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DEFORMABLE FOOT SUPPORT FOR SHOES AND METHOD OF MAKING THE SAME

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Fig. 1

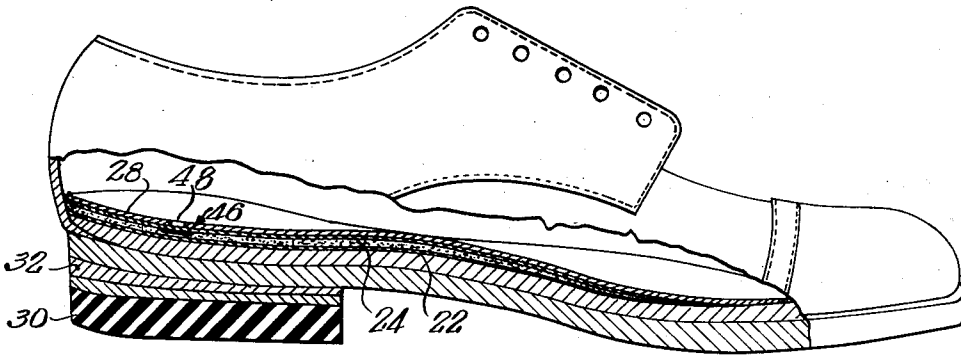


Fig. 2

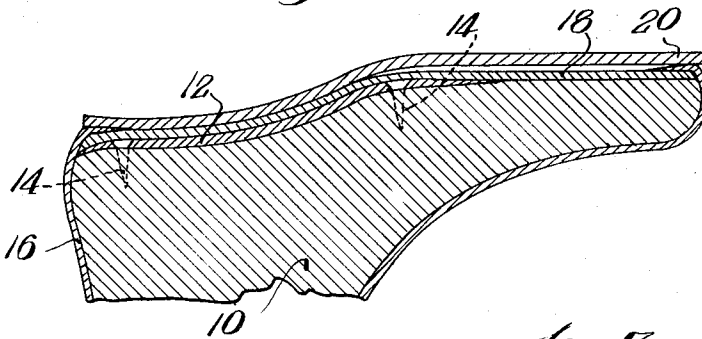


Fig. 3

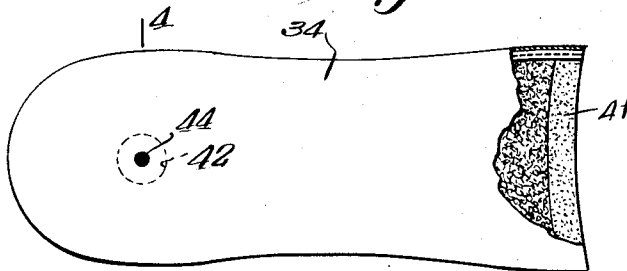
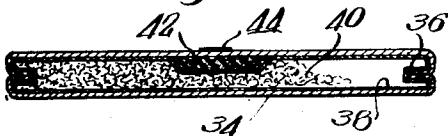


Fig. 4



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UNITED STATES PATENT OFFICE

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DEFORMABLE FOOT SUPPORT FOR SHOES AND METHOD OF MAKING THE SAME

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13 Claims. (Cl. 36—71)

This invention relates to improvements in deformable foot supports and methods of making and fitting such foot supports.

I have previously disclosed in my applications, Serial No. 44,040, filed October 8, 1935, and Serial No. 44,038 filed on the same date, certain improvements in the manufacture of foot supports which are moldable to receive foot impressions and which may be hardened to retain the foot impressions. As disclosed, such foot supports may be made separate from or built into the shoes and may extend the full length of the foot, three-quarter length to include the instep and heel, the heel only or may be in the form of a bolster for the instep portion only of the foot. According to my prior disclosures the foot supports are in the form of envelopes having moldable or flowable filling material therein which is retained in such state until hardening is desired to retain the foot impression.

It is an object of the present invention to initially make a foot support in the form of an envelope having a filler in a non-moldable state, but of such a character that it can be softened or made moldable when desired so that a foot impression may be taken and retained as the filler sets or hardens, if and when desired.

Another object of my invention is the method of making foot supports in which the filler in the envelope is transformed to a rigid or semi-rigid state by injecting ingredients into the filler while retained by the envelope to produce a chemical reaction or to otherwise cause hardening or setting of the filler.

