June 20, 1967 D. L. BRAY 3,325,922

TOE STIFFENER FOR SHOES

Filed June 25, 1963

Fig. 1

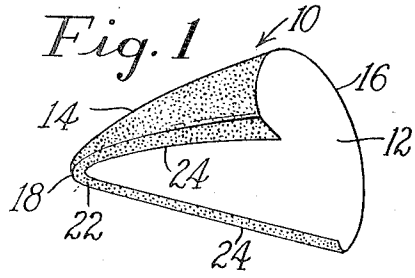



Fig. 2

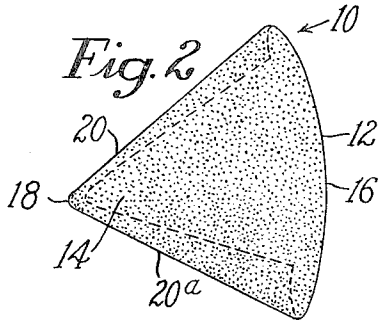



Fig. 3

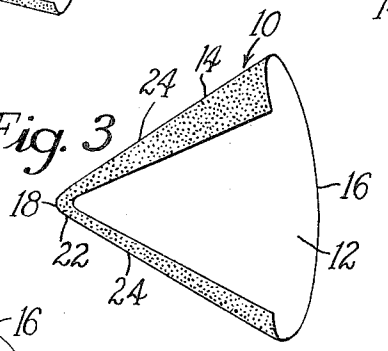



Fig. 4

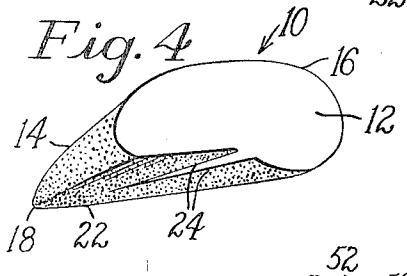



Fig. 5

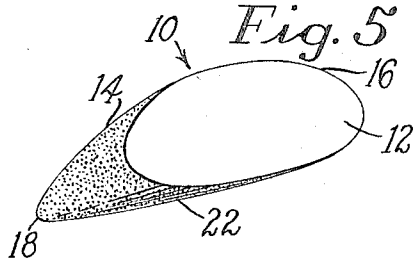
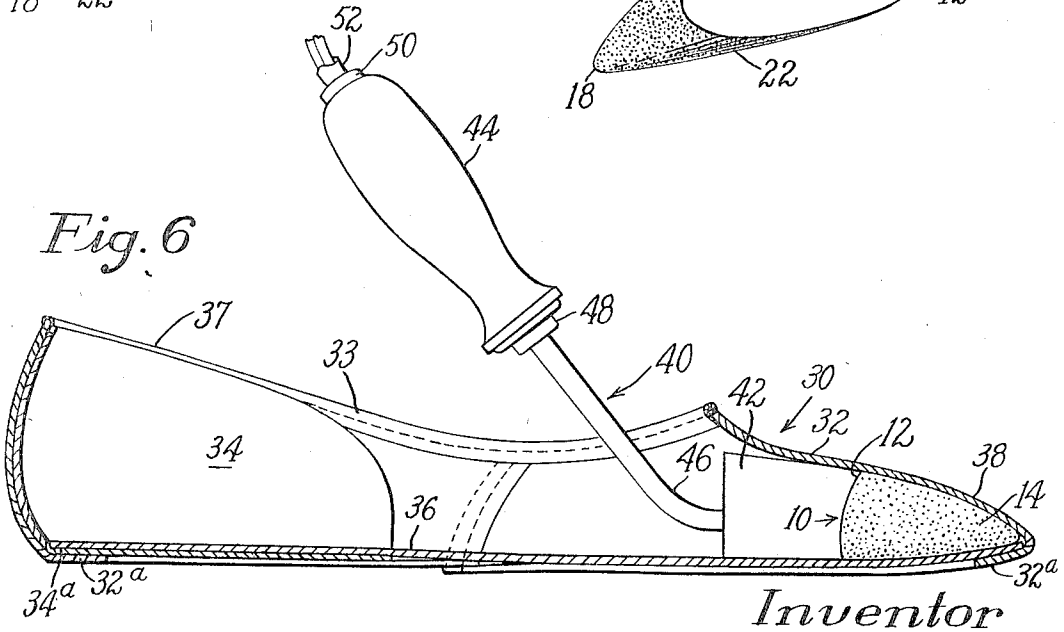



Fig. 6




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# TOE STIFFENER FOR SHOES

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The present invention relates to shoe stiffeners and more particularly to shoe toe end stiffeners.

