United States Patent

Rossmann

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[54] METHOD OF REINFORCING A KNITTED OR WOVEN FABRIC

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[21] Appl. No.: **56,223**

Related U.S. Application Data

[63] Continuation of Ser. No. 781,694, Nov. 29, 1968, abandoned, which is a continuation of Ser. No. 408,620, Nov. 3, 1963, abandoned.

[30] **Foreign Application Priority Data**

Nov. 5, 1963 Germany.....Sch 34118

[52] **U.S. Cl.**.....**156/148,** 156/180, 156/306

[51] **Int. Cl.**.....**B32b**

[58] **Field of Search**.....156/148, 180, 181, 296, 306, 156/308; 161/89, 158, 174

[56] **References Cited**

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[57] **ABSTRACT**

A method of reinforcing woven or knitted fabric of a plurality of threads in which an adhesive having a liquid vehicle is applied to selected threads and the threads are joined together by the adhesive. The threads are dried at the contact point leaving an adhesive substance in particle form. The threads are thereafter entwined in the fabric and the threads are heated at the points where the adhesive substance is applied.

7 Claims, No Drawings

METHOD OF REINFORCING A KNITTED OR WOVEN FABRIC

This application No. 56,223, is a continuation of Pat. application No. 781,694 filed Nov. 29, 1968 now abandoned, which is a continuation of Pat. application No. 408,620 filed Nov. 3, 1963, now abandoned.

The present invention relates to a knitted or woven fabric and to a method of making the same.

In knitted or woven fabrics having either a loose or sometimes dense setting of the web, it is frequently desired to reinforce certain parts of the fabric, more particularly such parts which are to form the selvage; as a consequence, the material will not fray after cutting, or, in other words, the threads of the warp and/or the weft will not separate and drop out at the edge of the fabric.

One known means to prevent this from happening is to sew up the selvage or to paste reinforcing ribbons thereon. Fraying is also prevented in a known manner by inserting foils or threads of thermoplastic material into the fabric and subsequently welding the foils or threads with the fabric. These known methods have the disadvantage that they require an additional processing step and that the properties in the reinforced portions of the fabric are different from the fabric as a whole; for instance, the reinforced portions acquire an undesirable stiffness.

It is the object of the present invention to overcome the above-mentioned disadvantages of the known methods for preventing fraying of knitted or woven fabrics.

It is another object to provide a method by which a fabric of uniform overall properties will be obtained which is not liable to fraying.

Further objects and advantages will become apparent from the following detailed description.

According to the invention, the above objects can be realized by joining together, by means of an adhesive, the single threads or groups of threads in those parts of the knitted or woven fabric which are to be reinforced.

A fabric having a structure according to the invention wherein crossing or contact areas of the threads are joined, as described, retains its original properties of suppleness and elasticity, since the threads are not rigidly connected and welded together on their entire contacting area, but at a plurality of small points at said contacting areas only fibers of the threads are interconnected, whereby a durable fastening of the threads will be achieved which is at the same time of high elasticity.

The knitted or woven fabric according to the invention can be made in a number of ways. It is only important that at the crossing areas of the threads no area welding or adhering occurs, but that the joining of the threads is effected at a plurality of small points only.

The invention will be best understood by reference to the following description taken in connection with the accompanying drawing wherein:

FIG. 1 is a sectional view illustrating a fabric according to the present invention; and

FIG. 2 is a section of the fabric shown in FIG. 1 as viewed in the direction of the arrows 2—2 in FIG. 1.

In a preferred embodiment of the present invention shown in FIGS. 1 and 2, the fabric 10 according to the invention is made by applying, before knitting or weaving the fabric, to at least one thread 11, shown intersecting with another thread 12; which is one thread in the crossing areas which are to be joined after the fabric is knitted or woven, a substance 13 which will attain the properties of an adhesive by special treatment. Substance 13 is applied to the thread 11 or threads in particle form at points P and is converted into an adhesive by special treatment, after the knitting or weaving of the fabric has been done, so that the joining of the crossing threads is accomplished thereby.

As shown in FIGS. 1 and 2, the threads 11 and 12 intersect one another at the crossing areas as indicated by distance D. The threads 11 and 12 are not adhered to one another over the entire crossover distance D, but merely at individual adhesion points P. Between the adhesion points P, regions remain, over which the threads 11 and 12 are not connected with one another.

The application of adhesive substance 13 may be effected, for instance, by spraying fine particles of a liquid adhesive in atomized state; or by wetting the threads with an adhesive dispersion, or in a similar manner. A particularly satisfactory method for applying the adhesive particles consists of immersing the thread or threads into a liquid or vehicle containing the adhesive in suspended or dispersed form. The particles will then be deposited after evaporation of the liquid by drying, and due to the even dispersion in the liquid they will be distributed in the form of small adhesive spots on individual fibers of the threads where they form points of joining the threads together.

