Oct. 19, 1937. H. GORDON 2,096,511

THERMALLY INSULATED SHOE SOLE

Filed Sept. 25, 1936

Fig. 1.

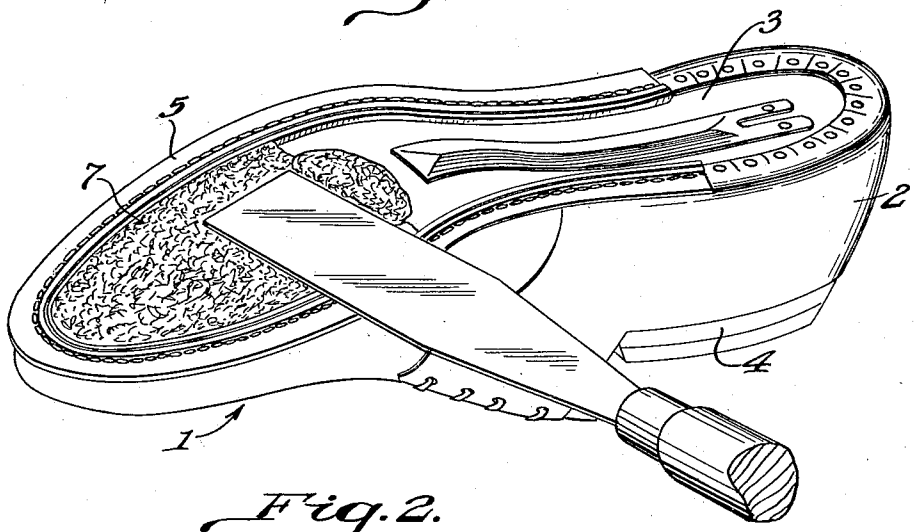


Fig. 2.

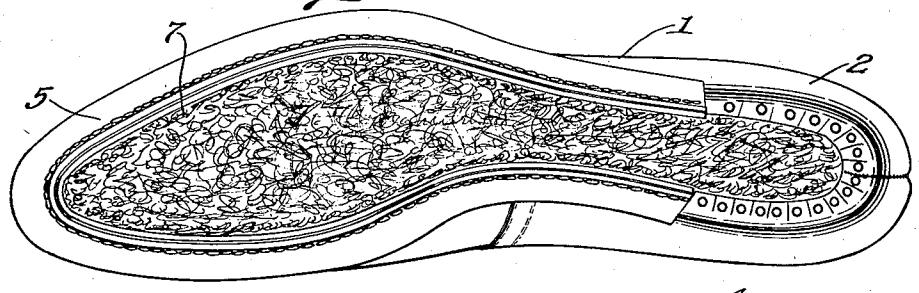


Fig. 3.

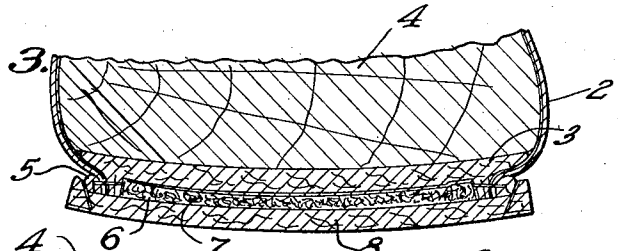
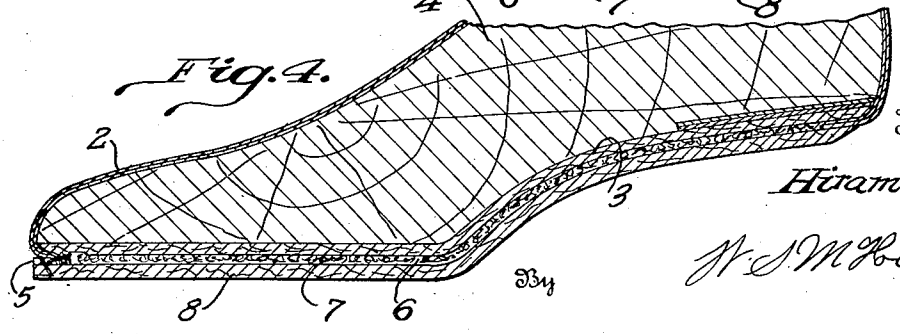


Fig. 4.



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THERMALLY INSULATED SHOE SOLE

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Application September 25, 1936, Serial No. 102,560

7 Claims. (Cl. 12—148)

This invention relates to improvements in shoes and similar articles of footwear, the primary object thereof being to improve the sole construction of such shoes, or other articles, by incorporating therein an improved thermal insulation, whereby to enable the soles to more effectively resist the transmission of heat or cold therethrough and to increase the foot comfort of the wearers thereof.

