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J. B. REID ET AL
METHOD FOR DETACHABLY SECURING AN INSOLE
TO THE BOTTOM OF A SHOE LAST
Filed Nov. 3, 1961

3,052,904

FIG. 1.

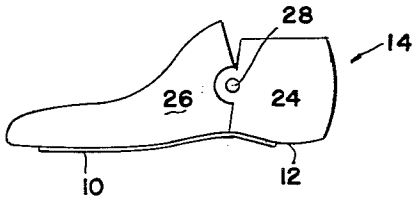


FIG. 4.

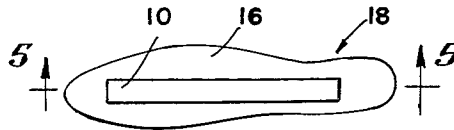


FIG. 2.

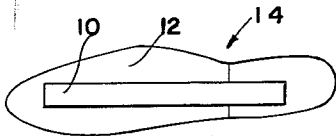


FIG. 5.

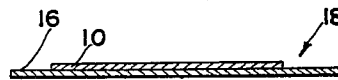


FIG. 3.

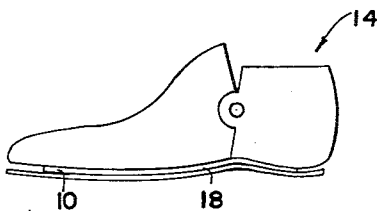
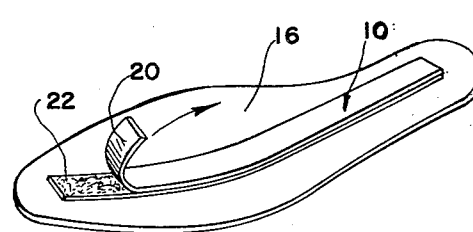


FIG. 6.



FIG. 7.



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METHOD FOR DETACHABLY SECURING AN INSOLE TO THE BOTTOM OF A SHOE LAST

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3 Claims. (Cl. 12-142)

This invention generally relates to the manufacture of footwear, and more particularly to a novel method and means for temporarily securing a shoe insole to the bottom of a last as a step in the manufacturing procedure. This application is a continuation-in-part of our copending application Serial No. 724,630, filed March 28, 1958, now abandoned.

In the past, insoles have customarily been secured to the bottom of a wooden last by means of suitable tack fasteners driven directly through the insole into the last in order to temporarily secure the same in assembled alignment until completion of the lasting operation. The disadvantages of such a procedure are readily apparent. Each tack must be individually applied and subsequently removed, either manually or by a mechanical puller, with the resultant destructive marring or gouging of the insole. Occasional shearing of the conventional tack head necessitates separate inspection of each shoe for the purpose of detecting and removing the embedded point. The exposed foot-contacting surface of the insole is often damaged by seepage of the bottom filler through the individual tack holes. Moreover, continuous insertion and removal of tacks results in permanent mutilation and eventual destruction of the wooden last.

The desirability of replacing the customary tack fastener with some other means to temporarily secure the insole to the last bottom has long been recognized by the industry. For example, the insole can be directly bonded to the last bottom by a thermoplastic adhesive which may be subsequently released through the application of either heat, as disclosed by the patents to Blake, No. 1,365,221, and Brophy, No. 2,520,995, or vibrational shock, as suggested in Nolan Patent No. 2,701,887. In fact, other attempts to solve the problem have been proposed but none have proved to be practical or acceptable to the industry.

The difficulties involved are understandable when the requirements of a successful solution are considered. Regardless of the means employed, the insole must be firmly retained in aligned position on the last so as to withstand the severe lateral stresses imposed during the lasting operation that tend to transversely displace the insole. At the same time, the temporary bond between the last and insole must be such that upon completion of the lasting operation, it may be easily broken so as to completely release the last for removal from the interior of the shoe without leaving any vestiges of the fastening means to either discolor or disfigure the foot-contacting surface of the insole. Further, the ultimate solution must be completely reliable and involve operational costs competitive with those presently incurred in the utilization of the customary tack fastener.

