

[54] SHOES OR BOOTS

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12/142 R, 142 RS, 142 P

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[57] **ABSTRACT**

An article of footwear having an outsole, a sole shell, an insole and an upper, in which, the outsole is formed as an internally and externally ridged member having a peripheral wall and defining a cavity on an inner side thereof, the sole shell being formed of reaction foam during a foaming operation and interfitting with the outsole inner side, the insole being connected to an outsole inner side, the insole being connected to an inner surface of the sole shell and the upper, lower peripheral edge portions of the upper being connected between the insole and the sole shell, with the outsole being connected to the insole and upper via the sole shell during said foaming operation.

**7 Claims, 2 Drawing Figures**

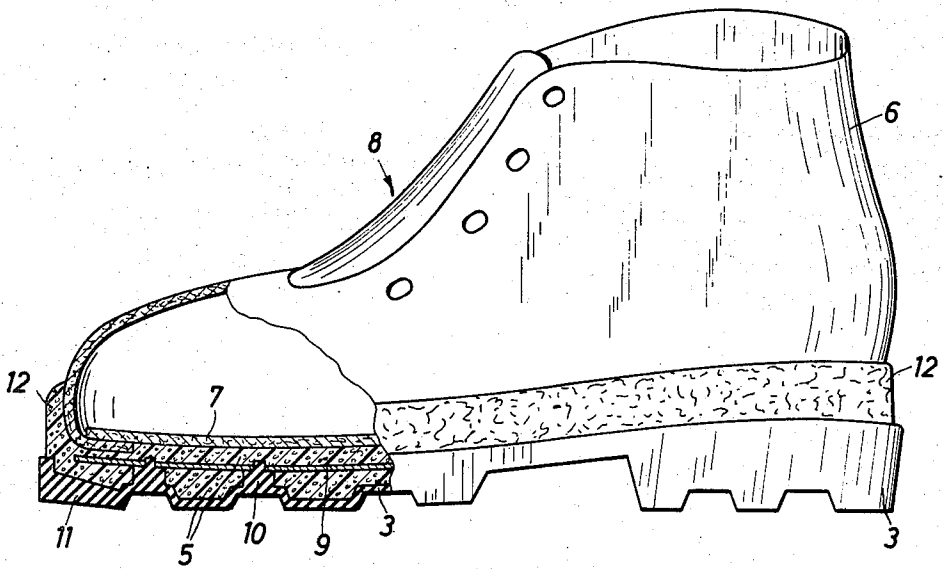


Fig.1

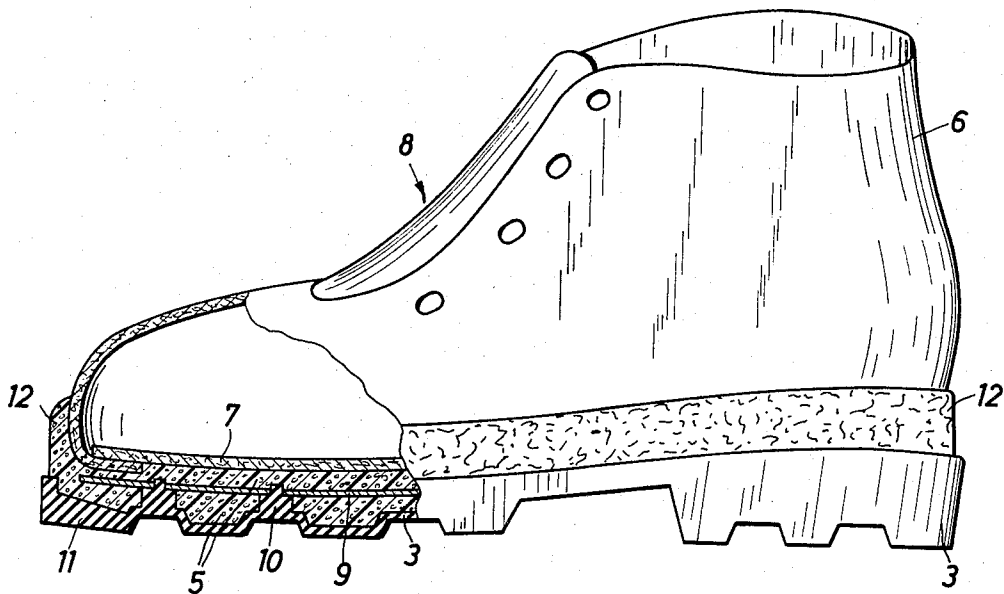
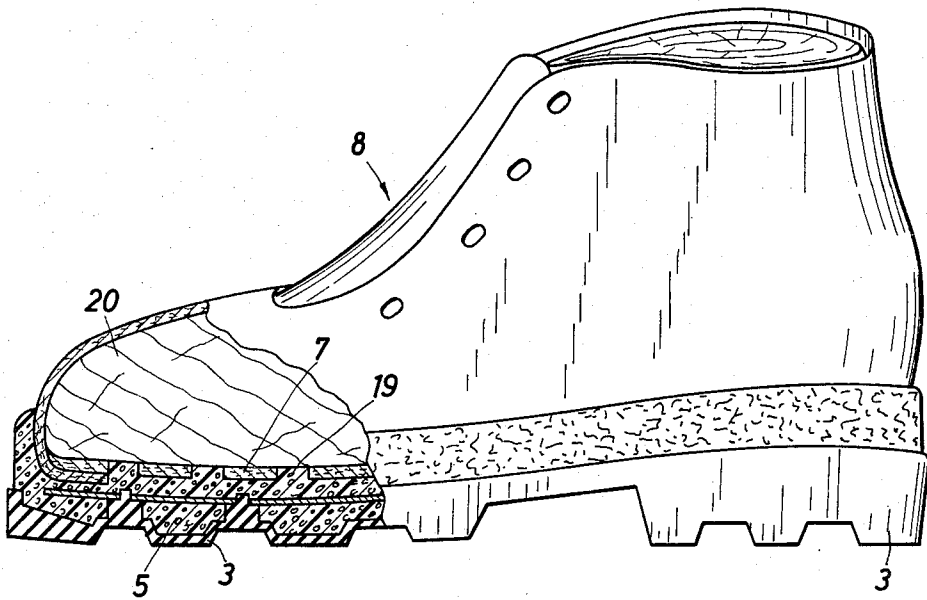


Fig. 2



## SHOES OR BOOTS

## BACKGROUND OF THE INVENTION

The invention relates to a shoe or boot, and in particular to a shoe or boot for use as a work or sports shoe, having a pre-prepared outsole of rubber or other abrasion-proof elastomer which is arranged as a thin-walled ridged sole an inner cavity of which is completely filled with a reaction foam. Furthermore, the invention relates to a method for the manufacture of a shoe of this kind.

## PRIOR ART

Shoes having so-called padded soles are already known wherein the soft elastic sole consists of a tough ridged and trough-like piece forming the tread, the inner space of which is completely filled with a soft elastic reaction foam to create a padded core. In known shoes, in order to hold the padded core, formed as a separate sole element, in a predetermined position in the ridged or trough-like sole and to secure it there so that the core is not displaced even by stresses which occur during the wear of the shoe, peripheral webs or holding tabs are provided on the upper edges of the sole shell. This, however, increases manufacturing costs. Since the padded cores have to be manufactured and treated as separate parts on corresponding machines, the technical expense also increases the cost of manufacture.

