Jan. 13, 1942. A. VAMOS 2,269,923

STRETCHABLE LEATHER

Filed Oct. 14, 1938

Fig. 1.

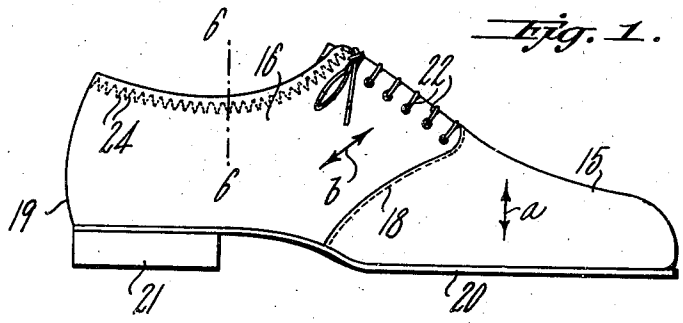

Fig. 2.

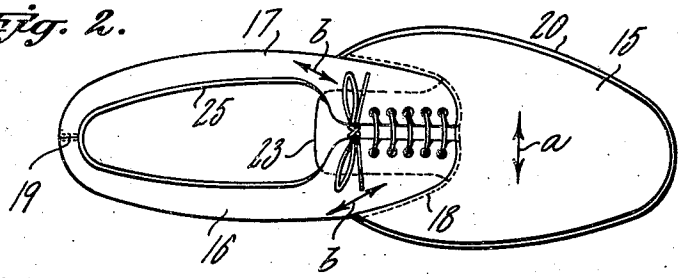

Fig. 3.

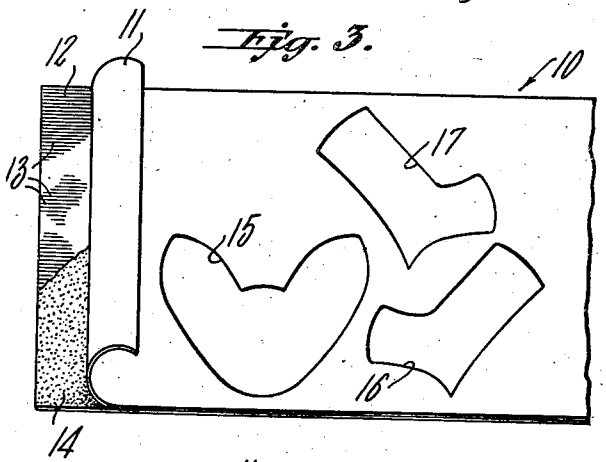

Fig 4.

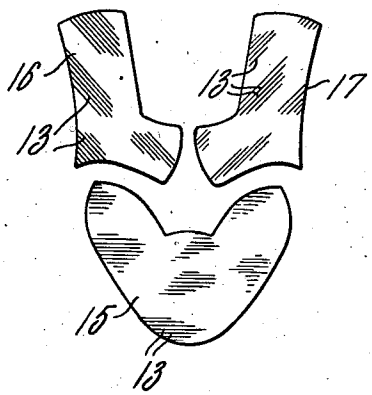

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE

2,269,923

STRETCHABLE LEATHER

Alfred Vamos, Brooklyn, N. Y., assignor, by mesne assignments, to United States Rubber Company, New York, N. Y., a corporation of New Jersey

Application October 14, 1938, Serial No. 234,863

2 Claims. (Cl. 154—48)

This application is a continuation in part of my prior application Serial No. 190,955 filed February 17, 1938.

The present invention relates to a stretchable plied or laminated material formed of a sheet of stretchable leather having a low elastic modulus and of a sheet of elastic material adhesively secured thereto.

The word "stretch" is herein used in the specification and claims broadly to describe materials which are capable of being extended or drawn out whether they possess the property of spontaneously returning to or nearly to their original dimensions or are devoid of this property.

It has been proposed heretofore to secure a thin strip of leather to a strip of elastic webbing to form a leather covered elastic strip suitable for use as a belt worn to support the trousers, but in such construction the wrinkles or lines formed transversely of the leather by the contraction of the elastic webbing are not particularly objectionable.

It has also been proposed heretofore to make a stretchable laminated leather strip suitable for use as a belt by employing a strip of soft stretchable leather such as is obtained from oiled glove stock and adhesively secure this leather to a strip of elastic webbing, but soft glove stock leather is not sufficiently tough and durable, even when backed with elastic fabric, to give satisfactory service when embodied in a shoe upper.

The stretchable backed leather material of the present invention has a smooth flat unwrinkled leather face and need not differ in appearance from ordinary leather. It may be employed for various purposes and may be capable of stretching repeatedly 50% or more, but it was developed primarily for use in shoe uppers where a relatively tough durable leather is required to give good service.