It is therefore the primary purpose of this invention to directly affix an insole to the last bottom without perforating the foot-contacting surface of the insole or applying external heat to release a thermoplastic bond.

The principal object of the present invention is the provision of a novel method and means for detachably securing an insole to the bottom of a last with double-faced pressure sensitive adhesive material in order to prevent lateral displacement of the assembled components during the lasting operation while facilitating instantaneous re-

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lease of the adhesive bond when subjected to a longitudinal separating force. An equally important object of the invention is to provide a method wherein the insole is superposed on the last in aligned relation and the two are united merely by pressure by a pressure sensitive adhesive material having opposed adhesive faces whereby the unit may be employed without requiring trimming of the insole.

Other objects and the entire scope of the present invention will become apparent from the detailed description and by reference to the accompanying drawings. It should be understood, however, that the detailed description and specific examples, while indicating the preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent as the description herein progresses.

Reference being made to the accompanying drawing which forms a part hereof, wherein like numerals refer to similar parts throughout, and in which:

FIGURE 1 is a side elevational view of a conventional last illustrating the application of double-faced pressure sensitive adhesive tape to the bottom portion thereof.

FIGURE 2 is a plan view of the last bottom shown in FIGURE 1;

FIGURE 3 is a side elevational view similar to FIGURE 1 but further illustrating an insole detachably secured to the bottom portion of a conventional last by means of double-faced pressure sensitive adhesive tape;

FIGURE 4 is a plan view of a conventional insole illustrating the application of double-faced pressure sensitive adhesive tape to the inner last-contacting surface of the insole.

FIGURE 5 is a sectional view taken substantially along the line 5-5 of FIGURE 4;

FIGURE 6 is a sectional view taken along the longitudinal center line of a conventional insole illustrating a modified embodiment of the present invention wherein a removable protective strip is applied to the outer adhesive surface of the double-faced pressure sensitive adhesive tape; and

FIGURE 7 is a perspective view of the modified embodiment illustrated in FIGURE 6 with the protective strip partially withdrawn.

Referring now in detail to the drawings, the longitudinally extending strip of adhesive material, generally designated by the numeral 10, preferably is in the form of double-faced pressure sensitive tape having opposed adhesive faces which may be applied either along the bottom portion 12 of a conventional last 14 or directly to the inner foot-contacting surface 16 of a shoe insole 18, but preferably the latter due to the relative planar configuration of the insole surface. In order to preserve the adhesive quality of the tape 10, a liner or strip 20 may be employed for the protection of the outer adhesive face 22 until such time as the insole and last are ready to be combined into an assembled unit whereupon the protective strip is withdrawn, in the manner illustrated in FIGURE 7. Subsequent to the application of adhesive material to either the insole or last, the latter components are thereafter positioned in superposed alignment with the longitudinally extending strip of pressure sensitive tape 10 interposed between the insole foot-contacting surface 12 and last bottom 16 in the manner illustrated in FIGURE 3. Upon the application of external pressure, which may be performed either manually or mechanically, a temporary adhesive bond is formed between the aligned components and the opposed adhesive faces of the tape which serves to retain the same in fixed assembled relation during subsequent lasting operations.

Upon completion of the lasting operation, the adhesive bond between the assembled components can be released

through the application of a longitudinal separating force. This is normally accomplished by withdrawing the last from the shoe after the heel portion 24 and toe section 26 have been collapsed or "broken" about the pivotal joint 28 in the customary manner. Thereafter, the tape can be easily stripped from either component without detrimental effect.

For the purposes of this disclosure, the term "pressure sensitive" serves to designate a distinct category of adhesive material which is permanently tacky at room temperature and firmly adheres to a variety of dissimilar surfaces upon mere contact with a minimum application of pressure without leaving a residue upon removal. Preferably, the adhesive material contemplated by this invention is in the form of double-faced pressure sensitive tape, as exemplified by the following patents: Kellgren Patent No. 2,206,899 of July 9, 1940, Kellgren et al. Patent No. 2,395,668 of February 26, 1946, Kellgren et al. Patent No. 2,496,349 of February 7, 1950, Dahlquist et al. Patent No. 2,532,011 of November 28, 1950, and Marcin Patent No. 2,565,509 of August 28, 1951.

