

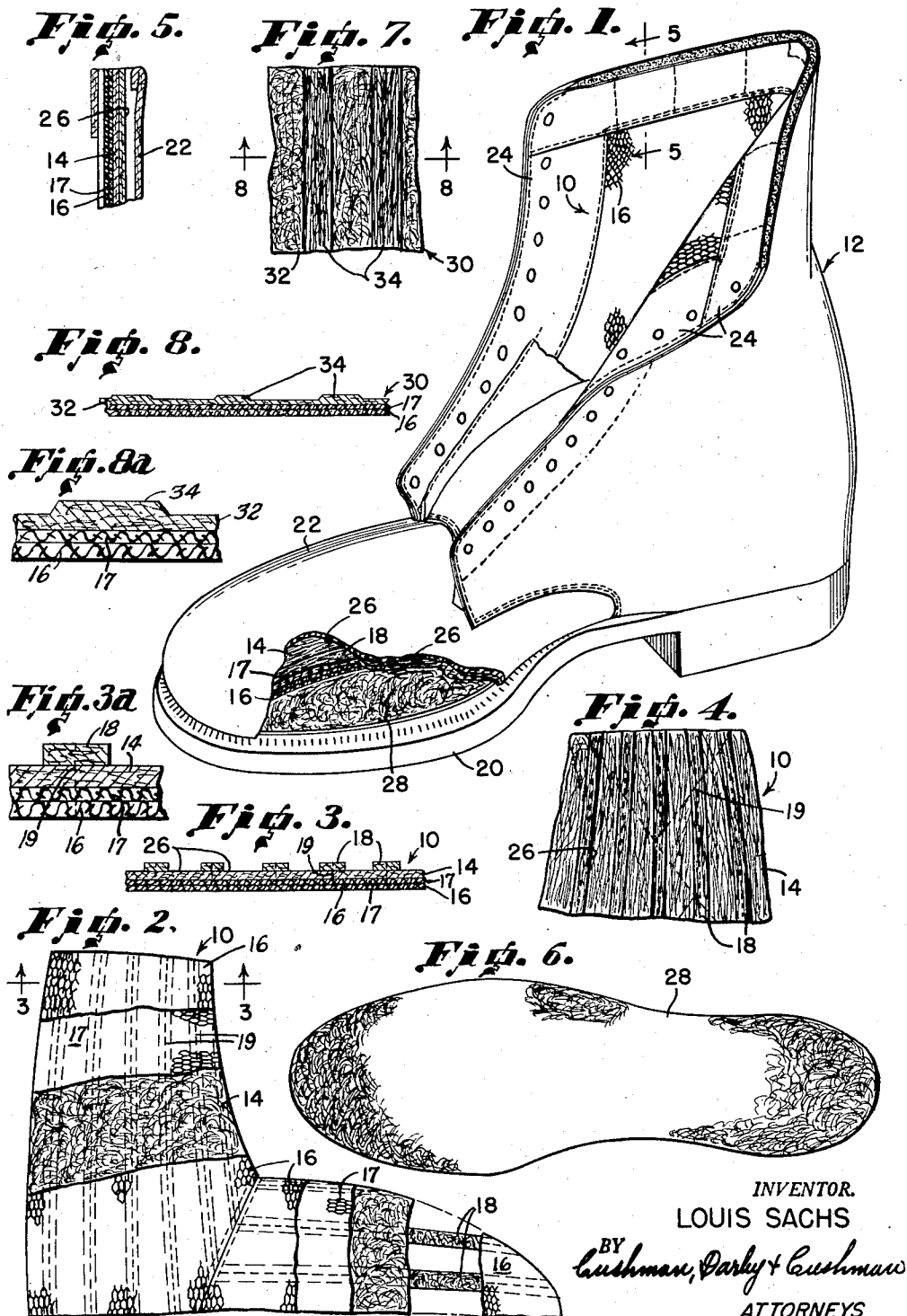
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MOISTURE ABSORBENT AND SELF-VENTILATING FOOTWEAR

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MOISTURE ABSORBENT AND SELF-VENTILATING FOOTWEAR

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6 Claims. (Cl. 36—3)

This invention relates to improvements in the construction of footwear and more particularly to improvements in the lining of boots, shoes and the like. This application constitutes a continuation-in-part of my copending application, Serial No. 391,807, filed November 13, 1953 since abandoned.