Present day shoes, particularly ladies' shoes, are quite strongly characterized by their extreme lightness in weight, this being a quality demanded by the majority of shoe buyers who have in view such factors as style, comfort and appearance. Manufacturers, in order to meet this demand, have resorted to the use of soles of thin flexible construction, with the result that when such shoes are worn on hot summer streets or in sub-freezing weather, there readily takes place the passage of heat or cold through the soles with varying degrees of resulting foot discomfort to the shoe wearers.

Partly to obviate this condition, manufacturers of shoes are now employing ground or granulated cork, admixed with an organic binder, and disposed in the form of thin layers in chambers provided between the insoles and outsoles of the shoes. Cork is a well recognized thermal insulation but the addition of the binder thereto reduces its normal effectiveness in this regard and, also, when shoes containing the same are worn, the bending and flexing of the soles is apt to produce cracks, fissures or breaks in the cork composition layers which further lesson the ability thereof to resist heat transfer.

In accordance with the present invention, an improved insulation for shoe soles is provided composed primarily of siliceous wool and which practice has disclosed to be superior to the ground cork compositions in its ability to resist heat flow, convenience of application to the shoe soles, greater manufacturing economy and in its ability to permanently maintain its effective form when subjected to prolonged periods of service in actively worn shoes.

Glass wool, particularly, is conceded to be an excellent thermal insulator and is now widely used in insulating house walls where its qualities of lightness in weight, economy and effectiveness are well recognized. Heretofore, however, it has been largely used in capacities in which the wool, when in use, is stationary and not subjected to forces which set up relative movement between the individual fibers thereof. Different problems exist, however, in adapting this high grade insulator to shoe construction. First, there is the consideration of limited available space in the construction of shoe soles in which to place a sufficient quantity of such wool to render the same effective in its intended capacity; second, the problem of holding the wool in a compacted state within the flat and thin receiving chamber of a shoe sole with the required degree of security and to prevent breakage thereof; and, third, to provide for economical and expeditious manufacturing operations so that manufacturing costs will not be excessive.

Glass wool is composed of matted fibers of steam blown glass and in its normal commercial form resembles raw cotton or animal wool. To handle this material in its normal state when applying the same to shoe sole construction would be difficult or impossible, particularly in the matter of securing a compact layer thereof of uniform thickness in the receiving chamber formed between the insole and outsole of a shoe.

I have solved these and related difficulties by treating the glass wool, prior to its application to the shoe, with a volatile plasticizer or binder, consisting preferably of a fluid compound of clear rubber and a low-boiling hydrocarbon oil, such as naphtha or benzol, whereby to reduce the wool to a plastic, workable condition at the time it is to be inserted in the receiving space therefor of a shoe sole. The plastic state of the wool permits the same to be spread uniformly with a knife or other tool over the full area of said space and to the required depth thereof from the heel to the toe of the shoe, filling said space compactly and without likelihood of accidental displacement. The wool is then permitted to dry by exposure to the air, or by artificial acceleration, the evaporation of the readily volatilizable compounds of the binder taking place. After such drying, the outsole of a shoe is secured by any standard process to the insole and upper, thereby confining the insulation in place and precluding dislodgment thereof.

Due to the fibrous nature of the glass wool, the same may not only serve as an insulator but to a large extent as a cushion layer between the insole and outsole which further adds to the comfort of the wearer of a shoe made in accordance with the present invention. Since the glass wool possesses relatively long fibers, which are interlaced or matted when disposed in a shoe sole, the latter may be flexed or bent as will occur with normal wear thereof, without detrimentally affecting the wool by causing the fibers to separate.

For a further understanding of the invention, reference is to be had to the following description and the accompanying drawing, wherein:

Fig. 1 is a perspective view of the bottom of a shoe, prior to the attachment of the outsole thereof, and disclosing the operation of applying glass wool to the receiving chamber therefor provided in the insole of a shoe;

Fig. 2 is a plan view showing the insole after the chamber formed therein has been completely filled with the glass wool, and illustrating the condition of the shoe during the operation of drying the wool;

Fig. 3 is a vertical transverse sectional view taken through the shoe with the outsole attached;

Fig. 4 is a longitudinal sectional view taken through the completed shoe sole.