The adhesive material utilized to develop a releasable bond for detachably securing the insole to the bottom of a shoe last preferably is in the form of a double-faced pressure sensitive tape for convenience of handling, applying, using and subsequent removal. The internal cohesive strength of the adhesive material must be greater than the adhesive bond established between the outer faces of the tape and the adjacent contacting surfaces of the insole and last, otherwise delamination of the material will occur. Further, the pressure sensitive characteristics of the adhesive material utilized in this method serve to provide subsequent detachability of each of the aforementioned elements, one from another, during a later stage in the manufacture of the shoe, without requiring the application of either heat, cooling, or destructive vibrational shock. In view of the severe stresses imposed upon the assembled insole and last during further operations in the manufacture of the shoe, it is apparent that the resultant adhesive bond between the insole and last must be capable of withstanding both tensile and shear forces, or a combination thereof until adhesion is no longer required. This is accomplished by the pressure sensitive adhesive which serves to resist the forces imposed upon the bond between the insole and the last.

For purposes of definition, the various terms used herein to describe the characteristics of the pressure sensitive tape are in accordance with the standards specified by the Technical Commission of the Pressure Sensitive Tape Council, Glenview, Illinois, for "Test Methods for Pressure Sensitive Tapes" appearing in Bulletin STC-1, issued September 1955 and revised May 1959. Since "adhesion" generally signifies the bond produced by the contact of a pressure sensitive adhesive to a surface on which it is applied, the force required to separate and remove the pressure sensitive adhesive at an angle normal to the surface of contact is commonly referred to as the "peel adhesion" characteristics of the tape while the lateral force which tends to misalign the insole and last in a direction parallel to the surface of contact is commonly designated as the "shear adhesion" characteristic of the tape.

In this regard, the tensile adhesion strength of the tape in a direction normal to the last must be sufficient to retain the combined insole and last in assembled relation and will depend upon (a) the length of tape applied, (b) the width of the applied tape, (c) the peel adhesion value of the tape, and (d) an empirical factor k which is based upon such items as: the age and temperature of the tape as well as the temperatures, cleanliness and finish of the insole and last surfaces. A range in peel adhesion of between 15 ounces per inch and 75 ounces per inch, according to the Pressure Sensitive Tape Council Standards, will provide adequate tensile adhesion to compensate for variations in (a), (b), and (d) above.

The shear adhesion strength of the tape must be sufficient to keep the insole and the last combined in fixed alignment and will depend upon (a) the length of the tape applied, (b) the width of the applied tape, (c) the shear adhesion value of the tape, and (d) an empirical factor k , which is based upon the same conditions noted above. A range in shear adhesion of between 15 ounces per square inch and 75 ounces per square inch will provide adequate shear adhesion to compensate the variations in (a), (b), and (d) above.

Tape width usually varies from $\frac{1}{2}$ " to 1", with $\frac{3}{4}$ " width proving satisfactory for the greatest number of situations encountered. The resistance to normal and lateral or parallel forces on each side of the tape may be expressed as a function of the area of the tape, the tensile and shear adhesion values of the tape, and the empirical factor k :

