Oct. 24, 1961 R. SHELARE ET AL 3,005,272

PNEUMATIC SHOE SOLE

Filed June 8, 1959

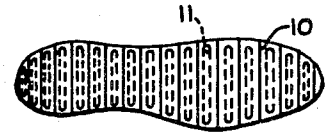

Fig. 1

Fig. 2

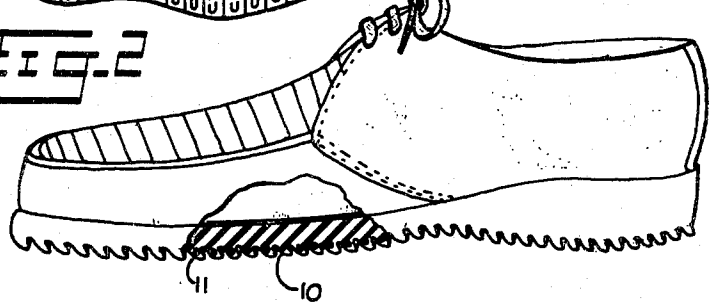

Fig. 3

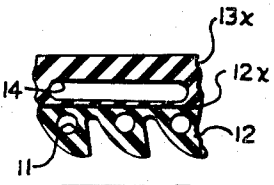

Fig. 4

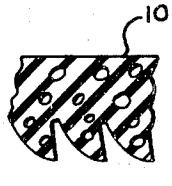

Fig. 5

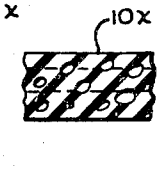

Fig. 6

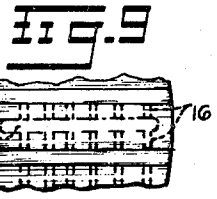

Fig. 9

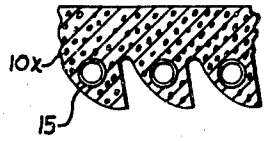

Fig. 7

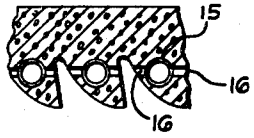

Fig. 8

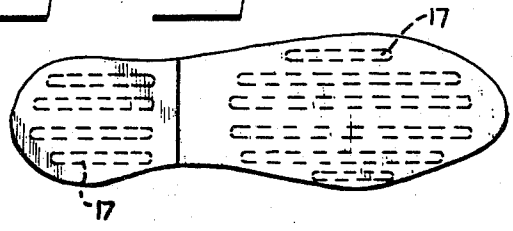

Fig. 10

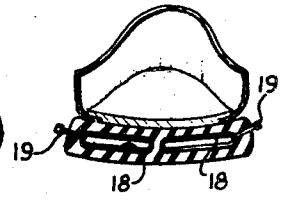

Fig. 11

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PNEUMATIC SHOE SOLE

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1 Claim. (Cl. 36—29)

This invention relates to a pneumatic shoe and more particularly to a shoe having a rubber or plastic lower construction containing capsules of air or gas.

It is an object of this invention to provide a novel shoe having heel and/or sole portions containing encapsulated air.

It is an other object of this invention to provide a shoe having cool wearing qualities.

It is a further object to provide a shoe having inner tubes or capsules of compressed gas so that the wearer truly walks on air.

It is still another object to provide a light weight shoe in that a portion of the bulk is taken up by air pockets.

These and other objects of this invention will become apparent upon reading the following descriptive disclosure taken in conjunction with the accompanying drawing in which;

FIG. 1 is a side view of a shoe, broken away in part, to show the manner of disposing elongated capsules of compressed air in a ripple heel and sole combination,

FIG. 2 is a bottom view of the shoe of FIG. 1,

FIG. 3 is a transverse view of a modification showing a two-ply encapsulated sole, having a top planar layer and a bottom ripple layer adhesively secured to the top layer.

