spread evenly on a flexible water-resistant foundation by vat coating, spraying, air-knife, reverse roll coating or the like. It is then heated to at least the fusion temperature of the wax used to melt the wax and evaporate the water, forming a waxy colored layer which is transferable to an adjacent contacting surface by pressure, but which is exceedingly dry, non-tacky and smudge-resistant.

Drying of the final sheet occurs preferably by heating to a temperature in the area of the melting point of the usual vegetable and mineral waxes employed in the transfer layer. This may be accomplished by passing the coated sheet through a drying tunnel, drying loft or on heated rollers. To drive off the water, the heating time is comparatively long in the loft method where low temperatures are used, and comparatively short where the high temperatures of heated rollers are used. The tunel method of heating is therefore preferred in which medium temperatures in the range of 150°–250° F. are employed and the dwell time is just long enough to provide excellent results. In this way, the wax layer fuses to a smooth, clean surface.

Where paper is used as the foundation material, it should be sized or otherwise treated to render it water-resistant. Conventional sizing baths may be used containing materials such as protein-formaldehyde, casein-formaldehyde, melamine-formaldehyde and urea-formaldehyde condensates, acrylate and methacrylate polymers, polyvinyl alcohol, etc. Such materials may be incorporated in the make-up of the sheet by adding them to the beaters, or otherwise applied in manners well-known to those in the art. Also, unsized paper may be treated with a coating of ethyl cellulose, vinyl resin or other synthetic polymer to render it water-resistant.

The ingredients mentioned heretofore are present in the pigment dispersion in about the following proportions:

	Parts by weight
Wax	8.
Emulsifying agent (fatty acid and alkali)	10–20.
Coloring matter	16–32.
Water	Sufficient to provide desired coating consistency, i.e. 100.

Various waxes and wax mixtures may be used and waxes which have been found particularly suitable are ouricoury wax, microcrystalline petroleum wax known as Be Square Wax, beeswax and raw montan wax.

No particular limitations need be placed on the type

of emulsifying agent used, but oleic acid and potassium hydroxide have been found to work very satisfactorily. In this connection it is noted that the alkali should be present in sufficient amount to bring about proper suspension in the water of all of the other ingredients, and to this end it is preferred that the alkali be at least equal in weight to the fatty acid present.

The coloring matter may be any of various pigments or lakes depending upon the hue desired and preferably is present in an amount equal to about two to four times the weight of the wax present. In case it is desired that the transfer layer have hectographic or copying properties so that the mark produced shall be usable as a master in a hectographic duplicating process, dyes soluble in alcohol or suitable duplicating fluids may be substituted in whole or in part for the pigments or lakes.

While it is not essential, the character of the coating is frequently found to be improved by adding a small amount of glycerine which acts as an additional softening agent.

In order that the invention may be more clearly understood, the following description of a particular preferred coating composition is given by way of example but is not intended to be limiting upon the invention.

Example

	Parts by weight
Ouricoury wax	4
Microcrystalline petroleum wax (Be Square Wax)	4
Oleic acid	6
Potassium hydroxide	8
Glycerine	1
Water	100

When the above-listed ingredients have been thoroughly intermixed and reduced to a smooth uniform consistency, preferably in a colloid mill, they are mixed with about an equal weight of a color mixture, for example a 20% dispersion in water of a pigment (e.g. carbon black), a lake, or a dye, and the whole composition is preferably milled together for a brief period. The composition is then in condition to be spread in a thin layer on a foundation member according to the procedure hereinbefore recited. When the layer is dry, the result is a completed transfer member whose coating is readily and easily transferred to a contacting sheet by writing or typing pressure. Furthermore, the surface of the transfer coating is clean and non-tacky and does not tend to smudge or offset in those areas where pressure is not applied. The coating will be found to be supported well up on the surface of the foundation and will not be impregnated materially into the body of the foundation.

The foregoing description should not be construed as being limited to the specific materials named, the essential point of the discovery being that water-wax dispersion coatings may be applied to water-resistant foundation sheets or ribbons in a simple and economical manner to provide transfer media having excellent properties of cleanliness-to-the-touch and smudge-proof images.

Any of the suitable conventional pressure-transferable waxes, pigments, emulsifying agents and foundation sheets may be used and are well-known to the art.

Thus, variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. A pressure-sensitive transfer medium comprising a substantially water-resistant foundation bearing a pressure-transferable coating comprising the heat fused residue of a water dispersion containing a major amount by weight of water, a water-insoluble wax, an emulsifying agent, and coloring matter.

2. A pressure-sensitive transfer medium according to claim 1 in which the water-resistant foundation is sized paper.

3. A pressure-sensitive transfer medium according to claim 1 in which the water-resistant foundation is a plastic film.

4. A pressure-sensitive transfer medium according to claim 1 in which the emulsifying agent comprises a mixture of a fatty acid and an alkali.

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