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LEATHER-LIKE MATERIAL  
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Fig. 1

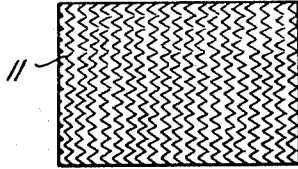


Fig. 2

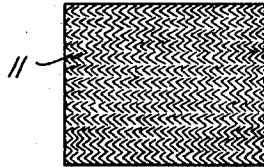


Fig. 3

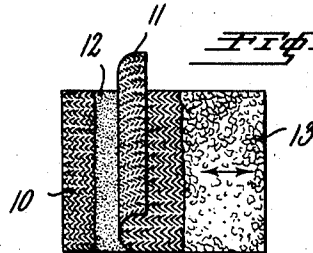


Fig. 4

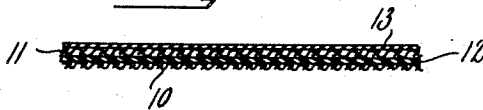
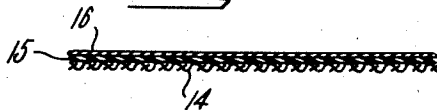


Fig. 5



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## UNITED STATES PATENT OFFICE

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## LEATHER-LIKE MATERIAL

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2 Claims. (Cl. 154—48)

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This invention relates to an elastic leather-like material developed primarily for use in place of leather as a shoe upper material.

Leather-like materials have been made heretofore and numerous efforts have been made to develop a satisfactory substitute for leather for use in the upper part of shoes, but these efforts have not been very successful as evidenced by the fact that leather is still used to form the upper part of most shoes, and only relatively small amounts of such substitutes are used in shoe uppers.

The requirements of any material used to form the upper part of a shoe are exacting, if such material is to give good service, since the material should be strong and durable and capable of giving long wear without scuffing, cracking or stretching out of shape, and it should be sufficiently soft and flexible to be comfortable to the foot.

The leather-like material herein contemplated has a fabric face adapted to form the lining of the shoe and a plastic face adapted to form the outer wear surface of the shoe. This construction makes the separate lining commonly used in leather shoes unnecessary.

Heretofore in making leather-like materials having a fabric backing and a plastic wear surface a single sheet of firma closely woven fabric has been used over which a plastic coating was applied that was sufficiently thick to prevent the threads of the fabric from grinning through. It has also been proposed heretofore to use a knitted backing fabric having a plastic wear surface, but unless the plastic was made stiff or used in a thick layer the threads would grin through the plastic. Such prior composite materials do not have sufficient stretch and flexibility to conform well to the shoe last and to feel comfortable to the foot.

The present leather-like material is made stretchable and elastic so that it will conform accurately to the shoe last and will stretch and contract with the foot movement, and is preferably formed of two soft, flexible fabric sheets that impart to the composite material the required strength and body needed to give good service in a shoe. The construction is such that the two soft, flexible fabric sheets are bonded together by a layer of rubber that supplies the desired elastic properties, and the ply sheet thus produced is very flexible which makes it well adapted for use as a backing for the plastic material provided to form a durable outer wear surface that is sufficiently non-brittle to stretch with the elastic backing.

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In accordance with the present invention each of the soft flexible fabric sheets is preferably condensed by crowding the threads extending in one direction of the fabric closer together. This serves two important purposes, it makes the fabric stretchable and it brings the threads closer together to make a smoother and more compact surface to which the plastic outer layer may be bonded. The sheet of fabric disposed at the inner face of the present leather-like material may be woven fabric or a fine knitted fabric so as to provide a smooth firm lining face. The other fabric sheet to which the plastic material is directly bonded should be a knitted fabric to give the desired softness to the finished product, and may be a somewhat coarser knit than the lining fabric. Both of these fabrics are preferably condensed in one direction and are bonded together by a layer of rubber which when vulcanized will normally hold both fabric sheets in the condensed condition to thereby form an elastic construction capable of stretching up to about 25%. This elastic material consisting of two sheets of condensed fabric bonded together by a layer of rubber is now ready to receive the plastic layer that forms the outer wear surface of the leather-like material. This plastic layer is bonded to the second fabric above described and need not have elastic properties but should have stretchable properties so that it will not interfere appreciably with the stretching and contracting of the elastic materials to which it is bonded.