FIG. 4 is a transverse view of another modification showing a two ply encapsulated sole, having a top ply having longitudinal capsules of air or gas and having adhesively secured thereto a bottom ripple ply having capsules in the ripples and transverse to said longitudinal capsules.

FIG. 5 is a transverse view of a modified unitary ripple sole having bubbles of compressed gas therein,

FIG. 6 is a longitudinal view of the modification of FIG. 5.

FIG. 7 is a transverse view of a ripple sole having inner tubes of gas impervious capsules disposed in the individual ripples.

FIG. 8 is a view similar to that of FIG. 7 showing a modification wherein the inner tubes are air cooled by cooling channels engaging the inner tubes,

FIG. 9 is a top view of the modification of FIG. 8.

FIG. 10 is a bottom view of another modification showing a planar flat slab heel and sole combination having elongated capsules of compressed gas suitably disposed therein, and

FIG. 11 is a transverse view of a heel portion of a shoe showing a unitary heel having flat bag capsules therein and tire valve means for enflating the capsules to a selective pressure.

The shoe of this invention contains capsules of air or gas such as nitrogen, helium, carbon dioxide gas, etc., preferably compressed gas in the soles and heels thereof.

The pressure of these capsules of gas, which may be spheres, ovaloids, elongated tubes, undulating tubes, etc., and which may be of uniform or varied cross-sectional diameter function as insulators from the heat or cold of the sidewalks as well as to lighten the weight of the shoe and to give resiliency or bounce to the shoe areas contacting the pavement.

The effect is similar to the pneumatic tire of an automobile wherein the shock of rolling on rough pavement is absorbed by the inner tube and its compressed air.

The plastic or rubber used for this invention is gas impervious where no inner tubes are employed. Where however a separate gas impervious inner tube is employed, the plastic base material need not be gas impervious and it may for example, be made of sponge rubber.

Where gas impervious plastic material is used preference is given to butyl rubber and to suitable polyethylene plastic. However, other conventional gas impervious isoprene and synthetic rubbers are operable.

Preferably the gas employed is nitrogen gas and it is incorporated into the plastic material in a suitable enclosed container or autoclave at a pressure above that of the atmosphere, for example, 15 to 30 pounds gauge pressure. Nitrogen gas is inert and hence doesn't tend to oxidize the enclosing plastic material as in the case of compressed air.

Turning now to the drawing and FIG. 1, the conventional ripple heel and sole shoe combination **10** is modified by providing each ripple with an elongated capsule **11** of gas running the length of the ripple. The gas capsule is disposed in suitable space-relationship to the wearing area of each of the ripples, namely the V-shaped edges. As shown in FIGS. 1 and 2 the body weight of the persons is disposed on the capsules of compressed gas, and in so doing the gas is compressed thereby absorbing the shock of walking. Moreover as the foot is removed from the ground the extra compression of the gas in the capsules **11** is returned rapidly to its normal compressed condition so that the capsule **11** functions as a spring to give bounce or resiliency to the foot as the shoe and the person's body weight leaves the pavement.

As shown in FIGS. 3 and 4, the heel and sole combination may be made of two plys, so that should the ripple ply become so worn as to become useless due to wear and tear of the capsules **11**, the bottom ripple ply **12** may be removed from the top non-ripple ply **13** by use of a suitable solvent for the plastic adhesive 12X employed. As shown in FIG. 3 the top layer **13** is also provided with cavities of compressed gas so that the combination of laminated layers **12** and **13** may be worn until layer **13** is completely gone.

FIG. 4 shows a modification wherein the top layer **13X** is modified by providing it with elongated capsules **14** running the length or a substantial portion of the length of the shoe. In this modification the elongated capsules **14** are at right angles to the elongated capsules **11** so that the compression of walking is distributed on layers of superimposed capsules.

