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METHOD OF DECORATING TEXTILE FABRICS

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6 Claims. (Cl. 91—68)

This invention relates to an improvement in the art of textile printing.

Conventional textile printing is ordinarily done with water solutions of dyestuffs containing water soluble thickening agents in sufficient quantity to retard the spreading of the color on the fabric after printing. The dyestuff is fixed onto the fabric by some chemical process and the thickening agent is then washed out of the fabric. The time and expense involved in this after treatment, added to the originally high color cost for light and tub-fast dyes, has been a major problem in textile printing. An unsolved problem has been the reproduction of very fine designs. Since the pastes spread on the fabric after printing when thin enough to be removed sharply from fine engravings, giving blurred designs, it has been found impossible to use photogravure cylinders or extremely fine mill and dye engravings. Attempts to modify these pastes by addition of wetting agents and emulsification of oils therein have not solved the basic difficulties.

The use as printing pastes of colored lacquers (which, for the purpose of this application are defined as dispersions of color in vehicles consisting of a solution of a plastic or solid film forming, water resistant binder such as a cellulose derivative or a resin, in an organic solvent or mixture of solvents) has been attempted in order to overcome the difficulties with prior art pastes, but has not been successful commercially. Relatively few lacquer compositions withstand both dry cleaning and washing; and such compositions as are resistant have been generally unacceptable due to the fact that the fabrics, when printed with these lacquers, develop an undesirable stiff feel (known to the trade as "hand"), to the necessity for using large amounts of color to obtain deep shades, and to the tendency of colored markings to rub off onto other clothing and leave a mark (known as "crocking").

I have invented a new method of textile printing involving the introduction of a new type of textile printing paste which eliminates the disadvantages of the conventional dye printing pastes and avoids the difficulties which have been encountered in the prior art lacquer printing pastes. My new pastes are emulsions in which an outer continuous water-immiscible-lacquer phase is thickened by an inner aqueous phase which is at least 20 per cent. of the total emulsion, by weight. Preferably, the binder of the lacquer is one which is originally soluble in ordinary organic solvents and which can be converted into an insoluble state after printing—most desirably, a readily heat-polymerizable synthetic resin, best exemplified by the plasticized urea formaldehyde resin.

The use of pastes in accordance with my invention permits of the use of cheap pigments and avoids the after treatment necessary with conventional printing pastes. Furthermore, my new pastes separate sharply even from very fine photogravure cylinders, although thickened sufficiently to prevent any spreading on the fabric; this makes possible much finer printing than can be obtained with conventional pastes. The hand imparted to fabrics by my new pastes is very much less than the hand imparted to similar fabrics by ordinary lacquer pastes having the same binder, the amount of color needed to produce deep shades is sharply reduced, and the crocking substantially eliminated.

I believe that the improved results obtained with my pastes are due to the fact that the color does not penetrate into the fabric or spread laterally on the fabric, so that the bulk of the color remains visible, cemented by binder to the structural fibres of the individual yarns of the fabric, as discontinuous markings at or near the surface of the fabric. Thus, the excessive cementing of fibres and yarns, and the dilution of pigment value characteristic of ordinary lacquer pastes, are both avoided, and hand, pigment cost and crocking are sharply reduced.

A further advantage of my invention lies in the fact that the use of water to thicken the lacquer sharply reduces the amount of binder required as well as the amount of pigment, so that excessive hand imparted by mere added weight is avoided. In general, I prefer to maintain the binder content at not above 25%, to minimize weighting of the fabric, and to maintain the volume ratio of binder to pigment at 2 to 1 or higher, to minimize crocking. Although good results are obtainable with 20% water, I prefer to operate in the range of 40 to 60% water content. Larger amounts can be added if desired, but care must be taken not to add so

much water that the emulsion breaks during application.

Still another advantage of the use of these emulsions lies in the fact that the body can be varied readily by varying the ratio of water to organic solvents. This permits ready reproduction of desired body with different lacquers and with different pigments.

Typical examples of textile printing pastes for practicing my invention are as follows:

Example 1

A printing paste is prepared as follows:

10.0 Parts by weight of hydrophobe urea formaldehyde resin solution (50% resin, 30% butanol, 20% xylol)

15.0 Parts by weight of alkyd resin (mixed ester of glycerol, phthalic anhydride and soya bean oil fatty acid corresponding to 25% glycerol phthalate and 75% soya bean oil)

17.0 Parts by weight of turpentine substitute (petroleum hydrocarbon) are stirred together to form the lacquer base.

10.0 Parts by weight of copper phthalocyanine blue pulp (20% pigment, 80% water) are let down with

48.0 Parts by weight of water

and stirred into the lacquer phase in a turbo mixer at a relatively high speed, and the mix is then passed through a colloid mill or homogenizer.