It is further an object of the present invention to disclose improvements in the method of lasting shoes whereby foot supports may be built into the shoes.

In the drawing:

Fig. 1 is a side elevation of a foot impression shoe partially shown in section;

Fig. 2 is a sectional view of a last and a shoe on the last;

Fig. 3 is a plan view partially in section of a foot support, and;

Fig. 4 is an enlarged section taken on the plane indicated 4—4 in Fig. 3.

According to my invention, a foot support may be built into a shoe by an improved method of lasting. In Fig. 2, 10 is a standard last for the desired size and style of shoe, but a special plate 12 is applied to the top of the last and may be retained in place by the screws 14 or other means. Preferably the plate 12 is substantially the same size as the foot support to be used. The upper 16 is lasted to the insole 18 and outsole 20 in the usual manner, thus forming a pocket or recess in the shoe which is below the normal level of the insole. The foot support comprising the envelope 22 and filler 24 is inserted in the pocket

or recess and the shoe is finished as in Fig. 1. A sock lining 28 or a suitable heel piece may be used as shown, but is not required. Due to the added thickness of the foot support the height of the heel 30 may be somewhat reduced to compensate therefor by eliminating one of the heel lifts 32, whereby the finished shoe will tread substantially the same as a shoe lasted in the normal manner upon the last 10 without using the special plate 12.

Figs. 3 and 4 show in detail the foot support which is built into the shoe of Fig. 1 or which may be used as a replaceable foot support for insertion in previously finished shoes. The foot support comprises an envelope 34, preferably of flexible or inelastic material which is stitched as at 36 to form the envelope. The envelope has a sealing coating 38 over the inner surface thereof; the sealing coating is preferably applied to the outside of a stitched envelope which is then reversed to the form shown in Figs. 3 and 4. The filling material 40 may be inserted in the envelope in a plastic state, as disclosed in my prior applications, or in a dry, finely divided state, whereby the material is flowable but not necessarily moldable, or in the form of a rigid block. The filling opening of the envelope may be sealed as at 41. In order to provide for the exhaustion of residual air or the injection of solvents, chemical hardening agents or other ingredients, the envelope has a button 42 of sponge rubber applied to the inner surface and the outer side of the envelope is suitably marked as at 44 to indicate the center of the sponge rubber button. If a sock lining or heel pad 46 is used, an opening 48 may be formed therein immediately above the center of the sponge rubber button. When it is desired to withdraw the residual air from the envelope or to inject ingredients into contact with the filler, a hypodermic syringe is used or some other suitable instrument which has a hollow needle that may be punched through the envelope and the sponge rubber button. Latex may be applied to the opening 48 in the sock lining or to the outside of the envelope of the foot support so that as the needle is withdrawn the latex will seal the hole, although the sponge rubber itself may form a satisfactory seal.

A preferable method of forming the foot support consists in forming an envelope of a suitable size, as above described, inserting a block of filler such as plastic wood into the envelope and sealing the filling opening of the envelope. The hard filling material may be softened by injecting a solvent as above described, and the residual air exhausted from the envelope. The filler will then be retained in a plastic state for a long period of time. The envelope and filler is placed in the shoe either in a rigid or moldable state. The foot impression is made while the filler is moldable

and by puncturing the envelope air is admitted to evaporate the solvent and to cause fast hardening of the filler when and if desired to retain the foot impression.

5 The filling material used for the foot support may be of such a character that the change from a moldable state to a form-retaining state is either a reversible or irreversible process. For example, certain compositions harden as a solvent is allowed to evaporate or is driven off by heating and can be resoftened by again adding the solvent. Other materials set or harden by a chemical reaction and can not be readily resoftened. Fusible or thermoplastic materials are reversible since they can be resoftened by heating after they have hardened from a plastic state.

10 The filling material may be capable of molding at normal temperatures or at elevated temperatures.

20 The filling material may be made initially in a plastic state and be retained in such state in a sealed envelope until hardening is desired or the filling material can initially be in a non-plastic state in the form of a solid block which can be softened by adding a solvent or by heating. The filling material could also initially be in a finely divided form whereby the material is flowable or displaceable but not plastic or moldable in the usual sense. Such finely divided material may be caused to set or harden by adding water or a chemical hardening agent.

25 The filling material may be converted to a hard rigid body which will retain the foot impression or to a semi-rigid or elastic body which will substantially retain the shape to which it has been molded.