Furthermore, it is known to fill the inner side of a tough elastic outsole of trough-like shape with a reaction foam until the tabs or adhesive webs provided on the upper wall edges of the outsole parallel to the tread are enclosed at the sides by reaction foam. Although, with such a sole, the foam core is directly connected or stuck to the material of the outsole during foaming, it is then necessary to stick the upper shoe to the outsole in a separate process after applying a suitable binder.

Furthermore, a sole for work or ski shoes is known which consists of an outsole which is flat on the inner side and a thermoplastic injection molded substance which sticks the upper shoe to the outsole and is mounted between the outsole and the upper shoe in a definite thickness which is dependent on the shape. A method is known for manufacturing work or sports shoes provided with this sole wherein the shoe upper forms the upper closure for the sole mold. The outsole having a flat inner or upper side is inserted in the mold and the remaining cavity between the outsole and the upper, which is clamped on a last and which closes the mold, is supplied with a thermoplastic injection molded substance through which the tough outsole is fastened to the upper. With such soles, not only thermoplastic injection molded substances but also other materials may be used as the outsole since the former are unsuitable as outsoles for ski shoes because of the danger of slipping on ice and snow and are unsuitable for work shoes due to their unfavorable temperature load. Natural rubber is the most preferable material for the outsoles of non-slip ski shoes and, for example, synthetic rubber as the outsoles for heat-resistant work shoes. Both materials are, however, difficult to injection-mold and are relatively expensive.