The present invention resides in a stretchable and contractible, leather faced plied material which is sufficiently tough and durable to give good wear in the upper portion of a shoe, and which consists of a sheet of upper leather having a substantial but easy stretch and is provided with an elastic backing adhesively secured thereto so that the leather will present a smooth, flat-unwrinkled surface throughout its range of stretch.

One desirable feature of the stretchable leather material of the present invention is that it be substantially indistinguishable in appearance from the ordinary shoe upper leather, that is leather commonly used heretofore to construct the upper portion of ordinary shoes. Another is that the bond between the leather and backing sheet be such that it will hold the two sheets firmly united throughout the life of the sheets forming the plied material. Another is that the adhesive binder provided between the leather and backing sheet shall not appreciably decrease the permeability of the leather to air so that the ventilating properties of the plied material will be substantially the same as that of the leather sheet alone.

The above and other features of the present invention will be more fully understood from the following description when read in connection with the accompanying drawing wherein:

Fig. 1 is a side elevation of a shoe of the Oxford type illustrating one embodiment of the invention.

Fig. 2 is a top plan view of Fig. 1.

Fig. 3 is a plan view of a sheet of stretchable plied material of the present invention having cut therefrom the vamp and quarters for the shoe of Fig. 1, the leather of this plied sheet being partly rolled back.

Fig. 4 is a plan view showing the reverse side of the vamp and two quarters cut from Fig. 3.

Fig. 5 is a vertical sectional view through the plied material showing the fabric skived from the leather adjacent one edge thereof preparatory to finishing the upper edge of this material; and

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 1 showing the step of Fig. 5 carried forward to provide the upper edge of the shoe with a smooth finished edge.

In carrying out the present invention, it is important to use upper leather; that is leather which has the strength and durability of the shoe upper leather employed heretofore but which has in addition thereto a substantial amount of stretch. The softer glove leather stock is not sufficiently tough and durable to give good service in a shoe even when provided with an elastic backing as herein contemplated.

When this stretchable and contractable plied material of the present invention is to be embodied in a shoe it is important that its elastic modulus be sufficiently low to cause the plied material to stretch with the foot movement.

It is found that the portion of the shoe constructed of this plied stretchable material may be thinner and more pervious to the air than the ordinary shoe upper leather since the elastic backing material adhesively secured to the

leather makes it unnecessary to use any other form of lining in the shoe.

It is practical in carrying out the present invention to impart to such backed stretchable leather a stretch of 50% or more without causing any appreciable changes to take place in the appearance of the leather throughout this range of stretch. The stretch of this plied material in most shoes will be about 20% or 25% but as little as a 10% stretch may be all that is desired in certain shoe constructions.

When I first became interested in the present invention I found it impossible to secure from the tanners, shoe upper leather having the required amount of easy stretch, therefore I developed the treatment described in the above mentioned application to increase the stretch and reduce the elastic modulus of the shoe upper leather as purchased from the tanner. This treatment as described in said application consists in first skiving the leather skin, or acting upon a face of the same with sandpaper or other roughening means to loosen the fibres and increase the penetration of the treating solution into the leather. The skived or roughened face of the leather is then thoroughly wetted with a wetting solution such as the following:

Water	liter	1
Sodium chloride	gram	15.2
Sodium bicarbonate	do	15.2
Soap (preferably olive oil)	do	15.2

Following this treatment the leather skin is allowed to dry, whereupon it will be found easier to stretch than before such treatment. More recently the tanners have made an effort to supply my requirements for a stretchable shoe upper leather and I am now able to buy from them such a leather having a low elastic modulus and 25% stretch or more, this making unnecessary in many cases the treatment described in the above mentioned application.

In carrying out the present invention, the stretchable leather as received from the tanner is first preferably skived to give it a uniform thickness, and it may be skived thinner than the leather commonly used heretofore in shoe uppers because the elastic backing sheet reinforces and strengthens the thin leather sheet. The skiving however should not be carried to such an extent that it produces an excessively thin leather sheet that will not stand up or give good service in a shoe. In most cases this skived leather should not be less than 1/64 of an inch thick. This skiving serves also to loosen the fibers at one face of the leather so that the latex will grip the same more firmly.

Leather suitable for use in carrying out the present invention is much softer and thinner than sole leather, and is stronger, tougher and more durable than very light glove leather. It will not readily scuff or split and is comparable in strength, weight and durability to the usual shoe upper leather commonly employed in the construction of the uppers of men's and women's shoes for ordinary street wear. It is the type of leather which is known in the trade and is described in leather publications as "upper leather," since it is used primarily in forming shoe uppers, but its use is not confined solely to shoes. The words "upper leather" have been used in the claims in accordance with the well established usage of these words and are to be so construed.