One object of the present invention is the provision of an improved boot or shoe having a novel lining which functions to absorb moisture from the feet of the wearer so as to maintain the same in a substantially dry condition.

Another object of the present invention is the provision of a novel boot lining of the type described which is constructed so as to permit self-ventilation of the moisture laden air surrounding the feet of the wearer within the boots.

A further object of the present invention is the provision of a novel boot lining which is not only moisture absorbent and self-ventilating, but odor resistant, non-rotting and non-allergic as well.

These and other objects of the present invention will become more apparent during the course of the following detailed description and appended claims.

The invention may best be understood with reference to the accompanying drawings wherein illustrative embodiments are shown.

In the drawings:

Figure 1 is a perspective view partly broken away showing a boot embodying the principles of the present invention;

Figure 2 is a front elevational view of one portion of the boot liner of the present invention showing the same in a flat condition before being applied to the boot with parts broken away for clearer illustration;

Figure 3 is an enlarged cross-sectional view taken along the line 3—3 of Figure 2;

Figure 3a is an enlarged cross-sectional view of a portion of Figure 3;

Figure 4 is a fragmentary rear elevational view of the boot liner;

Figure 5 is a fragmentary cross-sectional view taken along the line 5—5 of Figure 1;

Figure 6 is a top plan view of an inner sole such as disclosed in my aforesaid application;

Figure 7 is a view similar to Figure 4 showing a modified form of boot liner;

Figure 8 is a cross-sectional view taken along the line 8—8 of Figure 7; and

Figure 8a is an enlarged cross-sectional view of a portion of Figure 8.

As disclosed in my copending application Serial No. 391,807, referred to above, I have discovered that relatively thin compressed sheets of the interior fibrous structure of the luffa plant may be molded to the contour of inside surfaces of a boot or shoe, and when applied thereto, these sheets will effectively and rapidly absorb substantially all of the moisture present within the shoe, thus maintaining the foot in dry condition. I have further

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observed that when a shoe so equipped is removed from the foot, such sheets will rapidly pass the moisture so absorbed into the air. I have therefore found that such thin sheets molded and applied to the inside surfaces of boots and shoes, will be of pronounced usefulness in maintaining the feet in dry and comfortable condition. In the case of boots and shoes to be used in Arctic climates, the use of these sheets will prevent frost bite and freezing of the feet, it being well known that the presence of moisture on the feet is a primary cause of such casualties.

The luffa is a plant of the cucumber family whose fruit is of gourd-like form having an interior structure of interlaced fibers which are light but strong. The pulp may be removed when soft, as by washing same from the overripe fruit, without damaging the interior fibrous structure. The fibrous structure of the fruit comprises a tubular wall made up of a network of fibers, generally comprising an interior relatively coarse layer of interlaced fibers of generally parallel orientation and an exterior layer of finer, softer fibers of random orientation. When the pulp and core of the fruit are removed, the tubular wall may be cut longitudinally and flattened into sheet-like form, and if desired, the interior layer may be separated from the exterior layer to form separate sheets. These sheets are compressed by applying heavy pressure thereto.