## SUMMARY OF THE INVENTION

In one aspect, the present invention is a shoe, in particular a work or sports shoe of the kind initially men-

tioned, having a sole which is firmly connected to the shoe upper. Another aspect of the present invention is the manufacture of such shoes.

According to the present invention, there is an article of footwear comprising: an outsole formed as an internally and externally ridged member having a peripheral wall and a cavity portion on an inner surface thereof; a sole shell formed of reaction foam during a foaming operation and interfitting with the cavity portion of the outsole; an insole connected to an inner surface of the sole shell; and an upper, the lower peripheral edge portions of which are between the insole and the sole shell wherein, the outsole is connected to the insole and upper via the sole shell during said foaming operation.

Furthermore, the profile of the inner side of the outsole may follow the profile of the outer side of the outsole.

In shoes having a thick profiled tread, the inner side of the outsole has indentations following the outer profile and filled with reaction foam. This results on the one hand in an improved connection between the foamed material and the tough elastic outsole and on the other in a more uniform flexibility of the sole and thus the shoe during wear.

For particularly sturdy work boots having a heavy sole which cannot be penetrated, projections may be provided on the inner side of the outsole and a thin plate of a material which cannot be penetrated, e.g. metal foil or solid plastic is supported in a precisely fixed position and said attachments. The spaces between this plate and the shoe upper as well as between the outsole and the plate are filled with reaction foam which then not only provides the fixed connection between the outsole and the upper but also secures the non-penetrable plate by an all-around adhesion.

A further improved adhesion of the upper to the sole can be achieved if the foam core contains a wall bead extending over the edges of the peripheral wall of the outsole thus forming an additional fastening surface for the upper.

To manufacture a shoe according to the invention, a ridged outsole is inserted in a mold which is then covered by an upper seated on a last. The remaining free inner space between the inner side of the outsole and the upper is then filled with a soft elastic reaction foam firmly adhering the outsole to the upper.

For work shoes having a conductive sole, the ridged outsole consisting of a conductive material is to be filled with a likewise conductive reaction foam system which provides the conductive connection between the upper side of a non-conductive insole provided with holes and the ground, wherein the holes of the insole are likewise filled with the foamed material. Through a corresponding arrangement of these insole holes, it is ensured that during wear, there is a permanent contact between the foot of the wearer and the ground. The total resistance of the two materials of the sole should be within the limits laid down.

Particular embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view, partly sectioned, of a shoe or boot; and

FIG. 2 is a side view, partly sectioned, of a shoe or boot on a last, the shoe or boot having an electrically conductive padded sole.

#### DETAILED DESCRIPTION OF THE DRAWINGS

In the shoe illustrated in FIG. 1, a shoe upper 8 consisting of a shaft or angle portion 6 and an insole 7 is directly stuck to a padded sole consisting of a reaction foam core 5 and a ridged outsole 3 with a non-penetrable thin plate 9 of metal or like material embedded therebetween. This plate 9 is supported on integral projections 10 of the outsole 3 which extend inside the outsole ridges and accurately fix the non-penetrable plate 9. By securing the non-penetrable plate 9 in the padded sole and enclosing it on all sides in soft elastic foamed material, the stresses which automatically occur during use on bending the shoe can be compensated for thus resulting in a greater durability of the shoe and the new soles.

In this embodiment of the sole, a front part 11 of the outsole which is particularly subjected to wear and tear is sturdier than the remaining outsole walls which provides a further improved working life of the sole.

In this padded sole, the foamed material for forming a so-called sole shell is raised up in the form of a peripheral bead 12 laterally on the upper. This can be achieved by suitably shaping the sole mold.

