April 24, 1956 R. B. SLOANE 2,742,657

MOLDED SHOE INSERT

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Fig. 2.

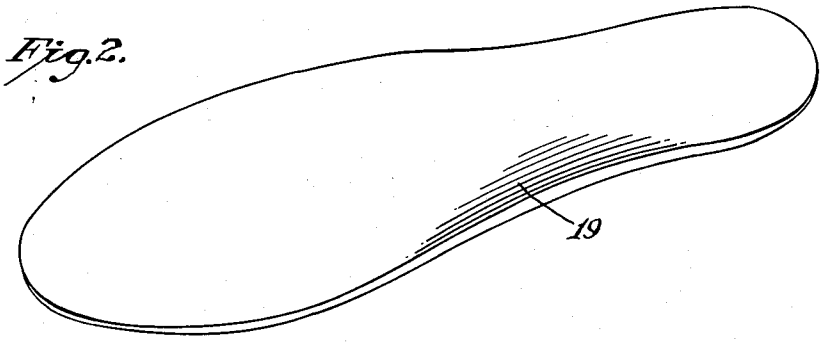


Fig. 1.

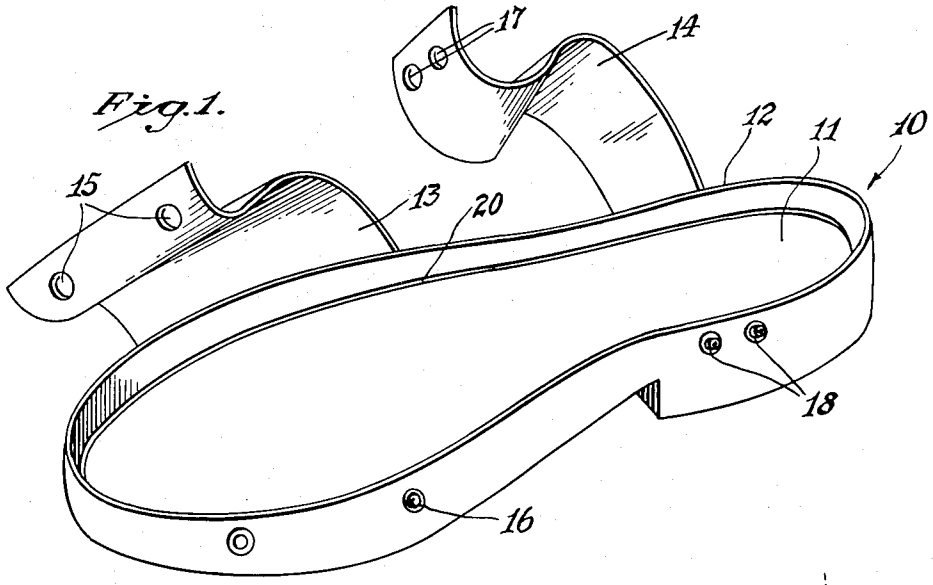
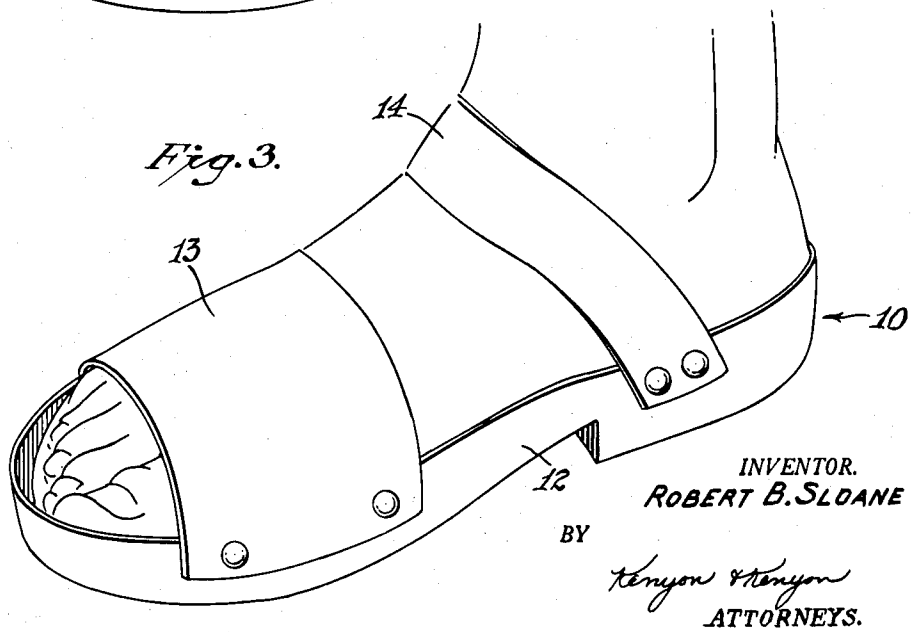