A major number of shoes are provided with shoe toe end stiffeners, or, as they are sometimes referred to, toe puffs or box toes. Their basic purpose is that of contributing to the toe section of the shoe a contour which is prescribed by the manner in which the upper is cut, shaped and attached to the insole. This situation obtains even though the toe stiffener is the "rigid" or "soft" type, using the characterization of the shoe trade. Choice in this latter respect depends upon the style and nature of the particular shoe involved.

Present shoe manufacturing practices involve including a toe end stiffener in a shoe by assemblying and incorporating steps carried out prior to the shoe being pulled over a last or shoe form. A toe stiffener may be introduced into a shoe assembly in final contoured condition. More commonly it is introduced or provided in a flaccid state and converted to a final stiff contoured state during or after being molded or otherwise conformed to the shape of a shoe last or form. In either case, care must be taken in positioning the toe stiffener with respect to the remainder of the shoe upper assembly. Not only must initial positioning be done properly, but, in addition, proper positioning must be maintained throughout the rather stern steps of lasting, forming and sewing or adhesive combination of the various shoe parts into an assembled shoe upper.

The provision of toe stiffeners in flat lasted cement shoes is particularly critical. The presence of the toe stiffener during the toe lasting operation contributes a considerable amount of bulk to the toe area which must be contoured into the desired toe shape. The bulk mentioned includes, and is contributed to in a significant extent by the edges of the stiffener. Those edges, together with the edges of the upper represent a number of layers of material, which are turned under and attached to the bottom of the insole. Consider the difficulty where in many instances shoes of the flat lasted cement type are designed to have pointed toes. In shoes of this type, where the stiffener is present during lasting or forming it becomes necessary that this bulk be reduced by an abrading or splitting process, or, compensated for by the inclusion of bottom filler. Otherwise proper adhesive attaching or cementing of an outsole to the upper is extremely difficult to obtain. Not only is poor adhesion a problem, but, in addition, the shape of the toe can be adversely affected. The added pressure necessary for cementing under the conditions brought about by the presence of this bulk may result in a toe having a flattened, squatted out or otherwise undesirable appearance.

A practice which has developed incidental to the preceding has been that of choosing a toe stiffener with care, the choice of stiffener reflecting the size and shape of the shoe in which it is to be incorporated. While this can serve to insure lessened bulk in the toe portion of a shoe it has at the same time added expense to the shoe manufacturing process which it would be desirable to eliminate.

Accordingly, it is an object of this invention to provide an improved shoe manufacturing method and shoe toe stiffening means for use in practice of the said method.

It is another object of this invention to provide a shoe manufacturing method and shoe stiffening means by



which conveniently to obtain a shoe having a toe section showing improved appearance and attachment with an outsole.

It is another object of this invention to provide a shoe manufacturing method and shoe toe stiffening means having broader availability based on variations in shoe sizes and shapes.

These and other objects of the present invention are obtained in a shoemaking method which involves introducing a shoe toe end stiffener to the inside of the toe end of the shoe after its removal from a shoe last or form, and conforming the stiffener to the upper of the shoe by application of heat and positioning pressure to the inside of the stiffener. The stiffener prescribed for use comprises a normally stiff, resilient, heat deformable, generally semiconical member having at least a portion of its bottom unitary with both sides or side edges of the said member. The member is formed from a thermoplastic synthetic polymeric material. A coating of adhesive is carried on the exterior surface of the member.

The following drawings are included for the purpose of illustrating the invention in which:

FIG. 1 is an angular view of an embodiment of a shoe toe end stiffener which may be used in practicing the present invention;

FIG. 2 is a top plan view partially in phantom, of a shoe toe end stiffener corresponding to FIG. 1;

FIG. 3 is a bottom plan view of a shoe toe end stiffener corresponding to FIG. 1;

FIG. 4 is an angular view of a second embodiment of a shoe toe end stiffener which may be used in practice of the present invention;

FIG. 5 is an angular view of a third embodiment of a shoe toe end stiffener which may be used in practicing the present invention; and

FIG. 6 is a side elevation partly in section showing a flat lasted shoe, prior to outsole attaching, being provided with a shoe toe end stiffener of the type prescribed for use in practice of the present invention.