$$R = A \times T \times K$$

wherein R is the resistance to normal and lateral forces on each side of the tape, tending to either separate or misalign the insole and the last, A is the area of the tape, T is the minimum value of the peel or shear adhesion and K is an empirical constant defined above. The adhesion strength of the tape necessary to hold a particular insole to the last must result in a value of R which exceeds the combination of forces tending to separate the insole from the last. The mean area of tape necessary therefore varies with the values of T and K in the formula above. For example, a double-faced creped masking or drafting tape "Scotch" Brand #400 is satisfactory in many cases in lengths of 6" to 8" when the width is $\frac{3}{4}$ ". Pressure-sensitive double-faced "Scotch" tape (non-creped cellophane base) has high peel and shear adhesive values. Therefore, the area can be substantially less utilizing this tape than in the case of "Scotch" Brand tape #400, or other tape of equivalent makes, and it is preferable for use in the manufacture of smaller sized shoes or in the manufacture of shoes wherein the space between the welt ribs or edges of the insole is relatively small. It is apparent that tapes possessing lower peel and shear adhesion values would utilize a larger area of tape and are easier to remove from the last or insole, but tapes possessing greater values of peel and shear adhesion with resulting smaller requirements of tape area are useful under particular circumstances. The length and width of the tape can, of course, be varied as can its lateral position on the insole or last. While a single longitudinally extending strip of pressure sensitive double-faced tape will perform the desired results, a plurality of strips may also be employed whenever desired without departing from the principles of the invention. However, it should be pointed out that single faced pressure sensitive adhesive material cannot be used even if doubled upon itself, since it would exhibit no cohesive characteristics whatsoever.

The following examples illustrate the results achieved in the use of double-faced pressure sensitive tape of varying peel adhesion values on insoles formed from leather and Prime's paper and a conventional wooden last.

Example 1

A double face tape comprising a saturated crepe paper base 8 mils thick had a listed Peel Adhesion of 30 ounces/sq. inch. A test of the roll used showed figures as low as 22 ounces/sq. inch. The tape was applied to an insole and thereafter compressed with a shoe last. The tape exhibited completely adequate adhesive characteristics.

Example 2

This example was conducted in the manner outlined in Example 1 utilizing a double face tape comprising a rope paper 5.5 mils thick with a listed Peel Adhesion of 45 ounces/sq. inch. The results were completely satisfactory.

Example 3

An attempt was made to find an adhesive material with

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a Peel Adhesion too low to hold the insole to the last. A double face paper tape with a listed Peel Adhesion of 7 ounces/sq. inch (testing as low as 2 ounces/sq. inch) was tried in the manner outlined in Example 1 and found to adhere to the last but not to the insoles.

Example 4

The experiment outlined in Example 1 was repeated with a double face glass tape with a listed Peel Adhesion of 70 ounces/sq. inch. The adhesive qualities were completely satisfactory and no difficulty was experienced in removing the tape from the insole.

The Peel Adhesion values referred to were determined according to "Test Methods for Pressure Sensitive Tapes" developed by the Spec. and Technical Commission of the Pressure Sensitive Tape Council, Glenview, Illinois, Bulletin STC-1, issued September 1955, revised May 1959.

The present invention will thus be seen to completely and effectively accomplish the objects enumerated hereinabove. By applying double-faced pressure sensitive adhesive tape material to either the insole or the last and thereafter aligning the elements in superposed relation, upon compression the adhesive faces will detachably secure the same in fixed assembled relation until completion of the required lasting operations. Since the insole and last need only be temporarily united, subsequent separation is possible upon exertion of a longitudinal face of the type caused by removal of the last from the shoe after completion of the lasting procedure. It will be realized, however, that various changes and substitutions may be made to the specific embodiments disclosed herein for the purpose of illustrating the principles of this invention, without departing from these principles. Therefore, this invention in-

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cludes all modifications encompassed within the spirit and scope of the following appended claims.

What is claimed is:

1. A method for detachably securing an insole element of a shoe to the bottom portion of a shoe last element which comprises the steps of applying pressure sensitive adhesive material having opposed adhesive faces to one of said elements merely by pressure, positioning said elements in superposed aligned relation with the opposed adhesive faces of said pressure sensitive material disposed therebetween, merely compressing said elements into intimate contact with said adhesive material to form an assembled unit having the elements affixed in aligned relation by the opposed adhesive faces of said pressure sensitive material whereby the elements can thereafter be separated without further treatment by stripping said material from either of said elements.
2. The method of claim 1 wherein the adhesive material is applied first to said insole element.
3. The method of claim 1 wherein the adhesive material is applied first to the bottom portion of said last element.

References Cited in the file of this patent

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