Fig. 3.



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Fig. 4.

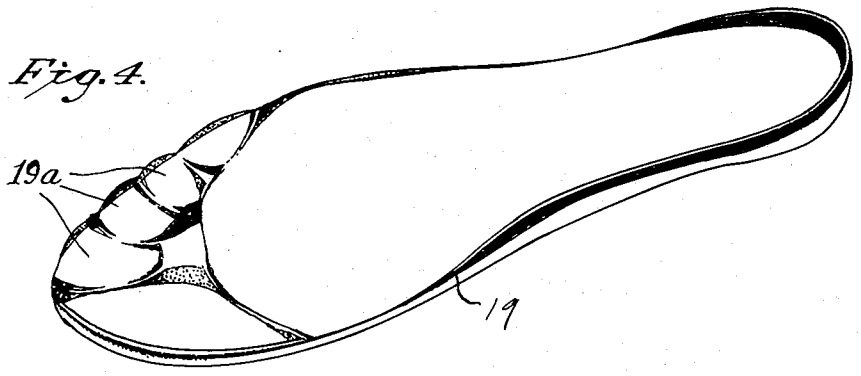


Fig. 5.

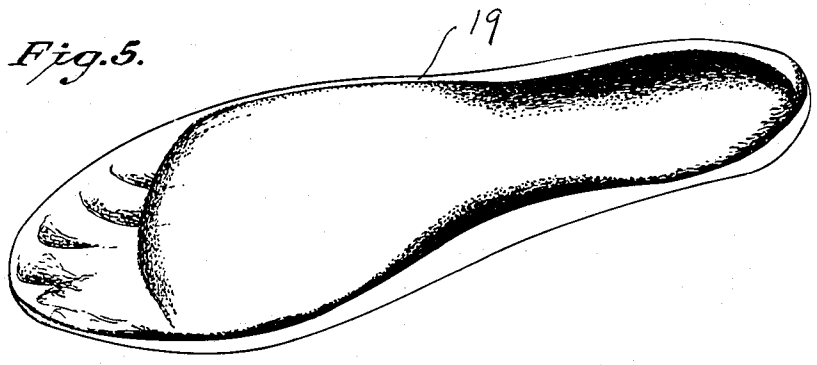
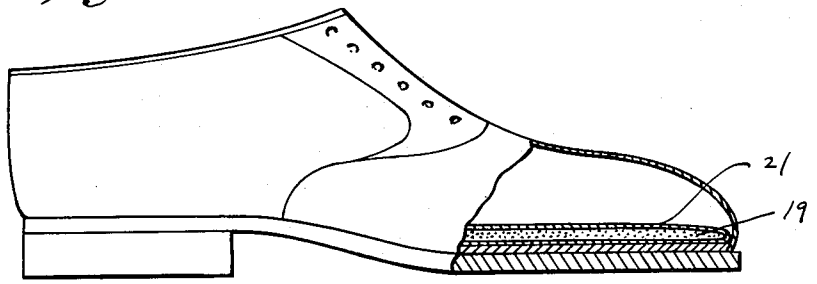


Fig. 6.