In carrying out the present invention, a shoe, as indicated at 1, in course of manufacture, is provided with an upper 2 and an insole 3, the shoe being preferably mounted on a last 4. Stitched to the sole margins of the upper and the insole is a welt strip 5 which extends from the toe to the heel regions of a shoe in the ordinary manner. The sole margins of the upper 2 and the thickness of the applied welt strip 5 produce in the sole region of a shoe a relatively thin flat chamber 6 which is adapted for the reception of the thermal insulation 7 used in carrying out the present invention. This insulation is applied to the shoe prior to the attachment of the outsole 8 thereof to the upper-carried parts of a shoe and while the latter is retained in a taut condition on the last 4.

The improved thermal insulation which I employ consists of siliceous wools, such as mineral wool or glass wool, the latter being preferred. In its normal dry commercial state, glass wool cannot be handled to provide for its proper and uniform insertion in the shallow recess or pocket provided therefor in the shoe sole, as indicated at 6 in the drawing. Therefore, in order to enable the material to be used in a practical and economical manner, I reduce the same to a plastic workable state by applying thereto a mixture composed of a low-boiling hydrocarbon oil, such as naphtha or benzol and a clear rubber adhesive so that when this volatile binder is thoroughly admixed with the glass wool, the latter assumes the form of a plastic mass. This enables the same to be applied to the back of a knife, or other type of blade and, as shown in Fig. 1, deposited in the pocket or chamber 6, to smoothly and uniformly fill the latter throughout the full area thereof, in other words, from the heel to the toe of the shoe. Due to its plastic form, the glass wool may be closely compacted within the pocket or chamber 6 with uniform thickness.

Following its application to the shoe, the insulation is air dried, preferably by natural or artificially induced air circulation, and in this connection, the air may or may not be heated, depending upon the speed of the manufacturing operations. Usually, after the insertion of the glass wool into the shoe, the latter is placed on a rack and in normal manufacturing operations, the time required to transfer a rack of such shoes from one department of shoe manufacture to another affords sufficient time for the evaporation of the volatile constituents of the binder.

When the drying operation is completed, the outsole 8 is attached to the upper-carried portions of the shoe by any approved operation, such as stitching, cementing or the like, the attachment of the outsole thus closing the pocket or chamber 6 on its open side to permanently confine the glass wool in its applied and operating position within the shoe sole.

A shoe manufactured in accordance with the present invention may be readily made so as to be light in weight and very flexible or pliable in the sole region thereof. Glass wool is a very light weight insulator so that its addition to the shoe does not add preceptibly to the weight thereof. In shoes which have used fillers of ground cork, the substitution of glass wool will lighten the shoe. By reason of the long fibers of the glass wool, the same tends to produce a felt-like cushion within the bottom of a shoe which, in addition to its value as a thermal insulator, is also of value because of the cushion-like action thereof.

While it has been stated that the glass wool is compacted and confined in the sole pocket or chamber 6, yet it will be understood that this compaction is not of a character as to in any way interfere or substantially diminish the resistance of the material to the passage of heat therethrough. Shoes made in accordance with the present invention may be widely used by those engaged in outdoor occupations, such as members of municipal police departments, sales persons and others, to marked advantage in the matter of diminishing foot discomfort.

What is claimed is:

1. A shoe comprising inner and outer soles having a chamber formed between the same extending from the heel to the toe of a shoe, and a heat insulator in the form of a siliceous wool disposed within said chamber to substantially completely fill the same.

2. In a shoe, an insole and an outsole, and a layer of glass wool confined between said insole and outsole and permanently retained thereby.

3. In a shoe, an insole and an outsole, there being a thin chamber formed between said insole and outsole and extending from the toe to the heel regions of said shoe, and a layer of glass wool confined between said insole and outsole and substantially completely filling said chamber.

4. In the manufacture of shoes, the step which comprises applying a layer of glass wool over the insole of a shoe prior to the securing of an outsole thereto.

5. In the manufacture of shoes, the step which comprises covering the bottom of the insole of a shoe with a plastic mass of glass wool.

6. The method of manufacturing shoes which comprises covering the insole of a shoe with a plastic layer of glass wool in which a volatile binder is incorporated, effecting the evaporation of said binder and the drying of the glass wool, and securing an outsole to the shoe to confine the glass wool therein.

7. In the manufacture of shoes, the steps which comprise applying to the bottom of the insole of a lasted shoe a layer of glass wool treated with a volatile binder composed of rubber and a low-boiling hydrocarbon oil, substantially evaporating the readily volatilizable constituents of the binder by air drying the same, and then securing an outsole to the insole to confine said glass wool therebetween.

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