SELVAGE FINISH COMPOSITIONS AND THE TREATMENT OF RESIN TREATED CELLULOSSIC FABRICS THEREWITH

9 Claims, No Drawings

ABSTRACT: Resin treated cellulosic fabrics having a firm and even selvage finish are prepared by treating the selvage of the resin treated cellulosic fabric with an aqueous emulsion comprising effective amounts of polyvinyl acetate and a low molecular weight alcohol followed by drying of the aqueous emulsion on the resin treated cellulosic fabric. The application of the aqueous emulsion comprising polyvinyl acetate and a low molecular weight alcohol as described above to the selvage of resin treated cellulosic fabrics followed by drying of the emulsion on the fabric has been found to provide uniform and even penetration of the resin treated fabric to give a firm and even selvage finish.
3,620,803

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BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to resin treated cellulose fabrics having a firm and even selvage finish and a process for the preparation thereof.

2. Description of the Prior Art

In the processing of cellulose fabrics it has been found to be necessary to provide the edges or selvage of the fabric with a firm and even selvage finish treatment to aid in the further processing of the fabric where the fabric must be held by the edges by grippers or pins, rolled without the edges curling, and the like. It has also been found that the treatment of the fabric with chemical adhesives along the edges of the fabric aids in preventing the cut edges of the fabric from curling, frayin, unraveling and the like. Various chemical adhesive treatments have been used in the past to provide adequate selvage finish to fabrics. Among the adhesives which have been used may be mentioned polyvinyl acetate, acetyl cellulose, gums, glues, shellacs and the like. These treatments have been for the most part unsatisfactory. However, most cellulose fabrics are presently being treated with various resins to provide additional properties to the cellulose fabric such as oil repellency, water repellency, soil-release features, durable-press features, and the like.

It has been found that it is very difficult to apply a firm and even selvage finish on cellulose fabrics which have been treated with any of the various resins discussed above due to the poor penetration properties of the treated fabric. Previous methods and adhesives used to provide even and firm selvage finishes on textile fabrics have been found to be unsatisfactory for the treatment of these resin treated fabrics.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide resin treated cellulose fabrics which have a firm and even selvage finish applied thereto.

It is a further object of the present invention to provide a convenient and simple method for applying a firm and even selvage finish to resin treated cellulose fabrics.

Other objects and advantages of the present invention will be apparent from the following detailed description thereof.

The objects of the present invention are accomplished by applying to the selvage of the resin treated cellulose fabric an aqueous emulsion comprising a polyvinyl acetate emulsion and a low molecular weight alcohol, each ingredient present in the emulsion in an amount sufficient to penetrate the fabric to provide an even and firm selvage finish upon the resin treated cellulose fabric after drying.

The selvage treated fabrics of this invention may then be further processed by conventional means to provide a number of textile materials for various end uses without encountering difficulties which might be encountered due to lack of or nonuniformity of the selvage finish.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The cellulose fabrics to be treated according to the present invention are fabrics comprised of at least about 35 percent by weight of cellulose fibers. The fabrics may be knit, woven, nonwoven, or the like. The treatment of this invention is particularly applicable to knitted fabrics where problems such as curling of the selvage during processing is more likely to occur. The fabrics may consist wholly of cellulose fibers or they may consist of blends of cellulose fibers with other fibers, such as rayon, polyester, acrylic, and the like. For the purposes of this invention, the fabrics treated in accordance with the present invention preferably comprise 100 percent by weight of cellulose fibers. Cellulose fibers applicable for the purposes of this invention include cotton, regenerated cellulose, such as viscose rayon and cuprammonium rayon, cellulose acetate and the like.

The particular problem which is solved by the present invention arises when the cellulose fabrics as described above have been treated with any one or more of various resins well known to those skilled in the art for imparting various properties to the fabric, such as water repellency, oil repellency, improved soil release characteristics, improved permanent press characteristics, and the like. The treatment in accordance with the present invention is particularly applicable to cellulose fabrics which have been treated in such a way to increase their water-repellent characteristics. As an example, 100 percent by weight cotton fabrics treated with a catalytic or nonionic emulsion of a film forming resin (such as Scotchgard FC-210, available from 3M Company) which has been applied properly and cured are extremely difficult to penetrate using conventional selvage finishes. The unique mixture of this invention has been found to overcome this penetration problem found in resin treated cellulose fabrics and penetrates the resin treated cellulose fabrics to provide an even and firm selvage finish.