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MOLDED SHOE INSERT

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5 Claims. (Cl. 12—146)

The present invention relates generally to foot-supporting inserts for shoes, and more particularly to an inner sole pre-molded to conform to the plantar of a wearer's foot and insertable in a shoe of standard design, and to techniques for forming such individualized inner soles.

Ready-to-wear shoes manufactured on a mass production basis are not designed to conform to an individual foot but are constructed about an idealized last having no human counterpart. The fact that the plantar area of a given human foot has a depth of curvature and a contour which is characteristic solely of that foot and corresponds to no other foot is necessarily disregarded in dimensioning the mass-produced shoe. The range of variation in human foot shapes is so great that conventional width and length sizes can at best only approximate the needs of the individual wearer.

Many foot difficulties arise from the prolonged use of shoes which are ill-fitting and fail to provide adequate support. The limitations of the standardized shoe are well recognized and various expedients have heretofore been proposed to afford proper support for the arch as well as other areas of the foot. For example, it has been proposed to form casts which correspond to the foot of the wearer and to construct or mold a shoe about the cast. Such individualized shoes are very costly and entail a complicated and time-consuming production technique. Moreover, the resultant shoe has a somewhat crude and awkward appearance which compares unfavorably with the highly finished, mass-produced product. For a prospective purchaser, the orthopedic virtues of such individualized shoes are usually outbalanced by their aesthetic drawbacks.

Attempts have also been made to fit standard shoes with replaceable supports for the feet, such as heel cushions and metatarsal supports. However, as a practical matter, such shoe inserts cannot be manufactured in a sufficient variety of shapes and sizes to make available supports adapted to fit any individual foot. Difficulty is also experienced in maintaining the proper position of such arch supports in the shoes. Shoe inserts have been proposed which initially are formed of a soft material and, after registering the impression of the sole, are set to form a rigid body. The inflexibility of such inserts render them impractical for use in shoes which flex in normal walking motion.

In view of the foregoing, it is the principal object of the present invention to provide a technique whereby conventional shoes made on standard lasts can be individualized for greater foot support and comfort.

More specifically, it is an object of the invention to provide an insert for a conventional shoe, which insert acts to individualize the shoe to the needs of the wearer, without in any way altering the outer appearance of the shoe.

Another object of the invention is to provide a shoe insert which is initially plastic and is molded in a former by contact with the foot of the wearer, such that when the individualized insert is cured it will permanently retain

without distortion the shape of the particular foot and the shoe with which such insert is to be associated. An important advantage of the invention resides in the fact that the nature of the plastic insert material is such that the curing thereof is accompanied without shrinkage or warping; hence the finished insert permanently maintains an accurate impression of the plantar of the foot. The fabrication of the insert may be carried out in such fashion as to add only slightly to the time generally needed for purchasing new shoes.

A significant feature of the invention is that the insert is usable with a standardized shoe and involves no changes in current machine methods of shoe manufacture. While the insert is impressed in depth to correspond to the plantar area of the wearer's foot, the outline of the insert is made to correspond to that of the inner sole of a standardized shoe representing the personal selection of the wearer. Thus, the insert when fitted into the shoe lies snugly therein and cannot be displaced by foot movement. Moreover, the insert can be made inexpensively and does not add materially to the purchase cost of the standard shoe. With the inserts in place the wearer will enjoy exceptional ease, whether standing or walking, in standard shoes which have been individualized for his comfort.

For a better understanding of the invention as well as other objects and further features thereof, reference is had to the following detailed description to be read in conjunction with the accompanying drawing.

In the drawing:

Fig. 1 is a perspective view of a former for molding a plastic blank insert to the shape of the plantar of the foot.