Since this application of adhesive particles according to the invention is effected before the weaving or knitting proper, e.g., before the warping of the yarn, there is, essentially, no additional work necessary in view of the fact that in weaving or knitting frequently impregnations or the like have to be carried out before. Therefore, the method according to the invention does not involve additional costs.

If the method according to the invention is used in connection with a loom, the warp threads of the fabric, before being introduced into the loom, may be immersed while passing through a liquid bath containing a suspension of an appropriate adhesive and may subsequently, likewise in passing, be dried immediately. The manner in which the method according to the invention is performed depends on the type of woven fabric to be made, the type of threads, and the nature of the adhesive used, as well as on the speed of the weaving process.

Any adhesive known for similar purposes may be used provided it will not stick after application to the threads when dried, and will only regain its stickiness after having been treated in a special manner, for instance, when heated, so that the individual threads will only then combine with their neighboring threads in several points. By the way, it should be mentioned that the adhesive should not add too much to the surface of the threads. Furthermore, it is preferable to choose an adhesive in which softening is not reversible, that is to say, in which re-heating will not cause the joining of the threads to become undone. Such adhesives which are already on sale in the form of emulsions, dispersions or suspensions are designated as "boilfast." An adhesive which is particularly well suited for the purpose of this invention, is a latex containing a synthetic resin component in the form of polychlorobutadiene.

Adhesives being primarily suited for the purpose of this invention are natural and synthetic latices as well as synthetic resin emulsions which break relatively quickly. Materials which afford particular advantages are quickly breaking polychlorobutadiene latices or dispersions which have a similar composition and break within a short period of time, the synthetic resin component solidifying and losing its stickiness after removal of the liquid vehicle. When a synthetic resin system of this kind is applied to the threads or yarns and the vehicle is evaporated or removed otherwise, particles of synthetic material distributed in spaced relationship are retained on the surfaces of the threads or yards after breaking of the dispersion. As emphasized above, these particles shall not be sticky since they might otherwise complicate the weaving process and all other steps between application of the emulsion or dispersion and curing of the synthetic material. Permanent curing of the synthetic material after completion of weaving or knitting is suitably effected by heating. Accordingly, the resins in question are preferably heat-curing polymers.

Of course, it is possible instead of dispersions of polymeric material to use also commercialy available emulsions or dispersions of monomers or prepolymerisates or precondensates of various synthetic materials being suited for similar purposes if polymerization, polycondensation or polyaddition

takes place before or during breaking of the respective emulsion or dispersion and if the resulting polymers show the desired properties.

In accordance with general practice the size of the particles present in latices and synthetic resin dispersions of this kind ranges below about 2μ. The particles may be diluted to any desired concentration.

The curable synthetic resins to be used for the latices may belong to various classes. Suitable materials are for instance dispersions of curable phenol- and carbamide-, melamine resins, polyurethanes, phenolformaldehyde-polyvinylformal combinations, resorcin resin adhesives which may or may not contain a certain proportion of synthetic rubber. In addition to that curing multi-component adhesives in liquid form and of a suitable pot life may also be used.

The vehicle or continuous phase of the dispersion can be water as well as the known organic solvents. The adhesives applied in liquid condition contain, of course, additives for stabilizing the dispersion, for modifying the synthetic resin and, if desired, curing agents for the resin component. If it is considered to be necessary, the adhesive systems may also contain wetting agents and other surface-active substances.

As already mentioned the synthetic resins should be capable of setting or curing, that means mostly heat-curing; however, on principle cold-curing resins are also applicable. In the case of the above-mentioned polychlorobutadiene adhesives heat-curing is required. Such a heat treatment can be carried out in a separate process step or in the course of the weaving or knitting process or during finishing.

The temperatures applied depend on the softening and curing temperatures of the resins and the nature of the fibrous material; generally they are in the range of more than 100° C. In the case of the above-mentioned polychlorobutadiene a temperature of, e.g., 120° C. is advisable.

It turned out that the loading, that means the deposition of the resin on the threads or yarns after the application of the adhesive dispersion and the removal of the vehicle ranges between 20 and 300 g calculated for 1 kg of the textile material. The loading depends, of course, on the kind of adhesive as well as on the kind of fiber material. In this connection it is not only the thread number which must be taken into account, it is also the chemical nature of the fiber material. Fine yarns require a greater amount of resin deposits than the coarser ones. The loading should preferably range from 50 to 200 g resin per kg textile.

The concentration of the latices and dispersions used as adhesives is in the range of the usual values; in general it is 40 to 60 percent; it is, however, possible to employ higher or lower concentrations, in particular lower ones if a comparatively small amount of resin is desired to be applied.