When it is not desired to skive the leather skin to reduce its thickness, it may be desirable to roughen that face of the skin to which the adhesive is to be applied, with sandpaper or other roughening means, in order that the adhesive may more firmly grip this surface of the leather. The adhesive binder may be applied to either the flesh side or the grain side of the leather depending upon which face of the leather is to be exposed in the finished shoe but in either case the face should be roughened.

After a skin of upper leather has been acquired from the tanner having a desired range of stretch and sufficiently low elastic modulus, or has been treated by the method described in the above application to impart the desired stretch and low elastic modulus thereto and has had the face to which the adhesive is to be applied either skived or roughened the adhesive binder may be applied.

The adhesive used is preferably a latex adhesive which will give a firm bond without needing to be vulcanized and the quickest and most satisfactory way yet devised for applying this latex adhesive is by a spraying operation. One important advantage obtained by spraying the latex upon the leather is that a good bond can be secured without decreasing the permeability of the leather to air. This latex adhesive is preferably sprayed upon the leather skin while its rests upon a supporting surface in a flat but unstretched condition.

After the stretchable skin has had the latex adhesive applied to one face thereof it may then be provided with the elastic backing.

Various elastic sheet materials which will maintain their elastic properties throughout the life of the shoe may be used as a backing for the above described leather sheet to hold the same normally in its contracted condition, but the material preferably used is a sheet of fine woven elastic fabric such as elastic batiste. The backing material preferably has a longer stretch than the leather so as not to interfere with the stretch of the leather and the contractive force may be as strong as needed for the purposes to which the plied material is to be put.

It is important that this backing material be carefully constructed so that the tension and stretch characteristics of the same shall be uniform throughout that area which backs any one skin, because if local variation exists in the tension of the backing fabric it will tend to pucker or distort the skin to which it is secured.

This backing fabric should have a latex adhesive sprayed upon one face thereof similarly to the manner in which this adhesive is applied to the leather skin, and here again it is desirable that the latex be so applied that it will not appreciably interfere with the passage of air through the fabric.

Almost immediately after the latex adhesive has been applied to the leather skin and to the backing material, say within two or three minutes, the two sheets may be united. This should be done while both the leather and backing are in an unstretched condition. It is found desirable while uniting these two sheets or shortly thereafter to pass them between calender rolls to increase the bond therebetween and force out any air which might be trapped. The stretchable plied material thus formed may then be placed in a flat condition in a stack with other similarly formed sheets which should be separated from each other by sheets of cardboard placed between the backed leather sheets. They should be allowed to remain in this stack for

about 12 hours while the moisture of the latex adhesive escapes or dries out. The material is then ready for use.

It is found that the moisture of the latex binder has a tendency to swell the textile fibers forming the backing sheet. Therefore, to reduce this swelling tendency, it has been found desirable to treat the face of the backing fabric to which the latex is to be applied with a light coating of any suitable water repellent substance which will lessen the tendency of the fibers of this fabric to absorb moisture from the adhesive. One well known water repellent substance which may be used consists of water containing about 2% emulsion of soap and carnauba wax.

Most leather skins will stretch more readily in the direction around the animal from which the skin was taken than longitudinally of such animal, therefore the backing material which is preferably a one-way stretch fabric is so applied to the skin that its direction of stretch will correspond with that of the maximum stretch of the skin.

The treatment involved in imparting the desired amount of stretch to the leather skin and in adhesively securing the elastic backing thereto need not in any way change the appearance of the outer face of the leather, and the total thickness of the two-ply material thus formed may be less than 3/64 of an inch.

Having described how the stretchable and contractable plied material of the present invention is made, I will now describe one type of shoe having its upper made of the material. It will be understood, however that such material may be embodied in various types of shoes and in various portions thereof, and may be otherwise employed, as disclosed for example in the Roberts et al. Patent No. 2,119,602, Riding breeches and like.

Referring to the drawing the stretchable plied material **10** is formed of a sheet of shoe upper leather **11** which has been treated by the tanner or otherwise, to give it a low elastic modulus and the desired amount of stretch, and to one face of this sheet of leather is adhesively secured the elastic backing sheet **12**. A perforated rubber sheet may be employed as the backing sheet but it is preferable to use a fine woven elastic fabric having a one-way stretch and having the elastic yarn **13** introduced therein either as warp or weft. A wide or broad loom elastic fabric rather than narrow elastic webbing is used as the backing sheet **12**, and the elastic yarn is preferably constructed in accordance with the Adamson Patent No. 1,822,847 for elastic yarn. That is an elastic yarn not over .02" in diameter and consisting of a fine rubber core having a textile cover is preferably used to impart the desired elastic properties to the fabric **12**. Such a woven elastic backing sheet makes an excellent lining for the portion of the shoe in which the stretchable leather is embodied and makes the use of any other lining in this area unnecessary.