30 Various compositions may be made which will be reversible between a moldable state and a hard state and generally include a filler, a binder and a volatile solvent. As the solvent evaporates the mixture becomes hard and non-plastic, but by adding solvent the hardened mass may be resoftened. Other materials may be present in the mixture such as non-volatile solvents, and plasticizing or stabilizing agents. A good example of such material is the so-called plastic wood described in Griffith Patent No. 1,838,618, as disclosed in my prior applications.

35 Among the fillers that may be used in finely divided form there may be mentioned, cellulose or mineral material such as wood, paper, cork, cotton, starch, clay, talc, silica, graphite, gypsum, asbestos, horn, bones, pumice or the like. The fillers may only be present in small proportions or may not be used at all if mixtures are made of the desired consistency which will harden as desired.

40 The binders may be synthetic or natural resins or other similar material such as cellulose esters, urea, phthalic acid, phenol condensation products, rubber or substitutes, coumarone, casein, shellac, gums, pitch, asphalt and waxes such as paraffins, ceresin, etc.

45 The volatile solvents may be simple alcohols such as methyl, ethyl, butyl and amyl alcohols; ethers such as ethyl or glycol ethers; esters such as the simple acetates; ketones such as acetone, methyl or ethyl ketone, etc.

50 The non-volatile solvents may include essential oils such as linseed oil and fish oil esters such as the phthalates, acetates and tartrates, camphor, glycerin, etc.

55 The foot support envelope may be filled with a composition which is non-plastic or non-moldable in its normal state, although if the composi-

tion is in a finely divided state, it may be to a certain extent flowable or displaceable under pressure of the foot so as to take the shape of the foot. The composition may be of such a character that it is converted by a chemical reaction to a form-retaining shape upon the addition of other elements in a liquid or gaseous state.

5 For example, the filler for the flexible envelope may comprise various cement compositions which set or harden either in a short time or over a long period of time. The rate of hardening may be controlled by using inert fillers together with the cements or by adding other elements which either hasten or retard the hardening of the composition. Such compounds as zinc oxide, zinc chloride, copper oxide, tin oxide, lead oxide, aluminum oxide, magnesium oxide, silicates and sulfates can be used with binders such as phosphoric acid or glycerin. Water is added to such compositions as set in the presence of water.

10 Thus, the envelope may be filled with plaster of Paris or calcined gypsum in a finely divided state. When it is desired to harden the filler and retain the foot impression water is injected into the envelope. The envelope could also be filled with litharge or lead sulfate, which sets and hardens when glycerin is injected into the envelope. The water, glycerin or other substance may be injected into the envelope by a hypodermic syringe in the same manner as the solvent above described, or in any other suitable manner. Amalgams of various metals with mercury form compositions which may be molded and which will set and harden to retain foot impressions that have been made thereon.

15 Organic polymers or condensation products could be used as fillers such as coumarone, casein, gelatin, indene polymers, vinyl acetylene polymers, condensation products of phenol, phthalic acid, etc., which set or harden in the presence of glycerin, formaldehyde or phosphoric acid. The hardening agents may be injected into the envelope when it is desired to cause hardening of the filler.

20 Rubber compositions may be used as the filler having suitable hardening agents mixed therewith, and accelerators to increase the rate of hardening may also be present. Benzine may be used as a solvent to resoften the hardened rubber. The rubber filler may merely harden to an elastic but form retaining state or the hardening may be carried to such a stage that the rubber will be a rigid block. Chemicals could be injected into moldable rubber compositions used as the filler which would react to produce heating and hardening of the filler.

25 The envelope material is preferably sealed by a coating of material which is unaffected by the filling material retained by the envelope. For example, if acetone is the solvent used for softening the filling material, the envelope may be coated with latex, while if benzine is the solvent to be used the coating would be of celluloid. The envelope material is preferably flexible but non-elastic and is preferably of fabric, although thin flexible metal could be used.

30 Various other filling compositions could be used as the filling material which require heat treatment to harden or soften, and such compositions have been specifically described in my application, Serial No. 56,010 filed on the same date as this application, and describing improved structures and methods for heating the foot supports

to produce physical or chemical changes of the filling material.

It is to be understood that the foot supports may be used in a moldable state as long as desired and other forms of foot supports can be made which will be deformable under the pressure of the foot and tend to force the bones of the foot back to their normal position. For example, moldable clays or putties may be used as the filler in the flexible inelastic envelope or finely divided material or liquids or gases. The envelope could be in the form of a bladder into which air or other gases are pumped past a suitable valve or materials may be placed in the envelope which react to form gases which will be retained by the envelope.