The plant having the fruit as referred to herein, has been defined in the prior literature as being of the botanical family Cucurbitaceae, genus Luffa, and species *Acutangula cylindrica* or *Aegyptiaca*. It is found in the Antilles and generally throughout the tropics, and in the Oriental countries, including the Philippines and Japan. The fibrous structure is of open-like character, with the fibers separated and interlaced to provide a ventilated structure. When wet, the material may be compressed to sheet form and molded to shapes as desired, and when it quickly dries, it will retain the molded shape. When compressed and dried, it tends to swell when moistened, but when thin sheets of the material are used as a lining for the interior of a shoe upper, there is not sufficient swelling to interfere with movements of the toes in the shoe, considering the ample space which is provided above the toes in ordinary shoe and boot designs. The formed sheets of the material, used as described, may be impregnated with antiseptic or deodorizing medicaments as desired.

With the above in mind, I have now found that when this material is utilized as a liner for a boot or shoe and provision is made to ventilate the same during wear, it will substantially eliminate the problems resulting from perspiration of the feet. The provision of suitable ventilation enables the moisture absorbent characteristics of the luffa material to be utilized to much greater advantage. That is, the luffa material not only serves to absorb a greater amount of moisture in a shorter period of time due to the movement of air, but in addition, a portion of the moisture absorbed may be carried away by the moving air while the boot is being worn. The luffa material is ideally suited to be utilized as a self-ventilating liner since its inherent open interlaced structure permits air to freely pass through it.

Referring now to Figures 1—6 of the drawings, I have shown one embodiment of a liner 10 constructed in accordance with the principles of the present invention as applied to a boot 12. In general, the liner 10 comprises a sheet of compressed luffa 14, processed in the manner noted above, having two layers of mesh material 16 and 17 on the finer surface thereof and a plurality of luffa strips 18 on the coarser surface thereof.

As shown in Figure 2, the liner 10 is preferably assembled in a flat condition before being secured within

the boot. In assembling the liner, the compressed luffa sheet 14 is first cut out to form blanks constituting a heel and ankle portion and a toe portion. The interior relatively coarse layer of fibers, while being interlaced, are generally oriented so that they extend in the same direction, and in cutting out the heel and ankle portion, the sheet is positioned so that these fibers extend vertically. In a like manner, in cutting out the toe portion, the inner coarse fibers are made to extend generally horizontally. These two blanks may then be suitably secured together, as by stitching or the like, to form one-half of the entire liner, as shown in Figure 2.

The strips 18 may be cut from a compressed sheet of luffa in such a way that the interior coarse fibers extend longitudinally thereof. These strips are then secured in spaced relation on the sheet 14 by any suitable means, such as stitching or the like. Preferably, the strips 18 are secured to the surface of sheet 14 which contains the interior coarse fiber layer; the strips secured to the heel and ankle portion being disposed generally vertically, with those secured to the toe portion being disposed generally horizontally. As shown in Figure 2, the strips extend the entire length of the toe portion and are aligned with the adjacent strips of the heel and ankle portion so that when the two portions are together, the aligned strips, in effect, form continuous strips.

The layers of mesh material 16 and 17 are preferably nylon and are cut to the shape of the combined heel and ankle and toe portions. Preferably, the two layers of nylon mesh material are suitably secured, as by stitching 19 or the like, to the surface of the sheet 14 opposite the strips 18. Preferably, this surface constitutes the exterior finer layer of fibers of the luffa material.

Two such halves of the liner may then be secured within the boot in any suitable manner. As shown in Figure 1, the boot 12 comprises the usual sole 20 having the usual upper 22 secured thereto. The liner 10 is affixed to the upper by marginal leather strips 24 suitably secured to the upper and to the liner, as by stitching or the like. It will be understood that the liner may be compressed to the shape of the interior of the shoe before being secured and that other securing means may be utilized if desired.

Of particular significance is the fact that the liner is secured to the upper with the strips 18 abutting the inner wall surface of the upper so as to space the luffa sheet 14 therefrom. Thus, the strips divide the space between the upper and the luffa sheet into a plurality of channels 26 which extend from the sole of the boot upwardly to the open top edge thereof. In this regard, it will be noted that the marginal leather strip 24 at the top edge of the upper is secured thereto by vertically disposed stitching extending through the luffa strips 18 so as to leave the channels completely open to the air at the top as can be seen from Figure 5.

