METHOD OF MAKING ELASTIC PLY FABRIC

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This invention relates to the method of making an elastic ply fabric consisting of two textile fabrics having a binder or binder confined therebetween to hold the fabric sheets yielding in a condensed condition, and to the fabric resulting from the method.

It has been proposed heretofore to provide an elastic sheet consisting of a stretchable textile fabric such as knitted goods, or the like, having a rubber binder applied thereto in an unstrained condition to cause the fabric to contract again after it has been stretched. It has also been proposed heretofore to provide an elastic ply fabric of limited stretch and consisting of two textile fabrics united by a rubber sheet or binder which secures the two fabrics together with the textile faces out.

In these prior constructions the rubber backing was so applied to the fabric that it would serve to return the stretched fabric to what might be regarded as the relaxed or ordinary condition of the fabric before the rubber backing was applied thereto, but these rubber backings would not serve to contract the fabric to a substantial degree past such ordinary relaxed condition to place the fabric in what might be called a super-relaxed condition.

The present invention contemplates the method whereby an elastic ply sheet may be formed by first uniting by a rubber binder two textile sheets which may constitute woven, knitted or other textile fabrics, and then condensing these united textile sheets so as to place the threads thereof extending in the direction of stretch in what is herein called a super-relaxed condition to permit the fabric a substantial range of stretch. The united sheets may then be heated or otherwise treated to set or vulcanize the rubber binder so as to form an elastic sheet between the two fabric sheets; which elastic sheet normally holds the fabric sheets yielding in the condensed or super-relaxed condition. The present invention not only provides a simple and practical method of forming an elastic sheet having a textile fabric at each outer face and a rubber binding sheet therebetween, but also provides to provide an elastic sheet having a long range of stretch.

As a result of the present invention the textile fabrics having the rubber binder sandwiched therebetween are held by the binder contracted to such an extent that they are much shorter in length than these same fabrics were before they were condensed. That is, these fabrics are not only held in a relaxed condition by the rubber binder but they are held in a condensed or super-relaxed condition so that the fabric may stretch a substantial degree before it reaches what may be regarded as a relaxed condition before it was condensed and may then stretched considerably further. In order that the fabric may have imparted thereto the maximum range of stretch or elongation it is necessary that the threads of the fabric extending in the direction of stretch be normally held in a thoroughly relaxed or unextended condition. This, as above stated, is secured by condensing the fabric to place it in a super-relaxed condition and by providing it with a rubber backing adapted normally to retain the fabric in this super-relaxed condition.

The various features of the invention will be more fully understood from the following description when read in connection with the accompanying drawing, illustrating one good practical form of mechanism for carrying out the present method, and also illustrating a fabric constructed by the method.

In the drawing:
Fig. 1 is a side elevation of mechanism shown more or less diagrammatically for carrying out the present method; and
Fig. 2 is a perspective view of an elastic ply fabric constructed in accordance with the present invention.

In carrying out the invention, two strips of textile fabric of any desired width are provided. These strips of fabric may be woven, knitted or otherwise constructed but the fabric, if woven, preferably has a relatively loose or open construction so that it can be condensed to a substantial degree, in the manner hereinafter pointed out.

In the construction shown in Fig. 1, one length of textile fabric is supplied by the upper roll 10 and a second and similar length is supplied by the lower roll 11. The upper fabric 12 supplied by the roll 10 and the lower fabric 13 supplied by the roll 11 are led toward each other along inclined paths as shown to bring the adjacent faces of these fabrics into close proximity to each other, and since it is desired to unite these fabrics, an adhesive binder containing rubber is supplied between them or upon the adjacent faces thereof so as to secure these fabrics together and form an elastic or rubber sheet therebetween. In the construction illustrated, the adhesive binder is applied to the adjacent faces of the fabrics 12 and 13 by the spraying nozzles 14. It will be apparent, however, that other
means for applying the binder material to the adjacent faces of these fabrics may be employed. The binder is applied to the fabrics 2 and 3 in the form of a liquid, plastic or paste containing rubber. It is found in practice, however, that aqueous dispersions of rubber such as natural latex, preferably containing vulcanizing agents and otherwise suitably compounded by methods well known in the art, are well adapted for this purpose.

Should it be desired to coagulate or partially coagulate the latex when sprayed upon the fabric, this may be done by applying a coagulating acid upon areas of each fabric before such areas arrive at the nozzles 14. This coagulation may be desirable to avoid excessive penetration of the latex into or through the fabric to the opposite face thereof and to decrease the water absorbing properties of the rubber film. After the latex or other binding material containing rubber has been applied to the fabrics 12 or 13, it may be desirable to dry this binding material to some extent and this may be done by subjecting the sheets 12 and 13 to the action of heated rolls 15 or the like, or a fan may be used for this purpose.