The method of lasting above-described has certain advantages even if foot supports are not used. If a certain style of shoe is to be made with a lower heel it is not necessary to make up new lasts, instead, the old lasts can be modified by the addition of plates, as above described, so as to lower the heel seat of the shoes, and lower heels are applied.

Instead of placing the foot support above the insole it could be placed beneath the insole, especially if the insole is of lightweight, flexible material or has been perforated or slashed to make it more flexible.

I claim:

1. The method of making a foot support with the impression of an individual foot, which consists in forming a block of material capable of being converted to a moldable condition, placing said block while in a non-plastic state in an envelope, converting said block to a plastic moldable mass by the injection of an agent through a wall of the envelope into contact with the said block, molding said mass to the shape of a foot by applying the foot to the outside of the envelope and finally causing hardening of said mass to retain the foot impression.

2. The method of taking a foot impression which consists in preparing a composition capable of being transformed from a non-moldable state to a moldable state and from a moldable state to a non-moldable state, placing said mass in a non-moldable state in a retaining envelope, transforming said composition while in said envelope to a moldable state at normal atmospheric temperature, applying the pressure of a foot to said envelope to make the foot impression thereon, and finally transforming said composition to a non-moldable state to retain the foot impression.

3. The method of taking a foot impression which consists in preparing a mixture of a filler and a binder, placing said mixture in a flexible envelope, adding a solvent to said mixture while in said envelope to produce a moldable mass, making a foot impression thereon, and evaporating said solvent to produce hardening of said mass and to retain the impression.

4. The method of taking a foot impression which consists in preparing a composition that sets and hardens in the presence of water, filling an envelope with said composition in a dry state, adding water to said composition while it is retained in said envelope to produce a plastic mass, taking a foot impression while said mass is in the plastic state, and finally permitting setting of said mass to retain the foot impression.

5. The method of taking a foot impression which consists in preparing a mixture of material that may be converted to a non-plastic state by a chemical reaction, filling an envelope with said material in a dry state, adding an ingredient to said material while it is retained in said envelope to produce a plastic mass and a chemical reaction which causes said mass to harden, and taking a foot impression while said mass is plastic, whereby said impression will be retained as the mass hardens.

6. The method of making a foot support which consists in forming an envelope, inserting filling material into said envelope in a non-moldable state, injecting a fluid substance into said envelope to convert the filling material to a moldable state and exhausting the residual air from the envelope, whereby the filler will be retained in a moldable state for a long period of time.

7. A foot support comprising a flexible envelope and a filling insert retained by said envelope initially in a non-plastic state but capable of being softened by a solvent to a plastic state, said envelope having a sealing coating which is insoluble by the solvent for the filling insert.

8. The method of making an article for taking impressions which consists in forming an envelope of flexible, inelastic material, filling said envelope with material in a non-plastic state, and adding a plasticizing agent to the filling material while retained by the envelope to obtain a plastic, moldable article.

9. The method of making an article for taking impressions which consists in forming an envelope of flexible inelastic material, placing a filling insert in a non-plastic state in the envelope, sealing the envelope, withdrawing the residual air from the envelope and injecting a solvent through the envelope into contact with the insert to soften the insert to a moldable state.

10. The method of making an article for taking impressions, which consists in forming an envelope of flexible, inelastic material, filling the envelope with material in a finely divided state, sealing the envelope, and adding an ingredient to the filling material while retained by the envelope to produce a plastic mass.

11. An article of manufacture having the outline of a portion of a foot comprising an envelope of flexible material, filling material retained by said envelope capable of molding in the presence of a plasticizing agent, said envelope having a button of yieldable material through which the plasticizing agent may be injected.

12. An article of manufacture having the outline of a portion of a foot comprising an envelope of flexible material, a sealing coating on the envelope, a rubber button in a top wall of the envelope through which an agent may be injected into the envelope, and filling material capable of molding retained by the envelope.

13. The method of taking a foot impression which consists in filling a flexible envelope with material in a non-plastic state which is capable of softening to a plastic state in the presence of a solvent, softening said material while enclosed within said envelope by a solvent, making a foot impression thereon while the material is plastic and causing evaporation of the solvent to harden the material and to retain the impression.

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