The present invention involves the treatment of resin treated cellulose fabric with an aqueous emulsion comprised of a polyvinyl acetate emulsion and a low molecular weight alcohol, each ingredient present in the emulsion in an amount sufficient to penetrate the fabric to provide an even and firm selvage finish upon the fabric after drying. The amount of polyvinyl acetate must be controlled in order to provide adequate stiffness to the treated selvage and the low molecular weight alcohol must be controlled to provide for adequate penetration into the selvage without causing the emulsion to become too lumpy. It has been found that a mixture comprising from about 5 to 35 percent by weight of polyvinyl acetate and from about 15 to 70 percent by weight of a low molecular weight alcohol, the balance of the emulsion being comprised of water, is suitable for the purposes of the invention. Preferably, the aqueous emulsion will be comprised of from about 10 to 30 percent by weight of polyvinyl acetate and from about 20 to 60 percent by weight of the low molecular weight alcohol, the balance being comprised of water.

The unique emulsion of this invention may be applied to the fabric by any convenient means. It is necessary only that the additives penetrate the resin treated fabric and provide an even and firm coating or film upon or around the selvage or edges of the fabric being treated. A convenient method of treating the fabrics in accordance with the present invention is to apply the emulsion to the fabric using a conventional wheel applicator utilizing a bath which contains the emulsion ingredients in amounts sufficient to provide effective amounts of the emulsion upon the fabric surface. The treated fabric is then dried to provide a uniform coating on the fabric.

It should also be pointed out that other ingredients may be placed in the treating bath besides the additives of this invention. Illustrative of other agents which may be conveniently employed in the treating bath are dyestuffs, wetting agents, emulsifying agents, dispersing agents, and the like.

Generally, the application of the aqueous emulsion is controlled to provide at least 5 percent by weight pickup on the fabric based upon the dry weight of the fabric. Normally, a pickup of from about 5 to 100 percent by weight from the bath is obtained.

Polyvinyl acetate emulsions may be used to provide the polyvinyl acetate ingredient of the emulsions of this invention. These polyvinyl acetate emulsions are suspensions produced by the polymerization of vinyl acetate in water. They are milky white liquids containing about 55 percent by weight of polyvinyl acetate, the balance being comprised of water. A good discussion of polyvinyl acetate emulsions and their manufacture may be found in "Encyclopedia of Chemical Technology." Raymond E. Kirk and Donald F. Othmer, 1955, Volume 14, pages 699-709. A polyvinyl acetate emulsion found to be particularly suitable for the purposes of this invention is that available from ICI Organics, Inc., Providence, Providence, Rhode Island, under the trade name "Calatac 1250." This polyvinyl acetate emulsion is a white emulsion containing
about 55 percent by weight of solids, having a specific gravity of about 1.11, and a pH of 4.5 to 4.7 in a 5 percent solution.
The low molecular weight alcohols which form an essential part of this invention are low molecular weight, low boiling alcohols which are water soluble and act as a solvent for the polyvinyl acetate. These alcohols may be represented by the formula ROH wherein R is a hydrocarbon group containing about 1 to 4 carbon atoms. Among the alcohols which may be used for the purposes of this invention are methyl alcohol, ethyl alcohol, n-propyl alcohol, isopropyl alcohol, and isoamyl alcohol. Isopropyl alcohol has been found to be most suitable for the purposes of this invention.

We have found that the aqueous emulsions of this invention should be prepared by slowly adding the low molecular weight alcohol to water under agitation and then adding the polyvinyl acetate emulsion to the alcohol and water mixture under agitation. Preferably, the mixture is agitated prior to use to prevent settling of the ingredients. For example, in commercial practice, it has been found that 7.5 gallons of isopropyl alcohol may be added slowly to 7.5 gallons of water under agitation and then to this mix slowly adding 15 gallons of polyvinyl acetate emulsion while still under agitation to prepare an outstanding selavage finish.
The treated fabric is then dried by any convenient means conventional to those skilled in the art in order to provide a coating or film on the fabric. Preferably, the treated fabric is dried at a temperature of about 300–350°F. for about 3 seconds up to about 5 minutes.

It has been discovered that the use of the polyvinyl acetate emulsion alone as the selavage finish is unsatisfactory due to the lack of penetration of the polyvinyl acetate into the resin treated fabric. It was further found that the polyvinyl acetate emulsion would lump up when mixed with 100 percent low molecular weight alcohol. It was then discovered that the use of polyvinyl acetate, a low molecular weight alcohol, and water in an unique mixture as described by this invention provided smooth and satisfactory emulsions which would give the desired penetration of the resin treated fabric and provide for a firm and even selavage finish.

