E. A. SAUNDERS.

RUBBER FOOTWEAR.

APPLICATION FILED JUNE 17, 1905.

905,105. Patented Nov. 24, 1908.

Fig. 1.

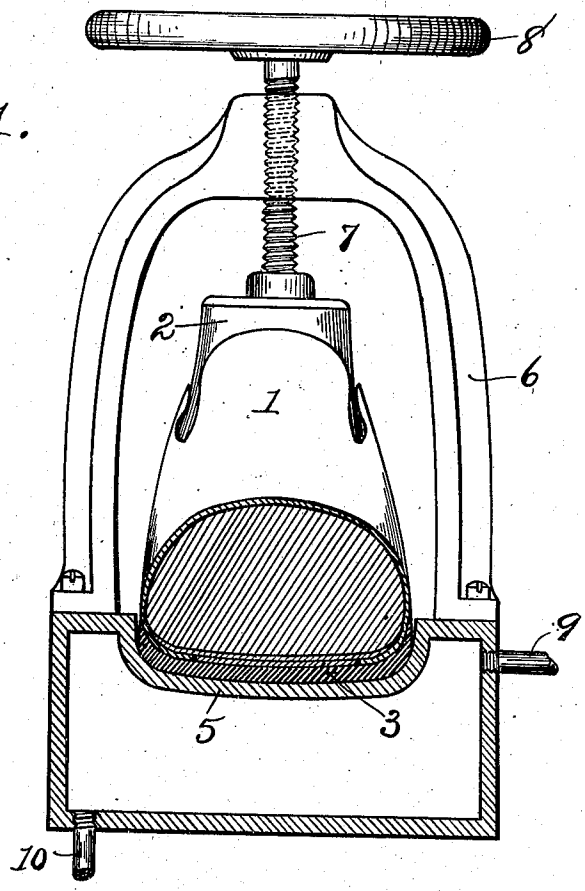
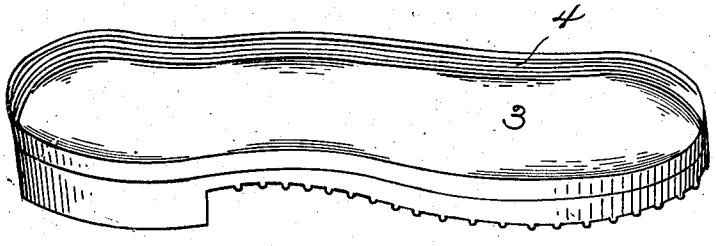


Fig. 2.



Witnesses:
Albert Popkins
Florence S. Pick

Emmett A. Saunders Inventor

By H. S. MacKaye

Attorney

UNITED STATES PATENT OFFICE.

EMMETT A. SAUNDERS, OF SOUTH BEND, INDIANA.

RUBBER FOOTWEAR.

No. 905,105. Specification of Letters Patent. Patented Nov. 24, 1908.

Original application filed February 24, 1905, Serial No. 247,101. Divided and this application filed June 17, 1905. Serial No. 265,724.

To all whom it may concern:

Be it known that I, EMMETT A. SAUNDERS, a citizen of the United States, residing in South Bend, Indiana, have invented a certain new and useful Improvement in Rubber Footwear, of which the following is a specification.

This invention has relation to integral or seamless rubber boots and shoes, whether lined with fabric or unlined.

The principal object of the invention is the production of improved rubber footwear which, by reason of its seamless character, has none of the disadvantages of a permanently cemented article; and wherein the under parts of the shoes on the one hand and the entire uppers on the other hand possess each the peculiar characteristics best adapted to their own necessities under conditions of use.

Seamless rubber footwear has been hitherto manufactured by building up the whole boot or shoe on a last and vulcanizing the parts all together to produce an integral article of manufacture. In some cases this vulcanization takes place by exposure to "open heat" in a proper oven. In other cases a mold is provided which incloses the entire boot or shoe and wherein it is subjected to simultaneous heat and pressure to accomplish vulcanization.

The present invention aims to overcome certain disadvantages unavoidably incident to both of the above named modes of treatment. These may be stated as follows: The main objection to vulcanizing an entire shoe by open heat in an oven lies in the fact that all green rubber compounds contain more or less moisture and other materials which form expansible gases on being heated. In consequence, when a rubber shoe is vulcanized by open heat these gases open up cells within the rubber walls, giving the whole a more or less spongy texture. The thin parts of the shoe contain less gas-producing fluids than the thicker portions, owing to the greater expressive effect of the forming rollers or calenders on thin sheets than on thicker masses. Hence the sponginess developed during vulcanization is not noticeable in these thinner portions, and such lack of solidity as does exist is rather beneficial than otherwise, as it promotes elasticity and pliability. The thicker portions of the shoe, however, containing as they do a greater amount of moisture etc., suffer a greater expansion and are converted into rubber sponge covered with a thin outer layer of firmer material. Wear soon penetrates this latter and before long a thick sole so made often absorbs and so to speak pumps up water into its interstices with every step. The result of this, of course, is a rapid deterioration.