The threads to which small adhesive particles have been applied which outwardly and in their properties are scarcely different from unprepared threads are inserted during the weaving or knitting process at the areas where later a reinforcement of the woven or knitted fabric is desired. For instance, in a multiple box loom a shuttle can be charged with a yarn treated according to the invention and at the desired areas a number of weft threads may be inserted in form of a ribbon or band. It is also possible to provide individual warp threads or groups of warp threads from threads treated according to the invention. After weaving, the treated threads are joined to the untreated or to other treated threads, for instance by heating for a short period the entire fabric or the areas having the prepared threads, if desired while applying pressure; thereby the threads are joined at the contacting or crossing areas. This operation can be combined sometimes with some other finishing operation, which is carried out anyway; for instance, when the fabric is passed through a hot calendering device. It is also possible to have the fabric pass over some individual heating spots consisting of small heated pads and appropriate pressure rolls. Depending on the nature of the adhesive, treatment for causing an adhering effect may consist of steaming or wet treatment.

A woven or knitted fabric having threads joined at a plurality of small points in accordance with the invention may be subsequently cut in a desired manner; the lines, at which cutting occurs, may be so placed that two reinforced selvages are formed at the section; or, in other cases, the cut may leave a reinforced selvage at only one cut portion of the fabric which may also have some projecting loose ends of threads forming an ornamental fringe. When the joined threads lie close to the edge of the fabric, the short ends of the cut threads may simply be cut off and sucked off by an appropriate device.

The method according to the invention is very useful for making small square kerchiefs or small handkerchiefs or the like. In that case, several bands of warp threads prepared according to the invention are properly distributed over the entire width of the web, and bands of likewise prepared weft threads are inserted, spaced from each other as required. After having been woven, the fabric may then be simply passed over a hot calender roll or the like, whereby the areas having the prepared threads are reinforced according to the invention; finally, the reinforced zones are cut along the middle. At the places where two groups of prepared threads are crossing, there will be a particularly good reinforcement, and a strong joining effect, which is particularly desirable in square kerchiefs.

Another example for the application of the method according to the invention is the manufacture of bandages, e.g., gauze bandages. In that case, it is simple to have groups of prepared warp threads spaced in the width of the desired bandage pass along through the loom and have them pass on the loom itself over small heated spots, whereby the groups of warp threads are joined or welded to the weft threads. The cutting of the fabric in the middle of the said groups of warp threads may be even carried out continuously on the loom proper, so that instead of the delicate wide gauze fabrics, the individual gauze bandages can be taken off the loom and wound.

Gauze bandages made according to the invention are low in price and very satisfactory in use, since their edges are well reinforced while being of moderate thickness without changing the elasticity of the bandage.

The foregoing disclosure relates only to preferred embodiments of the invention which is intended to include all changes and modifications of the method described within the scope of the invention as set forth in the appended claims.

The method according to the invention is illustrated by a specific example:

The adhesive used in a polychlorobutadiene-latex. This adhesive is an approximately 50 percent emulsion. The adhesive was applied to a yarn in an amount such that 200 g of latex were used for yarn No. 20 (20,000m = 1 kg). Thus a loading of 100g/kg was achieved. After application the vehicle was removed. Thereupon the synthetic resin is no longer sticky. The bonding of the fibrous material was effected in the desired way by heating to 120° C. At this temperature the synthetic resin softened and cured.

What is claimed is:

1. A method of reinforcing woven or knitted fabric of a plurality of threads, comprising applying an adhesive having a liquid vehicle to selected threads in an unwoven state, drying said threads and evaporating said liquid vehicle to form an adhesive substance in particle form, weaving selected threads as well as the other threads of said plurality of threads to form said fabric, treating said fabric in the woven state at the points of contact by inserting spots of adhesive at said points of contact to join said threads together at small points of joinder.

2. A method as claimed in claim 1, wherein said treating of said fabric comprises the application of heat to the selected threads of the fabric having said adhesive substance in particulate form thereon.

3. A method as claimed in claim 1, wherein said applying said liquid vehicle is by means of spraying said liquid suspension in an atomized state.

4. A method as claimed in claim 1, wherein said applying said liquid vehicle containing an adhesive is by passing said threads through a liquid suspension of said adhesive substance.

5. A method as claimed in claim 1, wherein said adhesive is a polychlorobutadiene.

6. A method as claimed in claim 1, wherein the deposition of said adhesive substance in particle form on said threads is in the range of 50 to 200 grams per kilogram of textile.

7. A method of reinforcing woven or knitted fabric of a plurality of threads comprising applying approximately 200 grams of polychlorobutadiene latex adhesive having a liquid vehicle to the selvage of said fabric, said latex adhesive being an approximately 50 percent emulsion placed on selected threads where said threads at their contact points are joined together by said adhesive, to form discrete points, drying said threads at said contact points whereby said liquid vehicle is evaporated to thereby form at each of said discrete points an adhesive substance in particle form, entwining said threads into said fabric, and heating the selvage of said fabric in an entwined state to about 120° C. to join said threads together at the points at which said adhesive substance is applied.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,663,329 Dated May 16, 1972

Inventor(s) RUDOLF H. ROSSMANN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Assignee's name should be corrected from "U.T.I., Inc."

to -- U.T.L., Inc. --.

Signed and sealed this 10th day of October 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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