The following examples are presented as a further disclosure and illustration of the improved selavage finish treatment which may be obtained by this invention and are not intended as a limitation thereof. All parts, proportions, and percentages are by weight unless otherwise indicated.

In the following examples where an isopropyl alcohol-water-polyvinyl acetate emulsion was used, each emulsion was prepared by first adding the isopropyl alcohol slowly to the water under agitation and then the polyvinyl acetate emulsion was slowly added to the alcohol and water mixture while under agitation.

EXAMPLE 1

Three 2-inch woven strips each composed of 100 percent cotton fabric and having previously been coated with an oil and water repellent finishing agent comprised of a nonionic emulsion of a fluorochemical resin were each coated from an aqueous bath comprising 20 grams of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 50 grams of isopropyl alcohol and 50 grams of water using a wheel applicator to provide at least about 6.5 percent pickup based upon the dry weight of the fabric. The treated fabric strips were then dried at temperatures of about 300°F., 325°F., and 350°F. respectively for about 5 minutes.
The finish penetration on each fabric strip was uniform and a firm and even coating was provided on each strip. The stiffness of hand of each strip was found to be very good.

EXAMPLE 2

Three 2-inch woven strips each composed of 100 percent cotton fabric and having previously been coated with an oil and water repellent finishing agent comprised of a nonionic emulsion of a fluorochemical resin were each coated from an aqueous bath comprising 20 grams of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 50 grams of isopropyl alcohol and 50 grams of water using a wheel applicator to provide at least about 6.5 percent pickup based upon the dry weight of the fabric. The treated fabric strips were then dried at temperatures of about 300°F., 325°F., and 350°F. respectively for about 5 minutes.
The finish penetration on each fabric strip was uniform and a firm and even coating was provided on each strip. The stiffness of hand of each strip was found to be very good.

EXAMPLE 3

A 2-inch woven strip composed of 100 percent cotton fabric and having previously been coated with an oil and water repellent finishing agent comprised of a nonionic emulsion of a fluorochemical resin was coated from an aqueous bath comprising 10 grams of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 50 grams of isopropyl alcohol and 50 grams of water using a wheel applicator to provide at least about 6.5 percent pickup based upon the dry weight of the fabric. The treated fabric strip was then dried at temperatures of about 300°F., 325°F., and 350°F. respectively for about 5 minutes.
The finish penetration on the fabric strip was uniform and a firm and even coating was provided on the strip. The stiffness of the hand of the strip was found to be very good.

EXAMPLE 4

A 2-inch woven strip composed of 100 percent cotton fabric and having previously been coated with an oil and water repellent finishing agent comprised of a nonionic emulsion of a fluorochemical resin was coated from an aqueous bath comprising 15 grams of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 70 grams of isopropyl alcohol and 30 grams of water using a wheel applicator to provide at least about 6.5 percent pickup based upon the dry weight of the fabric. The treated fabric strip was then dried at an elevated temperature.
The finish penetration on the fabric strip was uniform and a firm and even coating was provided on the strip. The stiffness of the hand of the strip was found to be satisfactory.

EXAMPLE 5

A 2-inch woven strip composed of 100 percent cotton fabric and having previously been coated with an oil and water repellent finishing agent comprised of a nonionic emulsion of a fluorochemical resin was coated from an aqueous bath comprising 15 grams of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 80 grams of isopropyl alcohol and 20 grams of water using a wheel applicator to provide at least about 6.5 percent pickup based upon the dry weight of the fabric. The aqueous emulsion used as the treating composition was somewhat lumpy due to the percentage of isopropyl alcohol used.
The treated fabric strip was then dried at an elevated temperature. The finish penetration on the fabric strip was uniform and a firm and even coating was provided on the strip. The stiffness of hand of the strip was found to be satisfactory.

EXAMPLE 6

A selvage finish composition was prepared containing 15 grams of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 85 grams of isopropyl alcohol and 15 grams of water. The resulting composition was extremely lumpy and could not satisfactorily be used as a selvage finish.

EXAMPLE 7

A selvage finish composition was prepared containing 15 grams of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 90 grams of isopropyl alcohol and 10 grams of water. The resulting composition was
3,620,803

extremely lumpy and could not satisfactorily be used as a selvage finish.