FIG. 5 and FIG. 6 shows another modification wherein the sole and heel combination is made from plastic material **10X** having bubbles of compressed gas therein. The compressed gas bubbles in the plastic may be generated in situ during the formation of the plastic heel and sole combination article of manufacture from the crude crumbs of raw material using inert pressured nitrogen gas in a pressurized container during the stirring and fusion operation. Alternatively suitable gas forming chemicals for example, sodium bicarbonate, may be added to the crude plastic crumbs so that upon heating and chemical reaction, carbon dioxide is released in situ during the molding procedure of the heel and sole article of manufacture.

Other materials than sodium bicarbonate may be used to obtain a suitable in situ gas during the molding step. Where in situ gas formation is used in this invention the capsules appear in the final or molded product as bubbles or spheres. Suitable molding heat forms gaseous bubbles having the gas therein under pressure, that is at a pressure greater than atmospheric pressure.

As shown in FIGS. 7, 8 and 9 the capsules may be miniature inner tubes **15** disposed lengthwise in the ripples of a molded ripple heel and sole combination **10X**. The inner tubes or balloons are made from suitable plastic such as butyl rubber and a suitable compressed gas and are disposed in the ripple compartments of the mold prior

to being enclosed by the base plastic which preferably is in liquid plastic form before being converted by vulcanization into a solid plastic engulfing said inner tubes **15**.

In FIG. 8 there is shown a modified inner tube combination of FIG. 7 wherein cooling conduits or vents **16** are provided in the ripples to cool the gas capsule **15** since the gas therein undergoing expansion and contraction during walking becomes heated. Preferably the material **10X** of the modification of FIGS. 7 and 8 is a sponge rubber.

The inner tubes **15** of the modification of FIGS. 7 to 9 may be inserted into molded holes in the ripple having a suitable diameter to receive said inner tubes **15**.

FIG. 10 shows a shoe having a plurality of longitudinal tubular capsules **17** disposed lengthwise of the heel and sole combination.

In this combination the pressure of contact between the shoe and the pavement is in parallel relationship to the elongated capsules **17**.

A modification of the heel and sole combination of FIG. 10 is shown in FIG. 11 where a pair of flat encapsuled tubes **18** run the length of the heel and sole combination. In this modification each capsule **18** is provided with a tire valve **19** so that each capsule may be separately inflated to a like or different pressure from the compressed air obtainable at a gas station.

The capsule **18** may be inner tubes as in the case of the modification of FIG. 8 and they may be inserted in holes of suitable cross-section provided for these inner tubes in the heel and sole combination.

Thus the heel and sole combination may be provided with a plurality of separately inflatable capsules or inner tubes **18**, each alike or different, and disposed therein so as to correct deformity of feet, increase shoe height to give height to the wearer, or to correct walking steps and posture.

Thus a knock-kneed person using the double sac or inner tube shoe construction of FIG. 11 can inflate the inner capsule **18** to counter the knock-knee effect. The shoe thus can be separately inflated at various points depending on the size and shape, for example, rectangular or elongated of the capsule or inner tube, their location, their degree of compressed air, etc.

Having described our concept other obvious modifications will now readily suggest themselves to those skilled in the art, but all such obvious modifications of this compressed gas shoe are deemed to be embraced within the claim herein. Thus while the capsules contain gas preferably at a pressure above that of atmospheric pressure other gas pressures within the capsules such as those below atmospheric pressure, are operable.

Also in FIG. 11 in lieu of two tubes **18** a single inner tube **18** is operable.

Clearly this invention is of broad scope.

We claim:

As an article of manufacture, an integral sponge rubber heel and sole combination unit adapted for attachment to shoe upper construction, consisting essentially of top smooth wall, a bottom wall having a plurality of transverse spaced-apart rearwardly sloped ribs, each rib having an elongated aperture centrally disposed therein, an elongated plastic flexible capsule having compressed gas therein disposed in each of said rib apertures, each of said ribs having a plurality of passageways disposed at a right angle thereto communicating between said capsule and the atmosphere, whereby the upper smooth wall of said sole is heat insulated from the walking area of said ribs contacting hot pavement.

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