The sheets **11** and **12** are secured together by an elastic binder **14** which is necessarily adhesive to accommodate the stretch of the plied material and this adhesive binder is preferably the latex binder above described which is so applied to the leather and fabric that it will not appreciably interfere with the passage of air through the stretchable plied material. By using a latex adhesive compound which is not too fluid and by employing a sufficiently small amount it is practical to spray the same on the leather and fabric in separate globules or droplets which will not run together, and thereby providing an air pervious binder between the sheets **11** and **12**.

The stretchable plied sheet **10** is shown as having cut therefrom the vamp **15** and quarters **16** and **17** for use in forming the upper of the shoe. The vamp and quarters are shown in Fig. 4 with the fabric face up so as to illustrate the direction in which the elastic yarn **13** extends in each.

The shoe illustrated differs from the ordinary oxford in that the entire vamp area of the shoe is formed of the stretchable vamp **15** which is placed in the shoe so that the elastic yarns extend transversely of the foot to impart to this part of the shoe a stretch and contractive force crosswise of the foot as indicated by the arrow *a*. The quarters **16** and **17**, it will be noted, are so cut from the sheet **10** that the elastic yarns **13** extend in a diagonal direction. The arrangement is such that the portion of each quarter lying in the vicinity of the throat stretches in the direction indicated by the arrow *b* whereas the portion of the quarter lying at each side of the foot stretches diagonally of the material. The shoe may be built upon a last as usual but it is desirable to secure a binding tape temporarily to certain portions of the inner face of the shoe material during the lasting operation to prevent the upper from stretching too much at this time.

The shoe may or may not have the usual box toe as there is no particular point to having the extreme toe of the shoe stretchable. The box toe is omitted in the construction shown. The vamp **15** as shown is secured to the forward portion of the quarters **16** and **17** by the usual seam **18** and these quarters are secured together at the rear of the shoe along the vertical seam **19**. The shoe is shown as having the usual sole **20** and heel **21** and the forward ends of the quarters **16** and **17** may be provided with the usual eyelets to receive the shoe lacing **22**, and the shoe is provided with a tongue **23**. The upper edge of the shoe around the foot receiving opening may be finished in various ways to provide a smooth rounded stretchable edge and in the construction shown this finish is secured by skiving away the woven fabric **12** near the upper edge of the shoe so as to expose the inner face of the leather **11** as shown in Fig. 5. This exposed portion of the leather is then folded over upon the skived fabric **12** as shown in Fig. 6 and it may be secured in this folded condition by an adhesive and also by the zig-zag stitching **24** to thereby provide a smooth rounded upper edge **25** around the foot receiving opening that will stretch.

It is found that when the latex adhesive is sprayed on the leather and fabric as above described a good bond can be secured without appreciably decreasing the permeability of the ply material to air. That is it is found by laboratory tests that the permeability of the ply material **10** to air is very nearly the same as that of the leather **11** before the latex adhesive is applied thereto. Therefore a shoe constructed of this stretchable plied material will not only be more comfortable than the ordinary leather shoe but will also afford the foot better ventilation than the usual leather shoe.

The words "elastic yarn" as used in the claims are to be construed as meaning a yarn or thread which is rendered elastic by rubber or a rubber substitute.

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

1. A leather faced plied sheet material not appreciably over 3/64 of an inch thick and having sufficient elastic properties to stretch and contract repeatedly at least 10% without causing the leather to show any change in appearance readily observable to the unaided eye throughout this stretch range; comprising a firm durable sheet of good quality, non-oil tanned, upper leather at least 1/64 of an inch thick that will not readily scuff or split and having a smooth, flat, unwrinkled surface, and provided with an elastic backing sheet adhesively secured thereto so that both sheets are free from tension when the plied material is relaxed, the backing sheet having a greater range of stretch than the leather and comprising a fine closely woven fabric employing elastic yarn less than .02 of an inch in diameter in its construction.

2. A leather faced, air-pervious, plied material not appreciably over 3/64 of an inch thick and having sufficient elastic properties to stretch and contract repeatedly at least 10% without causing the leather to show any change in appearance readily observable to the unaided eye throughout this stretch range; comprising a firm durable sheet of good quality non-oil tanned, upper leather at least 1/64 of an inch thick that will not readily scuff or split and having a smooth, flat, unwrinkled surface, and provided with an elastic backing sheet adhesively secured thereto so that both sheets are free from tension when the plied material is relaxed, the backing sheet having a greater range of stretch than the leather and comprising a fine closely woven fabric employing elastic yarn less than .02 of an inch in diameter in its construction, and the adhesive uniting the two sheets being a latex adhesive forming an air pervious bond between the sheets.

ALFRED VAMOS.