The above and other features of the leather-like material 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 plan view of a piece of knitted fabric adapted to form the inner or concealed fabric sheet of the present construction;

Fig. 2 is a plan view of the fabric of Fig. 1 after it has been condensed;

Fig. 3 is a plan view of the elastic leather-like material of the present invention, the successive plies being partly removed.

Fig. 4 on a larger scale is a transverse sectional view of the finished material of Fig. 3; and

Fig. 5 is a view similar to Fig. 4 showing a modified construction.

The preferred form of the present invention illustrated in Figs. 3 and 4 of the drawing is formed of two sheets of textile fabric 10 and 11. The sheet 10 which serves as a lining in the finished leather-like material may be a woven fabric or a closely knitted fabric so as to provide a

firm closely constructed lining surface in the finished material. The second sheet of fabric 11 which is completely concealed in the finished material should be a knitted fabric such as a plain knit fabric that is soft and flexible. The fabric 10 may be formed of rayon or other synthetic yarns but the fabric 11 is preferably formed of cotton because the plastic wear surface will adhere more firmly to cotton than synthetic yarn. Both sheets of fabric are condensed, preferably in one and the same direction only, by crowding the threads extending in one direction more closely together so as to impart to each fabric the ability to stretch a substantial amount. One good practical method that may be employed for condensing these fabrics 10 and 11 is disclosed in the Teague Patent No. 2,233,274 for Method of Making Elastic Fabric.

After the fabric 11 has been condensed as shown in Fig. 2, and the fabric 10 has been likewise condensed, they are bonded together by providing a layer of natural or synthetic latex or natural or synthetic masticated rubber between the two sheets as indicated by 12. The sandwich construction thus produced is then heated or otherwise treated to vulcanize the rubber layer 12 so that this layer will normally hold the two sheets of fabric in a condensed condition, and cause the ply construction thus produced to have good elastic properties and a stretch range of at least 8% and which may be as much as 25%. The term "elastic" as herein used means the capacity to stretch under tension and to return approximately to the original measurements when the tension is relieved; and the term "rubber" is used herein to include natural and synthetic latex and natural and synthetic masticated rubber.

The elastic ply material or backing material consisting of the fabrics 10 and 11 bonded together by the rubber layer 12 may now have the plastic layer 13 forming the outer wear surface of the leather-like material bonded directly to the textile face of the knitted fabric 11. The properties of the plastic material 13 should be such that it will be tough enough to give good wear without being hard or brittle, since it must contract and stretch with the movement of the underlying fabric. It need not be elastic but should be easily stretched, and should not penetrate deep into the fabric 11 as this would decrease the flexibility of the finished product.

The present stretchable leather-like material may be used in the construction of men's, women's and children's shoes to form the entire shoe upper or a substantial portion thereof. It is contemplated that such shoes may be made for street or dress wear and may be of various shades and colors in addition to black. The outer surface of the plastic layer 13 may be embossed or smooth. This layer may be of any desired color, of one or two tone coloring, non-transparent or transparent, and if transparent, a plain or figured fabric 11 may show through. Also if desired a thin stretchable lacquer film (not shown) may be applied to the outer surface of the layer 13.

