Aug. 28, 1956 C. G. NEWTON, JR., ET AL 2,760,215

SHOE BOTTOMING

Filed Oct. 29, 1954

Fig. 1

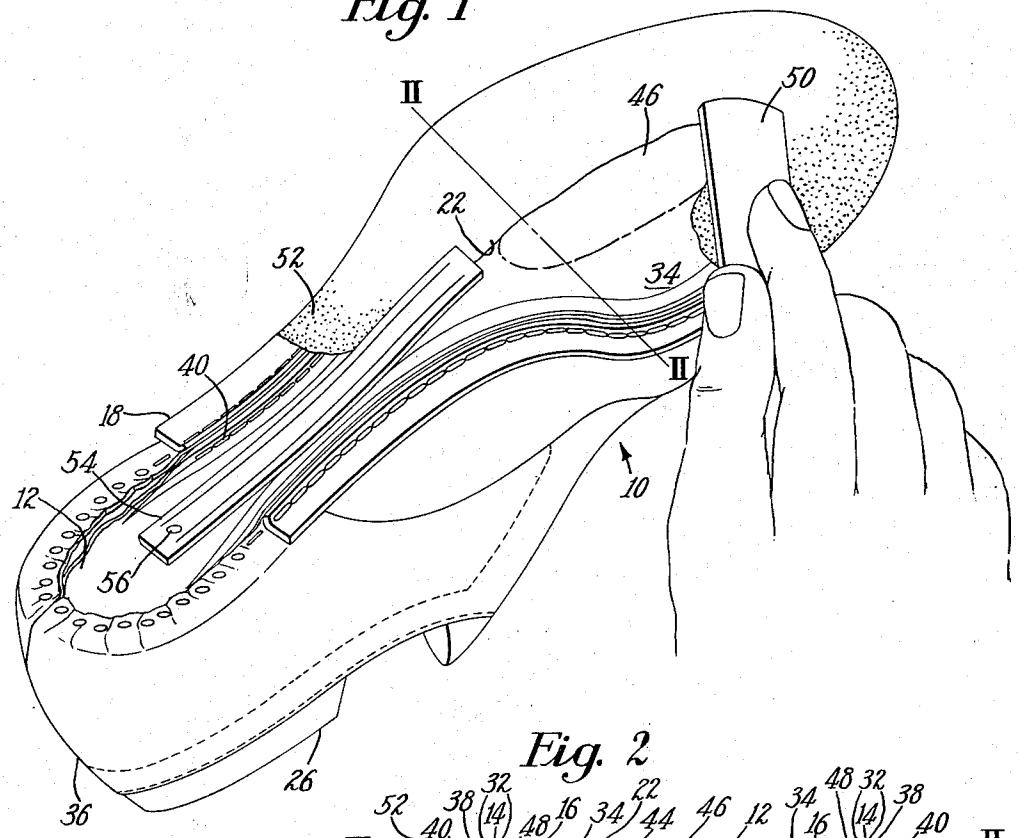


Fig. 2

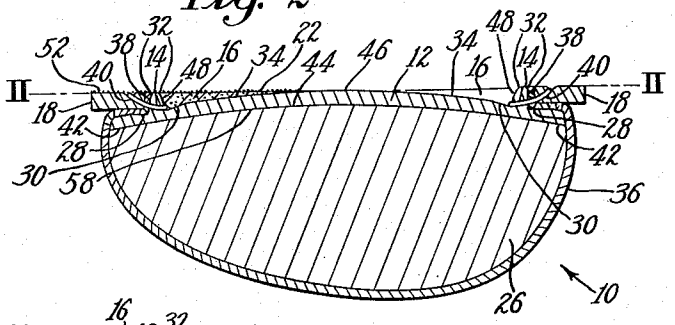
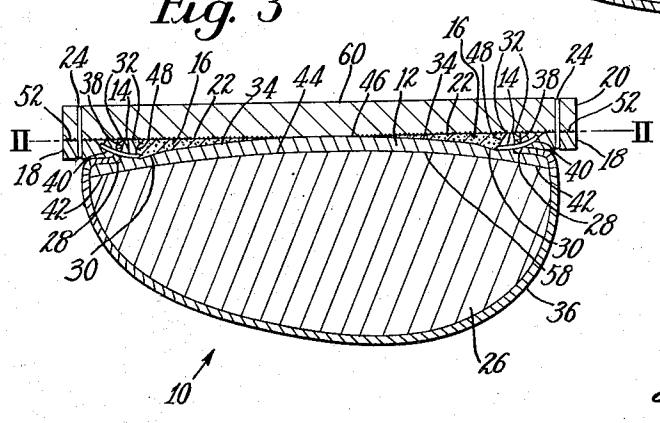