It is preferred to utilize an inner sole liner 28 formed of a compressed sheet of luffa material in the manner set forth in the aforesaid application. In brief, this inner sole liner consists of a compressed sheet of luffa material molded to the shape of the sole of the boot and adapted to removably rest thereon. As before, best results are achieved when the relatively soft outer fiber layer is exposed so as to contact the foot of the wearer.

Referring now to Figures 7 and 8, there is shown a liner 30 of a slightly modified construction. In this embodiment, a compressed luffa sheet 32 and a plurality of strips 34 are formed out of a single piece of luffa. It is preferable to form this integral sheet by cutting grooves out of the interior fiber layer of a dried longitudinally split luffa plant, preferably where the interior ribs of the plant are connected with the outer shell. In this manner, the exposed surface of the strips contain the relatively coarse fiber layer, and the fibers thereof are generally oriented in a longitudinal direction. The liner may then be built up with two layers of nylon mesh 16 and

thereafter applied to the interior of the boot in the manner previously described. This modified liner is especially advantageous for use in women's shoes due to its relative thinness.

It can thus be seen that there has been provided by the present invention a liner which is both moisture absorbent and self-ventilating thus assuring the maintenance of the wearer's feet in a substantially dry and relatively cool condition. It will be understood that dry luffa material has the property of absorbing moisture up to six or eight times its own weight without dripping and is self-drying from a completely saturated condition within four and five hours when exposed. The normal perspiration that would occur during use is, of course, considerably less than this, and under normal conditions, the liner is self-drying in a matter of fifteen or twenty minutes after being removed from the foot.

When the boot of the present invention is being worn, the heat generated by the foot warms the adjacent air, and since the liner 10 is of a porous or open network structure, the warm air passes through the liner and tends to rise through the channels 26 on the same principle as a chimney. This movement of air enables the moisture in the air to more quickly come into contact with a greater area of the luffa material thus effecting a more complete and faster moisture absorbency. Moreover, since the luffa material is somewhat exposed to the atmosphere, a portion of the moisture absorbed may be carried away by the moving air if conditions permit.

A significant feature of the present invention is that when the luffa material of the liner is fabricated in the manner indicated above, the natural general orientation of the interlaced fibers tend to give proper direction to the flow of air. That is, since the general orientation of the fibers in the strips and the adjacent surface of the sheet run in the same direction as the channels, a greater barrier is offered to the flow of air transversely across the strips than through the sheet or upwardly through the channels. In this manner, the luffa material utilized not only provides the essential moisture absorbent properties, but also makes it possible to achieve a truly self-ventilating liner. The combination of moisture absorbency and self-ventilation substantially alleviate the problems heretofore experienced due to perspiration of the feet.

Another significant feature of the present invention is the fact that the liner is self-compensating to take care of extreme conditions. As mentioned above, luffa expands as it absorbs moisture, but the expansion is not sufficient to cause discomfort during wear. This expansion, however, operates in the present invention to achieve a greater amount of ventilation just at the time when such greater ventilation is most needed, namely, when a great deal of moisture is being given off by the feet. Stated differently, the more moisture absorbed, the more ventilation obtained. This is possible due to the expansion of luffa material particularly the strips, thus making the channels deeper and permitting a greater amount of air to move.

I am aware that it has been proposed to provide boots and shoes with an integral liner of ribbed knit material, such as cotton, wool or the like, and that such liners achieve a somewhat limited degree of ventilation. However, such a liner constitutes nothing more than a mere ribbed hose such as are in common use. It is well known, that the ribs of ribbed hose are primarily decorative and do not achieve any substantial ventilating effect, due to the fact that once they are moisture laden, they tend to flatten out.