The plastic layer 13 may be formed of a vinylidene containing polymer, vinylchloride-acetate co-polymer, Koroseal (plasticized polyvinyl chloride compound), nylon (synthetic linear polyamide), or other stretchable wear-resistant material of a similar nature. This plastic compound may be previously prepared by calendering in sheet form to the desired thickness, for example from .02 inch to .03 inch. It may be applied to the elastic backing material, comprising

the layers 10, 11 and 12, by a pressing operation. That is the materials may be placed in a heated press which if the layer is to be embossed will carry the engraved embossing plate. The outer face of the fabric 11 may have an adhesive previously applied thereto to improve the bond between it and the layer 13. This layer 13 may also be applied as an aqueous dispersion rather than as a sheet. It should not be forced deep in between the threads forming the fabric 11 as this would interfere with the stretch of the fabric and reduce its flexibility.

As an example of a typical formula for the plastic layer 13 using a vinylchloride-acetate co-polymer the following is suggested, in which the parts are by weight:

|                                  |      |
|----------------------------------|------|
| Vinylite-VYNW*                   | 100. |
| Di-octyl phthalate (plasticizer) | 66.7 |
| Calcium stearate                 | 2.   |
| Carbon black (optional)          | 10.  |

\*A copolymer of vinyl chloride and vinyl acetate in which 93-95% is vinyl chloride.

While the finished leather-like material is primarily a one way stretch material as indicated by the arrow of Fig. 3 it should have a slight stretch, up to about 5%, in a transverse direction to facilitate lasting of this material in making shoes. This material may be made porous to give it ventilating properties by piercing small holes therein. The holes preferably should be made after the plastic is applied but before the rubber is vulcanized, to thereby lessen the tendency of the holes to close. The holes will make the fabric more flexible as well as porous.

The modified construction shown in Fig. 5 has a single sheet of fabric 14 instead of the two sheets of fabric shown in Fig. 4. The sheet 14 is condensed as above described and is normally held in the condensed condition by the rubber layer 15 bonded thereto and which is similar to the layer 12 above described. To the outer face of the rubber layer 15 is bonded the plastic layer 16 which may be similar to the layer 13. By applying a suitable cement to the outer face of the rubber layer 15 the plastic layer 16 can be bonded firmly thereto.

The leather-like material of the present invention, as above stated, was developed primarily for use as shoe upper material. It may however be used to form pocket-books, luggage and for other purposes. This material as a result of its construction above described has an exceptionally high degree of flexibility in addition to its stretch properties, and it also has sufficient body to retain its proper shape in a shoe without sagging. Furthermore, the present material conforms well to the shoe last and can be sewed without needle cutting. It will give excellent wear in a shoe without scuffing, creasing or cracking, and since the color and appearance of its outer face may be varied extensively it can be used in many different types of shoes.

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

1. A leather-like, multi-ply shoe upper material having elastic properties and a textile inner face and plastic outer face, and formed of two fabrics bonded together by a layer of rubber lying therebetween and which normally holds both fabrics in a condensed condition so that these fabrics will stretch between 8 and 25% in one direction and less than 5% transversely to such direction, at least one of said fabrics being knitted and having firmly adhered to its con-

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densed outer surface a stretchable tough layer of a heat softening vinyl resin that is about .02" thick, to thereby provide a flexible and stretchable composite sheet material that will give good wear without scuffing, sagging or cracking and without needle cutting when embodied in the upper part of a shoe.

2. A leather-like, multi-ply shoe upper material having elastic properties and a textile inner face and plastic outer face, and formed of two fabrics bonded together by a layer of rubber lying therebetween and which normally holds both fabrics in a condensed condition so that these fabrics will stretch between 8 and 25% in one direction and less than 5% transversely to such direction, at least one of said fabrics being knitted and having firmly adhered to its condensed outer surface a stretchable tough layer of a heat softening vinyl resin that is about .02" thick, and said layer of resin being embossed in situ without embossing the entire multi-ply material, to

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thereby provide a flexible and stretchable composite sheet material that will give good wear without scuffing, sagging or cracking and without needle cutting when embodied in the upper part of a shoe.

MERWYN C. TEAGUE.

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