Fig. 3



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SHOE BOTTOMING

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1 Claim. (Cl. 12—142)

This invention relates to a method of shoemaking, and more particularly to a method of bottoming shoes.

An insole having a firm body and an upstanding rib is the foundation to which an upper, a welt and a sole are linked in a welt shoe. In the manufacture of such a shoe an insole is tacked to a convex last bottom in such fashion that its rib protrudes from the insole bottom. An upper is mounted on the last and its lower edge is pulled around the edge of the last bottom and attached to the outer face of the rib. A welt is then placed in contact with the shoe upper contiguous with the outside of the rib, and the rib, the upper, and the welt are sewed together. Following this, the upstanding rib and upper are trimmed to a uniform height which is level with the welt. The shoe forepart bottom at this point has a non-uniform cross section with the welt and the trimmed rib and upper being at one level, and the level of the insole inside the rib dropping sharply adjacent to the inner face of the rib and rising gradually toward the center of the insole where it forms a crown. This crown is that portion of the insole forepart which is on a level with or slightly above the welt and trimmed rib and upper. The hollow extending around the insole forepart between the rib and the crown is the cavity.

The forepart of the shoe bottom inside the rib normally is filled over all in such fashion that the filled shoe bottom parallels the convex bottom of the last, and when a sole is attached to the shoe bottom the sole bottom assumes this convex shape. This filling is of advantage in that the filler supports the sole, the insole and the rib while the shoe is new, and no empty spaces remain within the forepart of the shoe. However, pressures applied to the shoe bottom during walking are localized at the high point of the shoe bottom crown, with the result that the sole wears rapidly. Furthermore, this localization of pressure magnifies the pressures applied to the filler at certain points and the filler shifts within the forepart to form humps and hollows in the insole foot facing and the sole tread surfaces. This unevenness causes extreme discomfort to a wearer of the shoe. An added disadvantage which causes further discomfort to the wearer, lies in the thickness of the combined insole, filler and outsole which results in a shoe which is resistant to flexing.

It is a feature of this invention to provide a method for manufacturing a novel and improved flexible welt shoe, in which the shoe has a substantially straight-across load distributing forepart bottom and a stably smooth insole foot-facing surface.

It is a further feature to provide a method for manufacturing a novel and improved flexible welt shoe, in which the parts of the shoe are supported against shifting and in which the sole is bonded to the shoe bottom.

The shoe formed in accordance with the method of the present invention, has a substantially straight-across, load distributing forepart bottom and a stably smooth insole foot-facing surface. The foregoing and other advantages of the present invention are obtained in a welt

shoe the processing of which includes the operations of depositing in the shoe bottom a sufficient quantity of a moldable and hardenable adhesive and filling composition to fill the cavity and to leave the crown of the insole free of the composition, spotting a sole onto the shoe bottom and pressing the sole to the shoe bottom while the composition is in moldable and adhesive condition. The pressing removes any surface irregularities in the composition which remained following deposition of it within the cavity, and establishes a bond between the sole and the shoe which not only serves as a sole laying bond, but which furthermore endures for the life of the shoe. Because of the lack of adhesive and filling composition over the crown of the insole and the resulting straight-across character of the shoe forepart bottom, pressures encountered by the shoe sole during walking are distributed evenly across the bottom. Accordingly, the sole wears evenly and therefore slowly, while the composition does not tend to become displaced during wear and the shoe parts are supported for the life of the shoe against shifting and forming humps and hollows in the foot-facing and tread surfaces. Furthermore, because of the lack of composition in the center of the forepart, the combined shoe parts in this area are thin and are free to slip relative to each other within the cement-free area with the result that a flexible shoe is produced.