Referring to the drawings, a number of different embodiments of shoe toe end stiffeners **10**, are shown in FIGS. 1–6. Basically, these are made up of a stiffener member **12** and a coating **14** of adhesive carried on the outside surface of member **12**.

The shape of stiffener **10**, which is determined by the shape of member **12**, is generally semiconical in nature.

This characterization is intended to connote that in general a stiffener **10** has a domed cross-sectional contour toward its open after end **16** which tapers down to a narrowed, closed tip at the forward end **18**. As shown, stiffeners **10** are adapted specifically as to shape for use in pointed toe shoes. To better facilitate conformation with a specific shoe, either left or right, the stiffeners are shown having more flare at one side **20** than the other **20***a*, see for instance FIG. 2. This latter is not a necessary expedient for reasons to be seen later in the discussion. In other situations, as in the case where stiffeners **10** are intended for use in a shoe whose toe is other than pointed, for instance one whose toe is rounded, the shape or shapes of member **12** and in turn stiffener **10** may be changed to one more accommodating.

Stiffener member **12** has at least a partial bottom section **22** in the form of a continuation of or unitary with both side edges **24** as shown in FIGS. 1–4. Section **22** may represent a very small portion of the available bottom as indicated in FIGS. 1 and 3, a section **22** of greater size as shown in FIG. 4 where the bottom section **22** takes up a greater area, or, as shown in FIG. 5 may be satisfied by a bottom section **22** which is entirely unitized, and in turn contributes a stiffener member **12** which is in effect an entirely unitized shell or shape. Under any condition the bottom section **22** is unitized at the forward

end **18** of stiffener member **12**. This construction is designed to minimize splitting or tearing of the stiffener member **12** which would otherwise initiate at forward end **18** during conformation of stiffener **10** with the inside of a shoe toe end.

Stiffener members **12** is constructed to be stiff and resilient at normal or ambient temperatures. The stiffness prescribed is that which is capable of providing and maintaining the upper at the tie end of a shoe in an arcuate shape which shape will not become permanently lost as by being depressed during exposure to normal wearing conditions. The resilience prescribed is that which insures spring back or return to the original or predetermined shape after the stiffener **10** or stiffener member **12** has been depressed, crushed or otherwise deformed as a result of a force or stress applied under normal wearing conditions. Both of these dimensional performances are understood to be present whether stiffener **10** is either of the rigid or the soft type, so called.

Stiffened member **12** is heat deformable in nature. This allows the stiffener member **12** to be conformed or postformed, which involves stretching or extending, in order for a single size or shape member **12** to have the capacity to fit a number of shoe toe sizes and shapes. For this reason the flaring previously mentioned is not a necessary expedient present in member **12** at the time it is initially introduced into a shoe. While the property of heat deformability is basically the result of the choice of the synthetic polymeric material from which member **12** is formed, the facility with which this property may be manifest or taken advantage of in processing may be increased as a result of the configuration given to the member **12** in its formation. In this latter regard the embodiment of stiffener **10** shown in FIG. 4 lends itself to effective use in shoes of a greater number of toe sizes and shapes than do the embodiments shown in the other figures.

Stiffener member **12** may be formed from a number of synthetic polymeric materials. These include polyethylene and polypropylene as well as other polyolefinic homopolymer and copolymers, polyvinyl chloride, cellulose acetobutyrate, various of the polyacrylates and polymethacrylates, as well as various copolymers of the preceding. Wall thicknesses of the members can range about .010 inch with a preferred range of about .015 to .050 inch being satisfactory from both technical and commercial considerations as applied to conventional ladies', children's and men's shoes. This preference is particularly applicable to a member **12** made from either polyvinyl chloride or cellulose acetobutyrate. Variations in wall thicknesses may be expected to be practiced with the choice of other synthetic polymeric materials. The wall thicknesses indicated as preferred are independent of thicknesses which may obtain at an after end **16** of a member **12** which may be skived to contribute a smoother, cleaner molded appearance to a finished shoe.