My arrangement, which is a perfect ventilating system, consists of a porous inner lining which is open at all times, leading into a rigidly constructed vent which cannot collapse, insures the passage of the warm air to the exterior at the top edge of the shoe and receives fresh air from the exterior. The reason that the luffa

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in this system is very necessary is because in the passage of the warm air, moisture is absorbed from it. What is more, any humid air which enters the shoe from the exterior at its upper edge, is dried before it reaches the foot. Moreover, the moisture removed from humid air is taken care of by the upper portion of the lining, above the ankle, while the moisture which originates from the foot is absorbed by the part of the lining below the level of the ankle. Furthermore, due to sweat absorption, rapid evaporation by efficient ventilation prevents deposit of and retention of sweat odor. The use of wool as a lining, though it absorbs some sweat, retains it. It is organic material. The acids and salts excreted in sweat becomes fixed in wool because of its organic structure and thus lead to rotting. On the other hand, luffa is a cellulose, and therefore is resistant to products of sweating which are absorbed thereby. Thus the present liner is also non-rotting and non-allergic.

The use of two layers of nylon mesh serves to protect the interlaced fibers of the luffa material from being accidentally separated and further serves to provide a smooth even surface which contacts the foot. While the luffa fibers are somewhat stiff when completely dry, after a short period of use, for example, fifteen minutes or more, the fibers soften and present a very pleasing and comfortable contact with the foot.

The use of the removable inner sole liner has the advantage that if water should seep into the shoes, the saturated inner sole liner may be removed and replaced by a dry one. The completely saturated inner sole liner will then dry in a matter of three or four hours after being removed. Moreover, it will be appreciated that the liner of the present invention will likewise quickly dry from its normal relatively unsaturated condition after removal following normal use, in a matter of fifteen or twenty minutes. While I have described herein the utilization of luffa as the preferred material for the boot liner because of its properties which are particularly suited to achieve the desired functions, it will be understood that other materials, both natural and synthetic, having properties approximating those of luffa may be utilized to achieve somewhat the same results.

It will also be understood that the terms "boots" and "shoes" as herein used are synonymous and comprehend within their meaning footwear in general, such as overshoes and the like. The forms of the invention herewith shown and described are to be taken as the preferred embodiments of the same, and it will be apparent that changes may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a shoe having a sole and an upper secured thereto, a liner for said upper including a porous inner sheet and a plurality of strips of the natural interlaced fibers of the luffa plant interposed between said sheet and said upper, said strips extending in a direction toward the open top

edge of said upper and being spaced apart transversely to form channels therebetween, said channels providing for the flow of warm air from the foot of the wearer upwardly therethrough to thereby ventilate the shoes, said luffa strips being operable to expand in accordance with the amount of moisture absorbed thereby so as to increase the depth of said channels and hence permit a greater air flow.

2. In a shoe having a sole and an upper secured thereto, a liner for said upper comprising a thin compressed sheet of the natural interlaced fibers of the luffa plant, thin strips interposed between the inner wall surface of the upper and the outer wall surface of said compressed sheet so as to space the latter from the former, said strips being spaced apart and extending in a direction toward the top edge of said upper so as to divide the space between said sheet and upper into channels which serve to ventilate the shoe and a mesh material adjacent the inner wall surface of said sheet.

3. In a shoe having a sole and an upper secured thereto, a liner for said upper comprising a thin compressed sheet of the natural interlaced fibers of the luffa plant having compressed luffa strips extending from the outer surface thereof, means for securing said sheet to the interior of said upper with said strips engaging the inner wall surface thereof so as to maintain said sheet in closely spaced relation thereto, said strips being spaced apart from each other and arranged to extend toward the top edge of said upper so as to provide channels which serve to ventilate the shoe.

4. A shoe as defined in claim 3 wherein said strips form an integral part of said luffa sheet.

5. A shoe as defined in claim 3 wherein said strips are separately formed and are secured to said luffa sheet.

6. In a shoe as defined in claim 2 said strips of the natural interlaced fibers of the luffa plant including a layer of relatively coarse fibers generally oriented in a direction parallel with the longitudinal extent of said strips.

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