The drying at this time however should not be sufficient to render these rubber covered faces of the fabric non-tacky before they are brought together, and if it should be found that the rubber faces to be united are too dry for satisfactory adhesion a thin film of fresh latex may be sprayed over such faces. It is important that these rubber surfaces be in the proper condition as they reach the uniting rolls to be described, so that they will adhere together to form an integral union without causing the latex to penetrate through to the outer face of the fabric. It is also important that the latex treated fabrics be in a moist condition when they are subjected to the condensing operation for these fabrics will not condense properly unless damp.

The fabrics 12 and 13 after they have the rubber binder applied to their adjacent face may be led between the slightly spaced rolls 16, which serve to bring these fabrics close together before they are subjected to the condensing action that forms an important step in carrying out the present method. The word condensing is used to designate the treatment of the fabrics 12 and 13 so as to place the threads thereof extending in the direction of stretch in a thoroughly relaxed condition, or what may be better defined as a super-relaxed condition. It will be apparent that if the elastic ply fabric of the present invention is to have a relatively long stretch, then the textile threads extending longitudinally of the fabrics 12 and 13 will need to be in a super-relaxed condition when the elastic ply fabric is in its normal contracted condition. Final vulcanization of the rubber sheet 17 may be secured by passing the ply fabric between the heaters 33, but if it is desired to avoid subjecting the belts 18 and 19 to the action of these heaters 33 they may be placed beyond the range of these belts, whereupon this finished ply fabric is wound or packaged in a tensioned condition, ready for the market or any desired subsequent treatment.

It should be noted that the rolls 20 are spaced some distance apart, the effect of this being that if any contraction in the belts 18 and 19 occurs, between these rolls 20 and the rolls 30, this contraction will not affect the fabric 12 and 13 since these belts do not grip the fabrics 12 and 13 until they are subjected to the confining pressure of the slats 29 of the caterpillar belts 27 and 28. Since however the rolls 20 and caterpillar belts 27 and 28 travel at the same surface speed no appreciable contraction in the portions of the belts just mentioned should occur. In order to facilitate the contraction of the belt runs 25 and 26 relative to the caterpillar belts 27 and 28 it may be advisable to apply powdered talc or the like to the faces of the belts 18 and 19 which contact with the slats 29.

It will be seen from the foregoing that through the present method the textile fabrics 12 and 13, are united by a rubber binder and then condensed to form a multiple elastic fabric having a single rubber sheet 17 formed between the textile fabrics and molded to the inner faces of said 17.
The fabrics 12 and 13 are shown in Figure 2 as knitted fabrics united by and normally held in a condensed or super-relaxed condition by the rubber sheet 17. The ply fabric thus produced may have a substantial degree of stretch, for example 100% or more.

Practically any textile fabric that has a sufficiently open or loose construction to permit the same to be condensed, by placing the longitudinally extending threads in a super-relaxed condition, may be formed into an elastic ply fabric in accordance with the present invention, but as above pointed out when a woven fabric is condensed it should not be subjected to a transversely expanding action that tends to tear the fabric, or cause the belt to creep relative to the fabric.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. The method of making an elastic ply fabric comprising applying aqueous dispersion of rubber to the surfaces of two textile fabric sheets, adhering said sheets together with the adhesive binder formed from said aqueous dispersion of rubber, engaging the outer surfaces of the textile sheets with stretched elastic surfaces and pressing said textile sheets together between said elastic surfaces, releasing at least some of the tension on said elastic surfaces while in engagement with the outer surfaces of the textile sheets and thereby condensing the textile sheets by the contraction of said elastic surfaces, and heating and drying said adhesive binder while said textile sheets are retained in engagement with said contracted elastic surfaces and held thereby in the condensed condition to some extent and until said binder is imparted sufficient strength to retain said textile sheets in the condensed condition. THOMAS G. HAWLEY, JR.

2. The method of making an elastic ply fabric comprising applying aqueous dispersion of rubber to the surfaces of two textile fabric sheets, partially drying said aqueous dispersion of rubber, adhering said sheets together with the adhesive binder formed from said aqueous dispersion of rubber, engaging the outer surfaces of the textile sheets with stretched elastic surfaces and pressing said textile sheets together between said elastic surfaces, releasing at least some of the tension on said elastic surfaces while in engagement with the outer surfaces of the textile sheets and thereby condensing the textile sheets by the contraction of said elastic surfaces, and heating and drying said adhesive binder while said textile sheets are retained in engagement with said contracted elastic surfaces and held thereby in the condensed condition to some extent and until said binder is imparted sufficient strength to retain said textile sheets in the condensed condition. THOMAS G. HAWLEY, JR.