As previously indicated, shoe stiffener **10** includes a coating of adhesive **14** at the exterior surface of stiffener member **12**. The coating **14** while preferably continuous, may be less than continuous in nature. The adhesive or cement constituting coating **14** is one which is adhesively compatible with the synthetic polymeric material from which stiffener member **12** is formed. In this respect note that when stiffener member **12** is formed from a polyolefinic material such as polyethylene or polypropylene the choice of adhesive is considerably restricted. In addition, the stiffener member **12** may be preconditioned to improve adhesion. This may be carried out chemically as by use of solvents, etc. or mechanically by abrading, etc. When stiffener member **12** is formed from polyvinyl chloride, cellulose acetobutyrate, and the like a number of conventional adhesives, such as the solvent type acrylic latex based adhesives, rubber based adhesives and the like can be used. In this regard too the choice of adhesive should be such that it does not degrade significantly when exposed to a convenient deforming temperature, which is to be used in conforming member **12**.



The coating **14** of adhesive on stiffener member **12** is of sufficient coated thickness to give good bonding between member **12** and a shoe upper. When the member is polyvinyl chloride a coating 0.0005 inch to 0.015 inch thick operates satisfactorily with a shoe upper made of leather. The adhesive or cement making up coating **14** is preferably either solvent or melt type. While thermoset types may be used their set times are generally longer, requiring that more time be expended in practicing the process and thereby increasing costs.

The shoemaking method of the present invention may be described with reference to FIG. 6. There, a shoe **30** of the flat lasted cemented type is shown, after its removal from a shoe last or form, not shown. Shoe **30** includes an upper **32**, which may be leather, fabric or synthetic material, a top binding **33**, and a counter **34**. The upper **32** and the counter **34** are turned over and cemented to the bottom of an insole **36**, see in this regard lapped over edges **32***a* and **34***a* respectively. Note the bulk presented at the underside of the backpart referred to generally at **37** of shoe **30** by the presence of lapped over edges **32***a* and **34***a*. If the same type double lapping were present in the pointed toe portion referred to generally at **38** of shoe **30**, which has a much smaller area, the bulking would be of far greater concern. The shoe **30** as removed from the last, not shown, may include an outsole, not shown, or an outsole, again not shown, may be laid on and cemented at a later time.

Stiffener **10** is inserted to the interior of the toe portion **38** of shoe **30**. Setting iron **40** is then used to conform stiffener **10** to the exact contour of the interior front of upper **32** in the toe portion **38**. As shown, setting iron **40** constitutes an electrically heated, metal head **42**, fitted with a handle **44** of nonconductive material and a hollow gooseneck **46** located between the two. Handle **44** is securely stationed by stops **48** and **50**. In order to provide an electrical charge with which to energize and heat head **42**, an electrical conduit **52** is provided connecting head **42** and a source of electrical power, the latter not shown.

Heating head **42** is caused to be heated to a temperature sufficiently high that pressure manually applied to shoe stiffener **12** through iron **40** causes the thermoplastic synthetic polymeric material making up stiffener member **12** to flow and effect the desired amount of deformation in stiffener member **12**, whereby the said member conforms to the contour of the interior front of upper **32** in toe portion **38** of shoe **30**. By contrast, the temperature to which heating is carried out should not be so high as to introduce too great or an ungovernable quantity of flow into the polymeric material making up stiffener member **12**. If this occurs the desired wall thickness of stiffener member **12** is difficult if not impossible to maintain through the conformation and adhesion steps. When stiffener member **12** is constituted of polyvinyl chloride having a wall thickness as indicated, that is greater than about .010 inch and preferably about .015 to .050 inch thickness, temperatures in the range of about 150° F. to 200° F., and preferably in the range of about 160° F. to 170° F. operate very satisfactorily.

During postforming or conformation of member **12** to the interior contour of the upper **32** in toe portion **38**, the adhesive coating **14** in activated condition is brought into contact and pressed against this part of upper **32**. This eventually results in the stiffener **10** becoming tightly adhered to the inside of the upper **32** in the toe portion **38** of shoe **30**, preferably over the entire contour of the same. The adhesive of coating **14** may be chosen so that the conforming temperature will also serve to activate the adhesive. After a short residence time, as short as a few seconds, contouring and adhesion of the stiffener **10** with the inside of the toe portion **38** of shoe **30** is completed to the extent that the iron **40** may be removed. For best results stiffener **10** should be allowed to cool fully to ambient room temperature before stresses are applied to the shoe **30**.

The practice described above results in the provision of a shoe toe end stiffener **10** in a shoe **30** which does not add bulk to the toe portion **38** of shoe **30**, bulk which would otherwise interfere with the laying and cementing on of an outsole, not shown. This obtains because the practice does not involve or require that the edges of the stiffener **10** be turned under the bottom of the insole **36**, and so interfere with the outsole laying step. In addition, it may be seen that the step of introducing deformation with conformation to stiffener **10** as practiced allows the use of a toe stiffener in which size and shape need not be in exact initial conformity with those of the toe portion **38** of the shoe **30** to be so provided with a stiffener **10**.