In the drawings,

Fig. 1 is an angular view of a welt shoe showing an adhesive and filling composition being deposited into the cavity;

Fig. 2 is a section taken on the line II—II in Fig. 1; and

Fig. 3 is a section similar to Fig. 2 showing a sole bonded to the shoe.

The shoe **10** prepared according to the method of the present invention includes an insole **12** having a rib **14** and a cavity **16** and has a welt **18** attached to the rib. A sole **20** is attached to the welt **18** by means of an adhesive and filling composition **22** which bonds the sole **20** adhesively to the shoe bottom and supports the shoe parts against shifting, and further by means of an outseaming thread **24** which stitches the sole to the welt.

Turning now to Figs. 1 and 2, a shoe **10** having an insole **12** is shown mounted on the last **26**. The insole **12** which is of a well-known type may be of leather and is provided with outside and inside rib forming channels **28** and **30**, the flaps **32** of which are turned up and bonded together to form the upstanding rib **14**. A cavity **16** is formed on the insole bottom **34** when the insole is mounted on the last **26** and an upper **36** and a welt **18** are stitched to the outer face **38** of the rib **14** with an inseaming thread **40** pulling the edges **42** of the insole **12** tight to the normally convex last bottom **44**. This conformity of the insole with the convex last bottom causes the center of the insole to protrude relative to the edges of the insole, thereby forming a crown **46** on the insole bottom **34**. The upstanding rib **14** and the upstanding portions of the upper **36** are trimmed to a height approximately level with the crown **46** which in a typical shoe extends roughly $\frac{3}{16}$ of an inch above the deepest portion of the cavity **16**, i. e. the inside rib forming channel **30**, and is approximately ½ of an inch or more wide at its widest point and one to two inches long. The area covered by this crown is dependent upon the radius of curvature of the crown of the last bottom and upon the rib height, and is outlined by the intersection of the insole bottom and a plane which is established by the top of the major part of the upstanding trimmed rib in the forepart area. The toe of the shoe normally curves away from this plane and thus the rib in that area does not contact the plane. Thus the area of this

crown in any shoe is determined by the degree of convexity of the last bottom and the height of the rib, which vary with the individual shoe style. For purposes of this invention, however, it is preferred that these factors be controlled to provide a crown which is at least ½ of an inch wide at its widest point and at least one inch long. This is because in either machine or hand filling of the cavity it is of importance that a reasonably large crown exists in the shoe bottom to serve as a registering and steadying means for the filling tool, and because a smaller crown makes it difficult to fill the cavity without covering the crown. The hollow in the insole bottom between the inner face **48** of the upstanding rib **14** and the outline of the crown **46** forms the cavity which is wedge shaped in section and decreases gradually from a depth of approximately 3/16 of an inch in its deepest section adjacent to the rib until it terminates in an edge where it meets the crown.

Other insoles suitable for use in welt shoes may be employed with equal ultimate advantage in the present invention. An alternate insole is a leather insole having a rib cemented to it. It is obvious that a cavity generally similar to that described above but not including the rib-forming channel thereof is formed on this insole bottom when the insole is mounted on a last and an upper and a welt are attached to its rib.

According to the method of this invention, a moldable, hardenable, adhesive and filling composition **22** is deposited within the cavity **16** (see Fig. 1) of the insole **12** where it serves to support the rib **14** and to fill the cavity **16** to a height level with the rib **14** and the crown **46**. It is important that the composition **22** be free of large, non-moldable particles which would interfere with the production of a smooth, even surface on the body of the composition, particularly where the composition is present in a thin section adjacent to the insole crown. This smoothness of surface is desirable in the shoe where it permits of smooth foot-facing and tread surfaces. Accordingly, such non-moldable particles should be of a size to pass through a 20 mesh sieve.