Fig. 2 is a perspective view of a blank insert.

Fig. 3 shows a foot strapped in place in the former to form an impression in the insert.

Fig. 4 is a perspective view of the top surface of the molded insert.

Fig. 5 is a perspective view of the bottom surface of the molded insert.

Fig. 6 is a sectional view of a standard shoe having an individualized insert fitted therein.

In individualizing a machine-made shoe to meet the personal needs of a prospective wearer, a standard shoe is first selected from stock by the wearer in the usual way. That is, under the guidance of a shoe salesman, the wearer's foot is measured and the wearer then chooses a standard shoe representing his personal preference from the style standpoint and one which fits his foot most comfortably.

The selection of the standard shoe having been made, the technique to individualize the shoe involves the following procedure. The first step is to make use of a slipper-like container or former, generally designated by numeral **10** in Fig. 1, which former is appropriate to the last, style and size of shoe selected. The former has an inner sole portion **11** whose configuration is similar to the sole portion of the selected shoe. Preferably the shoe is of a width which is one size greater than the measured size and of a length half a size larger. Thus, if the measured foot is size 9, C width, then the shoe will be in size 9½, D width. The reason for the difference between the foot measurement and the shoe size is that when the molded insert is finally placed in the shoe, the foot of the wearer will be elevated slightly above its normal position in the shoe. Since the upper of the shoe is normally curved inwardly and tends somewhat to constrict the foot when it is elevated, the use of an oversize shoe in conjunction with an insert produces a shoe which fits comfortably. A shoe store equipped to individualize shoes will therefore have available for this purpose appropriate formers for the shoes to be fitted with individualized inner soles.

The former **10** is fabricated of a rigid, relatively thin and light-weight material, such as aluminum, Mycalex

(glass-bonded mica) or any other inexpensive material of proper rigidity and strength capable of maintaining its form when subjected to the heating involved in the curing process, to be later described.

The former is provided with a vertical contour wall **12** curved to surround the foot, and with two removable straps **13** and **14** for holding the former to the foot of the wearer in walking movement. The former may also be made of sole and heel sections in hinged relation to provide an articulated device.

Strap **13** is relatively broad to cover the vamp and is provided at its free end with snap buttons **15**, which are insertable in sockets **16** on wall **12** of the former. Strap **14** is an instep strap and is also provided with snap buttons **17** which are receivable in sockets **18** set in the contour wall.

Placed on the bottom of the former **10** is an impressionable insert blank **19**, shown separately in Fig. 2, which is contoured to fit neatly into the former. The blank **19** is of uniform thickness, except in the region of the arch where it is made somewhat thicker. In practice, an insert uniformly 1/16 of an inch thick, save in the arch area where it grades up to 1/8 of an inch at the border, has been found satisfactory for this purpose.

The blank **19** is formed of a soft clay-like material whose properties are such that after having registered the impression of the plantar of the foot it may be processed or cured to take on a flexible, resilient form which resists permanent deformation. Preferably the insert blank is formed of plastigel compound whose physical properties are ideally suited for the purpose intended. Plastigel has an indefinite shelf-life in its uncured state and has a putty-like consistency and therefore may readily be molded to the undersurface of the foot. When heat cured, plastigel does not undergo appreciable dimensional change and in its cured form it is resilient, flexible and maintains the imprint introduced during its molding.

A plastigel is a dispersion of high molecular weight polyvinyl chloride resins, fillers, pigments and stabilizers in a liquid plasticizer medium. The quantity of plasticizers is maintained in such concentration as to impart a modeling clay consistency to the material, the plasticizers being so chosen that their solvating effect at temperatures is at a minimum, hence the desired consistency is maintained.