The resultant emulsion, although it contains only 22% solids, has a consistency like that of the conventional dye-pastes used for textile printing—that of a rather soft cold cream. When applied to water absorbent fabrics with the conventional intaglio rollers used for printing fabric with dye pastes, a discontinuous, non-penetrating film is obtained which is unusually flexible, soft and uniform, and has high color value. Because of the consistency of the emulsion, the film produced does not completely surround the individual fibers, but is confined largely to the portions of the fibers adjacent the printed side. In order to develop maximum resistance to washing and dry cleaning in this type of paste containing a heat convertible resin, the fabric should be heated to set the resin. This may be done by passing the fabric over the conventional heating drums used in textile plants, at a temperature of 250 to 300° F.

Some pigments such as the light chrome yellows and certain organic lakes precipitated on alumina hydrate tend to cause breaking of the emulsions. I find that this may be corrected by the inclusion of small percentages of colloidal clay, such as bentonite; these additions tend to stabilize the emulsions.

While stable emulsions can be made in a mixer alone, the use of a colloid mill gives a smoother, more desirable product. Where hydrophobe binders are used, while it is preferable to add the water to the lacquer phase, the order may be reversed; in such event, precipitation occurs initially, until sufficient lacquer is added, when the lacquer coalesces to form a continuous phase.

My invention, while it is of special value with respect to the production of permanent prints on fabric, may also be used for cheaper work, where prior art lacquer prints have been too expensive, by using pastes with very small percentages of pigment and binder. A typical example of this use is the following:

Example 2

A very cheap paste can be made as follows:

A lacquer phase of—

4.5 Parts by weight dewaxed dammar gum

3.5 Parts by weight xylol

19.0 Parts by weight kerosene

and a water phase of

7.5 Parts by weight barium lithol toner pulp (20% pigment, 80% water) let down with

65.6 Parts by weight water

are mixed as described above, to produce a textile printing paste containing only 6% binder and pigment which has the desired consistency of soft cold cream. This paste may be used where unusual flexibility and resistance to dry cleaning are non-essentials. Such low solid emulsions, when made with flexible film forming ingredients as described in Example 1, are highly desirable in the printing of very sheer fabrics.

Printing pastes made from any water-insoluble resins which may be rapidly converted to films which have the desired resistance to washing and/or dry cleaning may be used to produce water-in-lacquer emulsions for the best textile printing. While plasticized urea formaldehyde resins give the most satisfactory results, some phenolic resins, and some drying oil modified alkyd resins, have proven acceptable. These are resins of the class specified as preferable and most desirable on page 1, namely, readily heat-polymerizable synthetic resins which can be converted into an insoluble state after printing by heat-polymerization. These resins may be plasticized, as with fatty oils, the various chemical plasticizers which are water immiscible, and with alkyd resins. Practically all pigments may be used, including metallic pigments previously dispersed in hydrophobe solvents.

In the use of my printing pastes, I prefer to heat the printed cloth to a degree sufficient to convert the resinous binder used to the insoluble state.

The particular printing pastes described herein are not claimed in the present application as they form the subject matter of my co-pending application Serial Number 280,517, filed June 22, 1939, as a continuation in part of my co-pending application Serial Number 182,795, filed December 31, 1937. The present application is a division of said application Serial Number 280,517.

I claim:

1. The method of decorating textiles which consists in applying to an intaglio plate a printing paste consisting essentially of an emulsion of printable consistency containing coloring matter and containing a continuous water-immiscible lacquer phase and a dispersed aqueous phase, and printing upon a textile fabric from said intaglio plate.

2. The method of decorating textiles with a surface decoration which consists in applying to an intaglio plate a printing paste consisting essentially of an emulsion having a continuous water-immiscible lacquer phase containing coloring material bodied to printable consistency by a disperse aqueous phase comprising at least 20% by weight of the paste, and printing upon a textile fabric from said intaglio plate.

3. The improvement in the art of textile printing, which consists in thickening the colors printed on an absorbent textile by the emulsification of a thin aqueous liquid in a thin non-

aqueous liquid, instead of by the incorporation of a solid thickener.

4. The improvement in the art of textile printing, which consists in incorporating coloring matter in a vehicle consisting of thin aqueous and non-aqueous liquids stiffened to printing consistency by emulsification of the aqueous liquid in the non-aqueous liquid, and printing a design on an absorbent textile fabric with the colored vehicle.

5. The improvement in the art of textile printing, which consists in substituting for the dye pastes heretofore used in printing textiles a pigment-colored printing paste consisting of an emulsion having a continuous, thin, water-immiscible, lacquer phase containing the pigment, bodied to printable consistency by a dispersed aqueous phase.

6. The improvement in the art of textile printing, which consists in filling the engraved lines of an intaglio plate with a colored paste whose vehicle consists of thin aqueous and non-aqueous liquids stiffened to printing consistency by emulsification of the aqueous liquid in the non-aqueous liquid, and printing upon an absorbent textile fabric from said intaglio plate.

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