By the preferred method the composition **22** is placed on a spatula **50** and the spatula is wiped around the shoe bottom to spread a cavity filling quantity of the composition, while it is in moldable and adhesive condition, within the cavity **16**. Often it is preferred also to spread a film **52** of the composition **22** over the welt **18** during the spreading operation to enlarge the area of composition subsequently available for bonding the sole **20** to the shoe. However, in the specification and claims the term "cavity filling quantity" is intended to mean a quantity of adhesive and filling composition sufficient only to fill the cavity **16** to the level of the rib **14** and the crown **46**, and to leave the crown **46** free of the composition **22**. Thus the shoe bottom containing the adhesive and filling composition **22** presents a substantially straight-across, load distributing surface which is assumed by the flat outsole **20** when the latter is attached to it. When the cavity **16** is filled in this fashion the composition **22** is in position to support the insole rib **14**, the insole **12** and the sole **20** of the shoe **10** evenly, and because of this evenness does not tend to shift out of position itself or to permit these shoe parts to shift when the shoe is finished and worn. A depositing method more suitable for use with automatic machines and which may be used with equal ultimate advantage, comprises extruding the composition from a suitable nozzle within the desired area. The presence of a substantial crown permits use of a machine which registers the width and depth of the cavity to be filled. Thus a device on the machine can be designed to ride along the outline of the crown **46** and the rib **14** as a means for locating the cavity **16**.

Either prior to or after deposition of the adhesive and filling composition **22** within the cavity **16**, a shank piece **54** is tacked with tacks **56** to the insole bottom **34**. Following deposition of the composition **46** and attachment of the shank **54**, it is necessary to bond a sole **20** to the shoe bottom. This bond, which is of an adhesive nature and is augmented later when the sole **20** is sewed with an outseaming thread **24** to the welt **18**, is of great importance during the shoemaking where it is relied upon to maintain the sole on the shoe bottom during the rough rounding and stitching operations, and further is of extreme importance in the finished shoe where it combines with the mechanical bond produced by the sewing to stabilize the shoe parts, e. g. the insole rib **14**, the soles **12** and **20**, and the welt **18** against shifting.

It has been found advantageous to bond the sole forepart to the shoe forepart bottom in an area which excludes only the crown **46** in the center of the insole forepart. Thus in a typical men's Goodyear welt shoe an area of approximately 15.5 square inches is utilized as a bonding area out of a total forepart area of approximately 17 square inches, and a bond is derived which stabilizes the shoe parts, i. e. the sole **20**, the insole **12**, the rib **14**, and the adhesive and filling composition **22**, against shifting during wear and thus producing a shoe having humps and hollows on its foot-facing tread surfaces. In spite of its stabilizing action, however, the bond does not extend to the crown **46** of the insole **12** and thus does not eliminate that slight slippage between the sole **20** and the insole **12** which is an important element in providing a flexible shoe.

Frequently, the moldable, hardenable adhesive and filler composition **22** which is to be used as a sole bonding adhesive hardens and loses its moldability and adhesiveness before the sole bonding operation is performed. When this occurs, it is necessary to activate the composition **22** prior to sole bonding to render it moldable and adhesive. When a heat activatable composition is used the filled shoe bottom is heated, for example with infrared radiation, for a short time (approximately 10 seconds), the sole **20** is spotted onto the shoe bottom while the composition **22** remains moldable and adhesive and the sole **20** is pressed to the shoe bottom in a sole laying machine for approximately five seconds. Following the pressing operation the shoe is removed from the machine. The pressing completes the leveling of the adhesive and filling composition **22** which had a somewhat rough surface following its deposition, and furthermore presses the sole **20** into bonding relationship with the shoe bottom.

Following bonding to it of the sole **20**, the shoe **10** is completed according to usual shoemaking procedures. The sole **20** is sewed to the welt **18** with an outseaming thread **24**, it is rough rounded, i. e. the sole **20** is cut to conform roughly to its desired final outline, the heel is attached to the shoe and the shoe is finished by conventional means.

It is important that the adhesive and filling composition **22** employed exhibit substantial adhesiveness toward the shoe parts with which it comes in contact. This adhesiveness should be sufficient to maintain the shoe parts in bonded relationship for the life of the shoe and to pull a large amount of fiber from the leather shoe parts with which it is bonded when the shoe is pulled apart. It is important further that it be available in a moldable condition to allow deposition of it within an insole cavity **16**, that it be hardenable to a firm consistency and that it have substantial strength. Thus it should be sufficiently strong to provide support to the rib **14** and the soles **12** and **20** and to resist forces which would tend to crumble a highly weak and friable material. In this connection it should be noted that formation of cracks and splits in the composition does not impair its efficiency provided these cracks and splits are not extensive enough to cause it to shift.