Uncured, the plastigel compound has the soft putty-like consistency of modeling clay. Upon heating the compound to its fusing temperature, the plasticizers therein gain sufficient solvency and the resins are softened adequately, whereby solution occurs and the resin particles are fused together by the plasticizer. No curing of resins occurs; the phenomenon is one of simply increasing the temperature until the resin particles fuse together. It is therefore necessary merely to bring the entire mass to its fusing temperature. Extended bakes contribute nothing to the final product other than to accelerate the decomposition of the resin.

The fused product has the physical and chemical characteristics of vinyl compound and has excellent resistance to acids, alkalies, water and fungi. The latter characteristic is particularly important in a shoe with respect to fungus diseases of the foot.

A former and an insert blank, as above described, are provided for each foot, the feet of the wearer being strapped to the former, as shown in Fig. 3, to hold them in place as the wearer walks. In walking the weight of the wearer's body causes the soles of the feet to form an impression in the blanks, thereby molding the putty-like plastigel snugly to the soles. In practice, the actual molding takes no more than three or four minutes of walking. It is to be understood that the impression is not in static form, but registers the dynamic contours of the plantar area.

The inner surface of the contour wall **12** of the former is provided, as shown in Fig. 1, with a continuous bead line **20**, which line indicates the limit of the important part of the insert. After curing, the insert is trimmed to this line.

After the blanks have been properly molded, the straps **13** and **14** are unsnapped, the feet are removed from the formers and the formers containing the molded inserts are then subjected to heat to cure the plastigel. This may be accomplished in a pre-heated circulating hot-air type of oven and can be carried out in about 20 to 25 minutes at about 375° F. The curing time can be shortened by raising the temperature without adversely affecting the qualities of the cured plastigel.

If preferred, an infra-red heater may be used to cure the plastigel or high-frequency dielectric heating may be used for this purpose to appreciably reduce the curing time. After heat curing the inserts, the formers containing the inserts are cooled rapidly. This may be accomplished, for example, by immersing the formers in a water bath.

The inserts in the formers are then trimmed to the bead line **20** to cut away the excessive portions along the edges of the inserts. The excessively contoured ridges between the toes are also trimmed. The inserts when removed from the formers will have the appearance shown in Fig. 4, where it will be seen that the top face of the insert has toe impressions **19*a*** therein, as well as various curvatures in accordance with the curvatures of the plantar area of the foot. As shown in Fig. 5, the bottom face of the insert is the same as the inner sole of the shoe.

The inserts are now placed snugly in the selected standard shoes, and, as shown in Fig. 6, each insert is interposed between the sole of the foot and the inner sole of the shoe to provide proper foot support for the wearer. The shoe insert may, if desired, be covered in a soft suede-like leather **21** and then cemented into the shoe to become a fixed part thereof.

In the above-described method, the sole insert blank is shaped to conform to the plantar area of the foot by the use of a former, the molded insert thereafter being cured while positioned in the former. It is also possible to mold the blank without the use of a former. This may be accomplished by means of an uncured plastigel blank, of the type shown in Fig. 2, the blank being contained within a pliable semi-elastic envelope formed of a suitable plastic film. The foot-bearing surface of the envelope preferably is provided with a thin top layer of synthetic leather or a leatherette type of material. This top layer affords a smoother bearing surface for the foot by preventing an excessive amount of plastigel from intruding between the toes during molding.

The uncured insert blanks contained within the envelopes are introduced directly into the selected shoes, rather than being placed in formers. The wearer puts on the shoes with the blanks therein and deforms or molds the inserts by walking with the shoes for a few minutes. The shoes are then removed from the feet of the wearer and are placed in a dielectric heater for a short period sufficient to accomplish curing of the inserts without in any way affecting the leather of the shoes. This is made possible by the dielectric properties of the plastigel as compared to that of the shoe leather. The cured inserts are then allowed to cool naturally or by forced air draft. This procedure does away with the intermediate steps involving the use of formers and the transfer of the cured insert to the shoe.