EXAMPLE 8

The selvage of a 100 percent cotton fabric having previously been coated with an oil and water repellent finishing agent comprised of a nonionic emulsion of a fluorochemical resin was coated from a aqueous bath comprising 62.5 kg. of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 22.7 kg. of isopropyl alcohol and 28.4 kg. of water using a wheel applicator to provide at least 5 percent pickup based upon the dry weight of the fabric. The treated fabric was then dried at a temperature of 300° F. for 3 to 3.5 seconds.

The finish penetration on the fabric was uniform and a firm and even coating was provided. The stiffness of hand was found to be excellent.

EXAMPLE 9

Selvage treating composition was prepared containing 15 grams of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 80 grams of water and 20 grams of isopropyl alcohol.

Resin treated cotton fabric was then treated with this composition as described in example 1 and was found to provide an acceptable selvage finish although the treated fabric was not as stiff as desired.

EXAMPLE 10

A selvage treating composition was prepared containing 15 grams of a polyvinyl acetate emulsion containing about 55 percent solids dissolved in a mixture of 90 grams of water and 10 grams of isopropyl alcohol.

Resin treated cotton fabric was then treated with this composition as described in example 1 and was found not to provide an acceptable selvage finish because of the limness of the treated fabric due to lack of penetration by the treating composition.

EXAMPLE 11

Selvage treating solutions were prepared in which 85 grams of the polyvinyl acetate emulsion were mixed with 30 grams of the isopropyl alcohol-water mixture containing the following:

1. 25 grams of alcohol and 5 grams of water
2. 20 grams of alcohol and 10 grams of water
3. 15 grams of alcohol and 15 grams of water
4. 10 grams of alcohol and 20 grams of water In each of the above runs, very thick white solutions were obtained which were too thick to use in a selvage treating operation as in the case of (1) above or resulted in undesirable selvage finish on the fabric due to the stiffness of the resulting selvage.

It is understood that changes and variations may be made in the present invention by one skilled in the art without departing from the spirit and scope thereof as defined in the appended claims.

What is claimed is:

1. An aqueous emulsion comprising from about 5 to 35 percent by weight of a polyvinyl acetate and from about 15 to 70 percent by weight of a low molecular weight alcohol having the formula ROH wherein R is a hydrocarbon group containing about one to four carbon atoms, the balance being comprised of water.

2. An aqueous emulsion as defined in claim 1 wherein the polyvinyl acetate comprises about 10 to 30 percent by weight of the aqueous emulsion and the low molecular weight alcohol comprises about 20 to 60 percent by weight of the aqueous emulsion.

3. An aqueous emulsion as defined in claim 2 wherein the low molecular weight alcohol is isopropyl alcohol.

4. A process for the preparation of aqueous emulsions useful in the treatment of selvages of resin treated cellulosic fabrics to provide a firm and even selvage finish thereon which comprises slowly adding a low molecular weight alcohol having the formula ROH wherein R is a hydrocarbon group containing one to four carbon atoms to water under agitation and thereafter slowly adding a polyvinyl acetate emulsion to the resulting alcohol-water mixture under agitation, each ingredient being used in amounts sufficient to provide a final aqueous emulsion composition comprising from about 5 to 35 percent by weight of polyvinyl acetate and from about 15 to 70 percent by weight of the low molecular weight alcohol.

5. A process for providing a firm and even selvage finish on a resin treated cellulosic fabric which comprises treating the selvage of said fabric with an aqueous emulsion comprising a polyvinyl acetate and a low molecular weight alcohol and thereafter drying the fabric, each ingredient present in the emulsion in an amount sufficient to provide for penetration of the fabric so as to provide an even and firm coating or film upon the selvage of the fabric after drying.

6. A process for providing a firm and even selvage finish on a resin treated cellulosic fabric which comprises treating the selvage of said fabric with an aqueous emulsion comprising from about 5 to 35 percent by weight of a polyvinyl acetate from about 15 to 70 percent by weight of a low molecular weight alcohol having a formula ROH wherein R is a hydrocarbon group containing about one to four carbon atoms and thereafter drying the fabric to provide a firm and even coating or film on the selvage of the fabric.

7. The process as defined in claim 6 wherein the aqueous emulsion comprises from about 10 to 30 percent by weight of polyvinyl acetate and from about 20 to 60 percent by weight of the low molecular weight alcohol.

8. The process as defined in claim 7 wherein the low molecular weight alcohol is isopropyl alcohol.

9. A resin treated cellulosic fabric having a firm and even coating comprising polyvinyl acetate uniformly deposited upon the selvage thereof.