

P. R. FRENCH.
ARTICLE OF FIBROUS MATERIAL.
APPLICATION FILED NOV. 29, 1910.

1,084,264.

Patented Jan. 13, 1914.

Fig. 1.

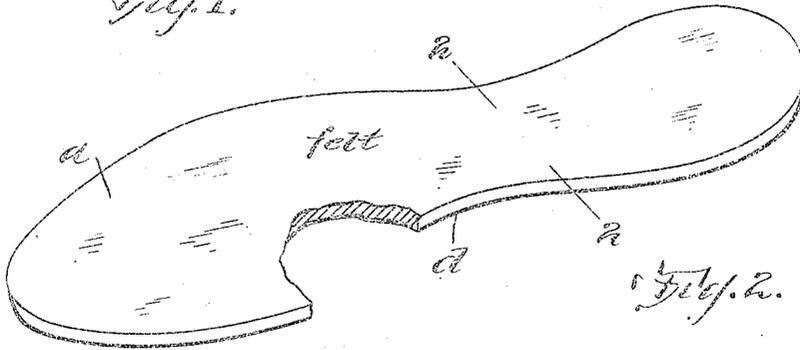


Fig. 2.

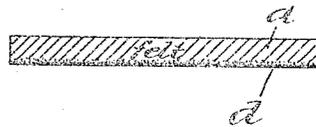


Fig. 3.

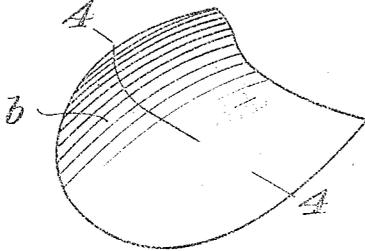


Fig. 4.

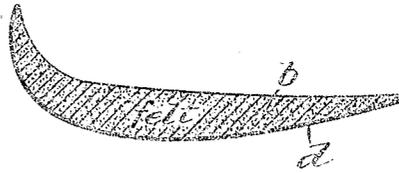


Fig. 5.

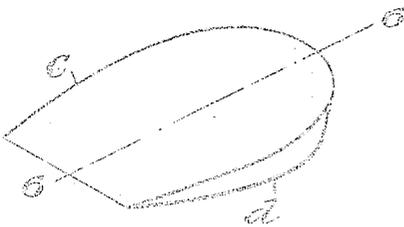


Fig. 6.



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UNITED STATES PATENT OFFICE.

PHILIP R. FRENCH, OF ANDOVER, MASSACHUSETTS.

ARTICLE OF FIBROUS MATERIAL

1,084,264.

Specification of Letters Patent.

Patented Jan. 13, 1914.

Application filed November 29, 1910. Serial No. 594,730.

To all whom it may concern:

Be it known that I, PHILIP R. FRENCH, of Andover, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Articles of Fibrous Material, of which the following is a specification.

This invention relates to articles made of fibrous material, felt, and particularly to articles of such material adapted for use in boots and shoes, my invention being applicable to felt articles such as inner soles, instep arch supporters, heel cushions, etc., adapted to be interposed between the bottom of the shoe and the foot of the wearer. The invention is intended particularly to render a felt body waterproof without destroying its resilience or its cushioning property, the waterproofing material being of such nature that it adheres tenaciously to the fibers of the felt and constitutes a binder which holds the fibers closely associated, but is not liable to be cracked and disintegrated by flexure of the felt article, the material being applied to the felt in solution with a volatile solvent and rendering the felt body plastic before the solvent is evaporated; so that the body may be molded into any desired form which is rendered permanent by the material after the evaporation of the solvent. The waterproof quality imparted to the felt renders it particularly desirable for use as a cushion interposed between the wearer's foot and the bottom of the shoe and preventing moisture from passing either from the bottom of the shoe to the wearer's foot or from the wearer's foot into the body of the article.

Of the accompanying drawings which form a part of this specification,—Figure 1 represents a perspective view of a felt inner sole embodying my invention; Fig. 2 represents an enlarged section on line 2—2 of Fig. 1; Fig. 3 represents a perspective view of an instep arch supporter embodying my invention; Fig. 4 represents an enlarged section on line 4—4 of Fig. 3; Fig. 5 represents a perspective view of an inside heel cushion embodying my invention; and Fig. 6 represents a section on line 6—6 of Fig. 5.

Similar reference characters indicate the same or similar parts in all the figures.

In carrying out my invention I dissolve a material such as cellulose tetracetate, in a volatile solvent such as acetone, and apply the same to a felt body which may be an inner sole *a*, an instep arch supporter *b*, an inside heel cushion *c*, or any other article which may be made of felt and to which it is desirable to impart a waterproof quality without destroying the resilience of the felt.

In case the felt article is an inner sole which does not require to be molded to give it its final form, I usually apply the solution only to the surface of the felt article, and preferably to the under surface, the solution being relatively thick or viscous and forming a surface binder *d*, indicated by the heavy black lines in Figs. 1 and 2. The solution penetrates the material only sufficiently to cause its firm adherence thereto, the depth of penetration depending on the viscosity of the solution. Before the solvent evaporates, the article with the plastic layer *d* is subjected to pressure between suitable pressing surfaces, one of which, that in contact with the layer *d*, being preferably smoothly polished so that it leaves a smooth lustrous surface on the layer *d* after the evaporation of the solvent. The pressure is maintained until the solvent evaporates, heat being preferably employed to facilitate evaporation. An inner sole thus constructed retains, throughout the greater part of its thickness, the original resilience of the felt, so that it constitutes a desirable cushion for the foot, the layer *d* not only binding the fibers at one side of the felt body together, but also preventing moisture from the bottom of the shoe from entering the inner sole.

