Aug. 5, 1941. W. L. SMITH 2,251,468

RUBBER SHOE SOLE

Filed April 5, 1939

Fig. 1.

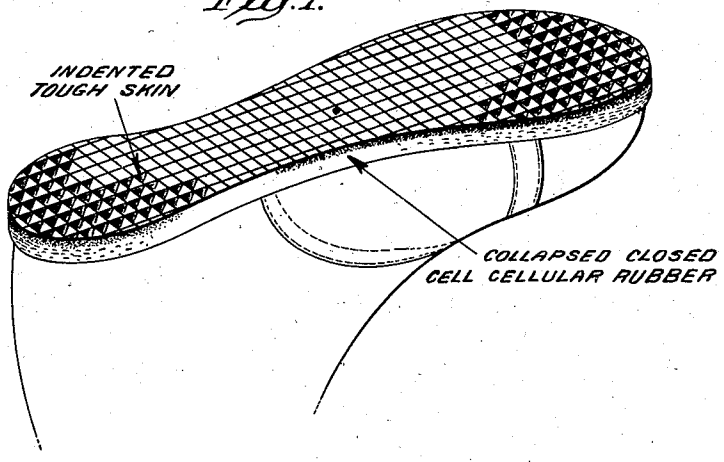


Fig. 2.

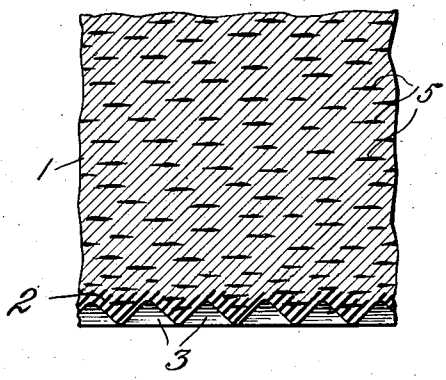
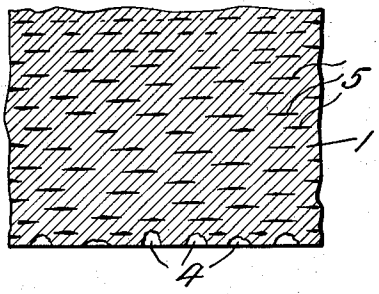


Fig. 3.



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RUBBER SHOE SOLE

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Application April 5, 1939, Serial No. 266,155

3 Claims. (Cl. 36—32)

This invention relates to rubber shoe soles, and aims to provide a sole having good wearing qualities and capable throughout its life of gripping on smooth and wet surfaces.

In accordance with my invention, a shoe sole is made from wholly or partially collapsed, closed-cell, cellular rubber. Such rubber is made by expanding a mass of soft rubber compound by means of a usual blowing agent under conditions which retain the gases produced by the blowing agent in closed cells within the mass of compound, and then cooling the rubber mass after vulcanization. The cooling has the effect of condensing or otherwise eliminating the gases produced by the blowing agent, so that the soft vulcanized rubber collapses substantially to the volume which it had before expansion. In its collapsed form, it has about the same degree of resiliency and the same wearing qualities of solid unexpanded soft rubber. Such collapsed cellular rubber has been made as an intermediate product in making sponge rubber, but has generally been regarded as of no value in itself.

I have discovered that when shoe-soles are made of collapsed cellular rubber, they are resilient, strong and durable and have the property of gripping on smooth surfaces until they are completely worn away. This property arises from the fact that wear on the under-surface of a sole made of collapsed cellular rubber opens the collapsed cells near the wearing surface, relieving the vacuum in these cells so that they expand and serve by a vacuum cup action to prevent the sole from slipping on smooth surfaces. Thus, although the sole has only the normal resiliency of solid soft rubber, its under-surface, as wear continues, consists always of a thin layer of expanded rubber containing opened cells which serve as vacuum cups.

To prevent the sole from slipping when it is new, indentations may be molded in the under-surface to provide an initial vacuum cup action. This is, however, not absolutely necessary, as collapsed cellular rubber has an irregular surface as the result of the collapsing of the cells, which is rough enough to provide some initial vacuum cup action up to the time that the cells begin to be opened by wear.

The accompanying drawing shows a shoe sole embodying my invention: Fig. 1 is a perspective view of the sole applied to a shoe; Fig. 2 is an enlarged diagrammatic vertical section of the sole when new, and Fig. 3 is a similar section of the sole after part of it has worn away.

The sole illustrated has a body 1 of collapsed closed-cell cellular soft rubber and an under-surface which is indented. When the sole is new, slipping is prevented by the vacuum cup action of the indentations 3 in the lower surface shown in Fig. 2. After wear, slipping is prevented by the vacuum cup action of the opened and expanded cells 4 near the wearing surface, as shown in Fig. 3. The cells 5 in the body remain collapsed until they are exposed by wear.

The sole which has been described may be made by utilizing the first part of a method which has been used for making sponge rubber. This method consists in expanding a mass of rubber compound by means of sodium bicarbonate or a similar blowing agent which is mixed with the compound before vulcanization. During the first part of the vulcanization, the rubber compound is confined in a mold having an internal volume no greater than the volume of the compound. This prevents any substantial evolution of gas within the rubber compound during the first part of the vulcanization and until the rubber compound has acquired a consistency and tensile strength sufficient to prevent entrapped gas from rupturing it. During the latter part of the vulcanization, the rubber compound is placed in a larger mold. On release from the first mold, or during the final vulcanization from the larger mold, or at both these times, the mass is expanded by gas produced by the blowing agent, so that, at the end of the vulcanization, there is produced a closed-cell cellular soft rubber article having the shape and size of the second mold.

Since the gas produced from sodium bicarbonate or similar blowing agents is of an unstable character, the gas is condensed or in some way chemically eliminated from the cells when the expanded article is cooled, so that it collapses and returns nearly to the size which the compound had before expansion.

In using this method to make a shoe-sole embodying my invention, the mold used in the first part of the vulcanization has a thickness substantially equal to that desired in the shoe-sole. The second mold has a thickness several times as great as that of the first mold and, most desirably, has at least one of its surfaces roughened to mold indentations in one surface of the rubber. The roughened surface of the mold may be a knurled metal surface or may consist of a piece of coarse fabric laid in the mold.

In manufacturing collapsed closed-cell cellular soft rubber by this method, not quite all the gas contained in each cell is eliminated on cooling

after expansion. It is to be understood that, as will be apparent to those skilled in the art, while the above-described specific embodiment of my invention is the sole of an ordinary shoe, my invention may, without departing from the spirit thereof as defined in the appended claims, be incorporated in any type of shoe or like article which is provided with a tread designed to engage a pavement or a similar surface without slipping or skidding.

What I claim is:

1. A shoe sole of substantially solid rubber containing almost wholly collapsed closed cells.

2. A shoe sole having a tread portion adapted to be exposed by wear comprising a layer of substantially solid rubber containing almost wholly collapsed closed cells.

3. A shoe tread comprising a layer adapted to be exposed by wear consisting of substantially solid rubber containing almost wholly collapsed closed cells.

WESLEY L. SMITH.