The chemical nature of the composition will vary as different sole materials, e. g. leather, vinyl resins, Buna-S rubber, etc., are used in the shoe in order that the composition may exhibit proper adhesiveness toward the

shoe parts. Thermoplastic resins which can be activated with heat and/or solvent to moldable adhesive condition, such as polyamide resins, vinyl chloride-vinyl acetate resins, reclaimed rubber-rosin blends, polystyrene resins, and the like and/or moldable thermosetting materials which set to a hard condition, such as polyester resins, aldehyde resins, vulcanizable rubber compositions, epoxy resins and similar materials are suitable for use in the present invention either alone or mixed with other resins and/or in combination with plasticizers, fillers, curing agents and other compounding ingredients. Non-moldable fillers employed herein should be of a particle size, i. e. less than 20 mesh, which permits the obtaining of a smooth, thin section of the composition in the area adjacent to the insole crown **46**. When excessively large non-moldable filler particles are used it is difficult to spread the composition in that thin section of the cavity **16** and maintain the smooth surface on the shoe bottom which is of advantage in obtaining a comfortable shoe. It is important further that the adhesive and filling composition chosen have a sufficiently high melting temperature to avoid shifting of the shoe parts which occurs when an adhesive and filling composition having too low a softening temperature softens during wear. Thus it is preferred that the composition have a softening temperature above 120° F.

Example

A Goodyear welt shoe upper **36** was lasted to a leather insole **12** having a cavity **16** and a rib **14**. A leather welt **18** was then inseam stitched to the shoe **10** with an inseaming thread **40**, the rib **14** and upper **36** were trimmed to a height approximating that of the center or crown **46** of the insole **12** and a steel shank piece **54** was tacked into the shank area of the shoe with tacks **56** (see Fig. 1). Following these operations a thermoplastic adhesive and filling composition **22** was heated to approximately 325° F., at which temperature it became a viscous, adhesive liquid, and was spread with a spatula **50** into the cavity **16** of the insole **12** (see Fig. 1). The thermoplastic adhesive and filling composition employed was:

	Parts by weight
Polyamide 94S	50
Polyamide 95S	50

The polyamide resins are alcohol soluble resins made by reaction of dimerized and trimerized linoleic and linolenic acids of soybean oil with ethylene diamine, and are produced by General Mills, Inc., Chemical Division.

The adhesive and filling composition **22** cooled below its softening temperature following its being spread within the cavity **16**. Accordingly, an infrared lamp was focused on the composition for one minute to reheat it to that temperature. While the composition was thus heat activated a leather outsole **20** was spotted onto the shoe bottom and pressed thereto in a sole laying machine for approximately five seconds at 90 lbs. per square inch of pressure. The shoe as it was removed from the sole laying machine had a smooth insole foot-facing surface **58** and a smooth, substantially straight-across, load distributing outsole tread surface **60**, and its parts were bonded together strongly.

The shoe then was rough rounded and its sole **20** was outseam stitched to the welt **18** with an outseaming thread **24**. No separation of the sole **20** from the shoe **10** was noted during these operations. The shoe was then heeled and finished by conventional means. A test subject who wore the shoe related that it was comfortable and its sole was found to have worn evenly due to the absence of wear-producing humps on its tread surface. Furthermore, the foot-facing surface of the insole remained smooth during the period of wear, indicating that the shoe parts had not shifted.

Thus, practice of the method of the present invention results in the production of a welt shoe having a uniform appearance and having the further desirable characteristics of long wear and comfort.

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

Method for producing a welt shoe comprising an upper, an insole having a rib, and having a crown in the center of its forepart bottom, a welt attached to said insole rib and to said upper, a cavity bounded by the inner face of said insole rib and the outline of said insole crown, and an outsole, and having a substantially straight-across, load distributing forepart bottom, a smooth foot-facing insole surface, support for said forepart bottom and said insole surface and a bond between a shoe sole and the forepart bottom, which method comprises depositing a moldable, hardenable adhesive and filler composition free of non-moldable particles of a size greater than 20 mesh within the cavity of an insole leaving the crown of the insole free of said composition, said crown being at least ½ of an inch wide at its widest point and at least one inch long, spotting a sole onto the forepart bottom in contact with said composition and pressing said sole to said forepart bottom to establish a bond with and to smooth the forepart bottom.

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