For manufacturing the shoe, according to the invention, the upper 8 clamped on a last is inserted as a closure on a mold in which the outsole 3 has already been placed. By means of a metal conduit which leads to the die (all not shown), the interspace between the shoe upper and the mold is injected with reaction foam whereby the tough outsole and the upper are firmly connected together with the formation of an inflated padded core. Before filling with foam, the non-penetrable layer 9 consisting of sheet steel is fixed on the attachments 10.

FIG. 2 illustrates a further padded sole according to the invention which is similar to the embodiment according to FIG. 1. The tough outsole 3 consists of an electrically conductive elastomer material, and the foam core 5 is also conductive. Apertures 19 are provided in the insole 7 and during filling with conductive reaction foam, these are filled up to an adjoining last 20 supporting the upper 8.

Since the foam core of the padded sole according to the invention extends over the entire tread of the shoe, the shoes are extraordinary light-weight and very comfortable when walking. The present soles are, therefore particularly, suitable for orthopaedic foot-wear. The large surface fixed connection between the outsole and the padded core, furthermore, has the advantage that relative displacements between the padded core and the outsole or between the padded core and the shoe upper cannot occur.

The shoes or boots manufactured according to the present invention have the important advantage that particularly high strength factors of the reaction foam can be dispensed with since good support and abrasion properties are provided by the pre-prepared outsole. A cheaper reaction foam based on polyether can also readily be used for heavily stressed footwear.

This important advantage is particularly evident in so-called anti-static footwear for which the hitherto known foamed soles are unsuitable since all electrically

conductive foam systems have unfavorable mechanical properties.

I claim:

1. An article of footwear comprising an outsole, a sole shell, an insole and an upper, wherein, the outsole is formed as an internally and externally ridged member having a peripheral wall and defining a cavity on an inner side thereof, the sole shell is formed of reaction foam during a foaming operation and interfits with the outsole inner side, the insole is connected to an inner surface of the sole shell and the upper, lower peripheral edge portions of the upper being connected between the insole and the sole shell, the outsole being connected to the insole and upper via the sole shell during said foaming operation.

2. The article of footwear of claim 1 wherein the profile of the inner side of the outsole follows the profile of the outer side of the outsole.

3. The article of footwear of claim 2 further comprising a non-penetrable plate supported on projections on the inner side of the outsole, reaction foam being disposed between the non-penetrable plate and the insole and upper as well as between the non-penetrable plate and the outsole, the non-penetrable plate being held in position on the projections by the reaction foam.

4. The article of footwear as claimed in claim 1, wherein the peripheral walls of the outsole are thinner than a tread surface of the outsole.

5. The article of footwear as claimed in claim 1 wherein the sole shell has a wall bead portion at a forward peripheral region thereof, with the wall bead extending over the peripheral wall of the outsole to provide an additional fastening surface for the upper shoe.

6. A method for manufacturing an article of footwear including an outsole, a sole shell, an insole and an upper in which the outsole is formed as an internally and externally ridged member having a peripheral wall and defining a cavity on an inner side thereof, the sole shell being formed of reaction foam during a foaming operation and interfitting with the outsole inner side, the insole being connected to an inner surface of the sole shell and the upper, lower peripheral edge portions of the upper being connected between the insole and the sole shell, and the outsole being connected to the insole and upper via the sole shell during said foaming operation, comprising the steps of: placing the outsole into a mold; clamping the upper and the insole on a last; closing said mold with the last having the upper and insole clamped thereto; and filling the inner space between the inner surface of the outsole and the insole and upper with reaction foam to firmly adhere the outsole to the upper and insole.

7. A method for manufacturing an article of footwear including an outsole, a sole shell, an insole and an upper in which the outsole is formed as an internally and externally ridged member having a peripheral wall and defining a cavity on an inner side thereof, the sole shell being formed of reaction foam during a foaming operation and interfitting with the outsole inner side, the insole being connected to an inner surface of the sole shell and the upper, lower peripheral edge portions of the upper being connected between the insole and the sole shell, and the outsole being connected to the insole and upper via the sole shell during said foaming operation, comprising the steps of placing the outsole formed of electrically conducted material into a mold;

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seating the upper and insole on a last, the insole having perforations therein; closing said mold with the upper and insole; and filling the free inner space between the inner surface of the outsole and the insole and upper,

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including the insole perforations with conductive reaction foam while simultaneously sticking the upper to the sole.

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