Certain classes of articles are preferably treated with two solutions, one of which is relatively thin and permeates the entire thickness of the article, while the other is thick and viscous forming a surface binding layer *d*.

While the inner sole, represented by Figs. 1 and 2, may be treated with the two solutions above mentioned, I prefer, since the inner sole does not require molding, to provide it with the binding layer *d* only.

In Figs. 3 and 4 I show an instep arch supporter which is transversely curved so

that one edge is raised above the body portion and is adapted to bear on the inner side of the instep of the foot. In forming this article I take a suitably shaped felt blank and saturate it with the thinner solution which permeates the entire thickness of the blank, as indicated by the stippling in Fig. 4. I then subject the saturated blank to the molding pressure, imparting to it the desired form, and cause the evaporation of the solvent, to make said form permanent. The binding layer *d* may be applied after the evaporation of the solvent of the thinner solution.

In Figs. 5 and 6 I show a wedge shaped heel cushion, adapted to bear on the heel end of the permanent inner sole of the boot or shoe, and serve as a cushion for the heel of the wearer's foot. This cushion may be treated in the same manner as the inner sole, shown by Figs. 1 and 2, that is to say, it may have a surface binding layer *d*, the main body of the felt being free from the binding material. If desired, however, the cushion *c* may be treated only with the thinner solution permeating its entire thickness, as indicated by the stippling in Fig. 6. Furthermore, it is obvious that the cushion *c* may be treated both with the thinner solution, and the binding layer *d*. The instep arch supporter *b* may also be made without the binding layer, although in a molded article of this character I consider the binding layer more desirable than in an article which is not molded, the binding layer increasing the stiffness of the article and enabling it to retain the shape imparted to it by the molding operation without impairing its resilience, by which term I mean in this case, its freedom to yield to the pressure exerted on its upper side and to expand on the removal of such pressure.

I find that cellulose tetracetate dissolved in a volatile solvent and applied to a felt article is characterized after the evaporation of the solvent as follows: (1) The residual material forms a tough and tenacious binder which adheres firmly to the fibers of the felt and is free from liability of being cracked or disintegrated by flexure of the article so that it does not crumble or assume a granular condition either when applied in the form of a relatively thick or a relatively thin solution; (2) the residual material applied in either form renders the felt waterproof; (3) the material when constituting the residuum of a thin solution, permeating the entire thickness of the felt, renders the latter plastic before the solvent evaporates, so that the article may be readily molded, the residual material after the evaporation of the solvent becoming a binder which holds the fibers associated without materially affecting the resilience of the felt body; (4)

the residual material is not softened and rendered sticky by the heat of the foot; and (5) the residual material dries quickly to hardness.

While cellulose tetracetate dissolved in acetone constitutes the best solution known to me for the purpose described, it is obvious that I may dissolve any other suitable material in a volatile solvent of any suitable character to form a solution, the residuum of which imparts to a felt article the characteristics above specified.

The thinner solution is preferably made by dissolving ten (10) pounds of cellulose tetracetate in one hundred (100) pounds of acetone.

The thicker solution is preferably made by dissolving twenty (20) parts of cellulose tetracetate in one hundred (100) pounds of acetone.

I claim,—

1. An instep arch supporter comprising a resilient, shaped, felt body permeated with the residuum of a solution of waterproofing material, said residuum waterproofing the fibers and constituting therefor a binder free from liability to be disintegrated by flexure of the article and unaffected by the heat of the foot, said body having a stiffening layer on its surface formed by a thicker deposit of residuum from a solution of similar waterproofing material.
2. An article adapted for use in those parts of footwear contacting with the sole of the foot, comprising a resilient fibrous body portion provided with the residuum of two solutions of waterproofing material, one residuum being relatively thin and permeating the entire article, while the other residuum is relatively thick and forms a stiffening layer on the surface of the article, each residuum waterproofing the fibers with which it is in contact, and constituting a tough, tenacious and flexible binder which is free from liability to be disintegrated by flexure of the article, and is unaffected by the heat of the human body.
3. An article adapted for use in those parts of footwear contacting with the sole of the foot, comprising a molded resilient fibrous body portion permeated throughout its entire mass with the residuum of a solution of waterproofing material, said residuum being relatively thin, and permeating the entire article, and waterproofing the same without materially affecting its compressibility and resilience, and constituting a tough, tenacious and flexible binder which is free from liability to be disintegrated by flexure of the article, and is unaffected by the heat of the human body.
4. An article adapted for use in those parts of footwear contacting with the sole of the foot, comprising a resilient body portion

of felt, whose fibers are waterproofed and held associated by the residuum of a solution of cellulose tetracetate, said residuum constituting a tough, tenacious and flexible binder free from liability to disintegrate by flexure of the article and unaffected by the heat of the foot.

In testimony whereof I have affixed my signature, in presence of two witnesses.

PHILIP R. FRENCH.

Witnesses:

C. F. BROWN,
GEO. W. FRENCH.