The procedure set forth above lends itself to variations.

One instance illustrating this is in the case where it would be desirable to provide the shoe **30** with a fabric lining to the inside of stiffener **10**. This can be accomplished by adhering a liner to the stiffener **10** before, during or after the introduction of the stiffener **10** into the forward end **38** of shoe **30**. Another variation is that designed to maintain a clean, molded appearance on the exterior of forward end **38** of upper **32**. In that case the exterior of upper **32** is subjected to rolling as the conformation and adhesion step are carried out. In that way the feather line at the after end **37** of the stiffener **10** is not struck through the upper **32**. This has particular application when upper **32** is cut from light or thin leather, fabric or the like. Other additional adaptations are available to be included in practice of the present invention.

In order to further illustrate the present invention the following example is included.

*Example I*

A number of approximately semiconically shaped shoe toe end stiffeners, which are open at their after ends, are molded around a heated mandrel from semi-rigid polyvinyl chloride sheets having a thickness of 0.120 inch. Each of the stiffeners has an overall length of 1.25 inches; a width of 1.50 inches and a height of 0.875 inch both at the open after end and tapers to an approximate point at the forward closed end or tip. The unitized or closed bottom section extends back 0.125 inch from the tip and the remainder of the bottom is taken up with both of the side edges which are turned into form a bottom which is split down the middle from the after end to the unitized forward section.

The exterior surfaces of each of the stiffeners is brushed with methyl isobutyl ketone and allowed to dry in a hood at room temperature. An adhesive, which is an acrylic latex is then applied to the exterior to the extent that a continuous coating is obtained on drying having a thickness of about 0.005 inch.

The stiffeners are then positioned in the interior toe portions of a number of flat lasted, pointed toe, cement shoes previously provided with cemented outsoles. The shoes range in size from 5 to 9 and widths A to D. A fitting iron having a tip in the shape of a wedge and heated 170°–175° F. is inserted behind each tip and manually pressed causing the tip to contact the inside of the toe end of a shoe upper. The iron is maintained in this position for a period of 5 seconds and then removed. Inspection on cooling indicates that a firm bond and excellent conformity between stiffener and shoe upper is obtained in every case.

Shoes provided with stiffeners as indicated above are wear tested using conventional techniques. In each case the shoes are found to exhibit good performance. Adhesion between the stiffeners and the toe end survives very well and the shape of the toe is maintained to an extent which can only reflect excellent performance.



It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained, and, since certain changes may be made in carrying out the above shoemaking method and in the shoe toe end stiffener set forth without departing from the scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A shoe toe end stiffener adapted for post insertion, attachment and conformation with the inside of a toe end of a shoe upper by application of heat and pressure applied to the interior of said stiffener, the said stiffener comprising a normally stiff, resilient, heat deformable, semiconical member having an inwardly directed bottom section, at least a portion of the bottom section of which is unitary with both side edges of the said member, the said member being formed continuously of thermoplastic synthetic polymeric material and having a wall thickness of greater than about .010 inch and carrying a coating of adhesive at the exterior thereof.

2. A shoe toe end stiffener according to claim 1 wherein the wall thickness of the said member ranges about .015 inch to .050 inch.

3. A shoe toe end stiffener according to claim 1 wherein the said member is formed from polyvinyl chloride.

4. A shoe toe end stiffener according to claim 1 wherein the said member is formed from cellulose acetobutyrate.

5. A shoe construction comprising a shoe including a shoe upper having a toe end stiffener conforming and adhering to the inside of the toe end of the shoe upper, the said stiffener comprising a normally stiff, resilient, heat deformable, semiconical member having an inwardly directed bottom section, at least a portion of the bottom section of which is unitary with both the side edges of the said member, the said member being formed continuously of thermoplastic synthetic polymeric material and having a wall thickness of greater than about .010 inch and carrying a coating of adhesive at the exterior thereof.

6. A shoe construction according to claim 5 wherein the wall thickness of the said member ranges about .015 inch to .050 inch.

7. A shoe construction according to claim 5 wherein the said member is formed from polyvinyl chloride.

8. A shoe construction according to claim 5 wherein the said member is formed from cellulose acetobutyrate.


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