The second process above mentioned and hitherto used is also open to objections. Where the entire shoe is placed in a mold for vulcanization under pressure, the sponginess above mentioned is prevented in the thicker parts but the softness is also suppressed in the thinner portions of the shoe. As heretofore mentioned, this softness is beneficial in the thinner walls, and its suppression tends to brittleness in the very parts which must be allowed to yield when the shoe is taken off or put on, and must bend or wrinkle when on the foot. Another important disadvantage met with in this prior process is that the thicker parts, including the heel, the sole and those portions of the remainder of the shoe in direct contact therewith, require more prolonged action than the uppers. It results from this that either the uppers are overcured during a given treatment, or the aforesaid thicker portions are not sufficiently vulcanized. If the uppers are overcured they are hard, inelastic and unyielding and, as the strains of wear on the uppers are pulling and bending strains, quick deterioration is the result. If, on the other hand, the thin uppers are not vulcanized too hard, the thicker parts at sole and heel are left too soft for resisting the wear to which they are subjected. This wear takes the form of shock and abrasion, and a tough, hard, relatively unyielding condition is best in these portions of a boot or shoe.

By the practice of my present invention I am able to produce a shoe having a soft elastic and pliable texture in the thin walls of the upper portions but free from spongy or cellular structure in those thicker portions at the bottom of the shoe which are intended to resist shocks and abrasive action.

In making my improved shoe I may make use of any desired apparatus whether novel or well known, and an example of suitable means is illustrated in the accompanying drawings, wherein Figure 1 is a cross section of one form of pressing and curing means

with a shoe on its last shown in the operating position and Fig. 2 is a perspective view of a rubber sole ready for application to a shoe in the mold shown in Fig. 1.

The body of the shoe including the inner sole all shown at 1 in Fig. 1, is built up in the usual manner on a last 2, being constructed of properly shaped parts temporarily cemented together.

The thick outer rubber sole 3 is separately prepared, being either formed green or partly vulcanized in a press in a well known manner. The sole shown in Fig. 2 is a typical example of this part as prepared for application to the shoe. It is concave in transverse section to fit the convexity of the shoe body, and is preferably provided with an upturned edge 4, which is adapted to fit closely all around the lower edge of the shoe body. The form of sole illustrated is not essential to my invention the scope of which covers the use and application of a mere tap sole or of a heel alone.

The shoe body and the thick lower part to be applied thereto having been thus separately prepared, the latter is placed in a mold 5 into which it fits snugly, which mold is combined with means for pressing the shoe body, while still on the last, down onto the sole in said mold.

In the illustrative form of apparatus shown in the drawings, this takes the shape of an arch 6 fitted with a screw 7 having a hand wheel 8. The last with the shoe body upon it is placed upon the sole 3 so as to fit within the upturned edge 4 and the screw 7 is turned down hard upon it. The action of the convex body when thus forced down into the concave sole when in the mold 5 is to create a pressure between the soft meeting surfaces at all points, and thus the sole is pressed upon the shoe body, not only on the under surface, but horizontally along the entire length of the upturned edges 4.

In order to carry out my process, the mold must be heated to a proper vulcanizing temperature and this may be accomplished in any manner desired. In the apparatus shown in the drawing the mold 5 is hollow as shown and the heat is supplied by steam entering for instance at 9 and returning at 10.

By the means above described there is created a strong continuous pressure which is preserved during the period of vulcanization of the lower shoe body and joined surfaces, or until this process has been carried so far that the material is able, of its own resistance to suppress all formation of sponginess under the further influence of heat. When the rubber reaches this last named condition it may be said to "set." This word is intended to express a sufficient degree of vulcanization to prevent sponginess on application of further heat.

Local vulcanization in a mold as above described must be continued at least to such a point as to "set" the composition in the whole underpart of the shoe before the mold is taken off. It may be carried further than this without departing from my invention. The process having been carried to this point, the shoe is taken from the mold, and, while still upon the last, is subjected to the proper vulcanizing temperature in an oven without the application of pressure. The sole and heel being set, there is no danger of sponge therein and the manufacturer is free to secure the best results in the uppers without danger to the remainder of the shoe.

The apparatus whereby my process is carried out forms no part of this invention, as any form of machine appropriate to accomplishment of the steps above described may be employed.

In the following claims the term "sole" is intended to cover either the tap sole or heel or both together and whether extending upward on the side of the shoe body or not.

The process herein described is claimed in my pending application for patent Serial Number 247,101, filed February 24th, 1905, of which this is a division.

What I claim is—

1. As an article of manufacture, an integral rubber boot or shoe having uppers of thin soft and elastic texture and outer and inner soles with contiguous parts of solid and relatively inelastic material, substantially as described.

2. As an article of manufacture, an integral rubber boot or shoe in which the sole and contiguous parts are made of compressed and vulcanized rubber while the uppers are made of rubber vulcanized without pressure, substantially as described.

3. As an article of manufacture, an integral vulcanized rubber boot or shoe having a compressed long-cured sole and contiguous parts and having uppers cured for less time and without pressure, substantially as described.

4. As an article of manufacture, a rubber boot or shoe, having the insole, outer sole and uppers vulcanized together in one piece, and wherein the insole and outer sole are of molded rubber vulcanized under pressure to the edge of the upper, and the upper is composed of elastic unmolded rubber, substantially as described.

EMMETT A. SAUNDERS.

Witnesses:
HAROLD A. MACKAYE,
FLORENCE S. PICK.