An alternative method which obviates the need for curing by the use of heating apparatus makes use of an uncured plastic insert packaged within an envelope, as above described, the envelope incorporating a catalyst within a compartment separated from the uncured plastic. This compartment is formed by a thin breakable membrane disposed within the envelope to isolate the catalyst from the plastic. The weight of the foot on the packaged insert serves to rupture the separating membrane and

thereby set off the curing cycle. The catalyst serves to initiate a reaction which will change the insert plastic from its uncured state to the cured state.

The characteristics of the plastic material in its uncured state should be such that by virtue of appropriate fillers the material is readily moldable, it has a reasonably long shelf life when properly packaged and will set upon the application of a non-toxic plasticizer or catalyst, the setting takes place concurrently with the molding. The material, when cured, will maintain indefinitely the deformation introduced by molding, and be semi-resilient and sufficiently flexible to bend approximately 35° without tearing.

Among the substances suitable for the plastic insert are polyester resins, or copolymers of styrene. These are essentially thermosetting resins which, though liquid, can be reinforced by the addition of a mineral type clay, talc or calcium carbonate fillers to develop the required resiliency in the uncured state. Such plastic material can be cured at room temperature by the use of a peroxide catalyst. The gel time can be adjusted by the addition of cobalt naphthenate in a proper percentage.

Since the catalyst, accelerator and filters must be added during the blending of the basic material, the setting starts as soon as the components are integrally related. One way to inhibit the reaction is by freezing the sole inserts during storage. Another method is to use benzoyl peroxide as a catalyst and when ready for use to apply diethyl or di-methyl aniline solution to the surface.

While there have been shown what at present are considered to be preferred techniques for forming shoe-supporting inserts, it will be obvious that many changes and modifications may be made therein without departing from the essential spirit of the invention. It is to be understood that while the invention has been disclosed in connection with inserts for men's shoes, the invention is equally applicable to shoes for women. It is intended therefore in the appended claims to cover all such changes and modifications as fall within the true scope of the invention.

What is claimed is:

1. The method of producing a foot-supporting shoe insert comprising the steps of molding in a former an uncured insert blank formed of plastigel to take on the shape of the plantar area of the foot, said plastigel having a curing temperature in excess of 300° F., said former being impervious to said curing temperature, curing said impressed insert while in said former to form a finished

insert which permanently maintains said impression without distortion and is resilient and flexible.

2. The method of producing a foot-supporting shoe insert comprising the steps of placing an uncured insert blank having the contour of a sole and formed of plastigel into a former whose sole dimensions correspond substantially to that of a standard shoe appropriate to the foot of a wearer, securing said former with the insert therein to the foot of the wearer, whereby when the wearer walks the insert blank is shaped to conform to the plantar area of the wearer's foot, heating said impressed insert while positioned in said former, and rapidly cooling said heated insert while positioned in said former to form a finished insert, which permanently maintains said impression without distortion and is both resilient and flexible.

3. The method of producing a foot-supporting shoe insert comprising the steps of placing an uncured insert blank having the contour of a sole and formed of plastigel into a rigid former whose sole dimensions correspond substantially to that of a standard shoe appropriate to the foot of a wearer, strapping said former with the insert therein to the foot of the wearer, whereby when the wearer walks the insert blank is shaped to conform to the plantar area of the wearer's foot, heating said impressed insert dielectrically while positioned in said former, and rapidly cooling said heated insert while positioned in said former to form a finished insert.

4. The method of producing a foot-supporting shoe insert comprising the steps of placing an uncured plastigel insert blank having the contour of a sole into a slipper-like former whose dimensions correspond substantially to that of a standard shoe appropriate to the foot of a wearer, strapping said former with the insert therein to the foot of the wearer to shape said insert by causing the wearer to walk with said former, removing the foot from the former, heating said former with the shaped insert therein to cure said insert, rapidly cooling said heated insert by immersion in water, and inserting the completed insert into the standard shoe.

5. The method set forth in claim 4, further including the step of covering said completed insert.

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