May 6, 1958 M. HACK 2,833,057

RESILIENT SHOE SOLES.

Filed June 21, 1957 2 Sheets-Sheet 1

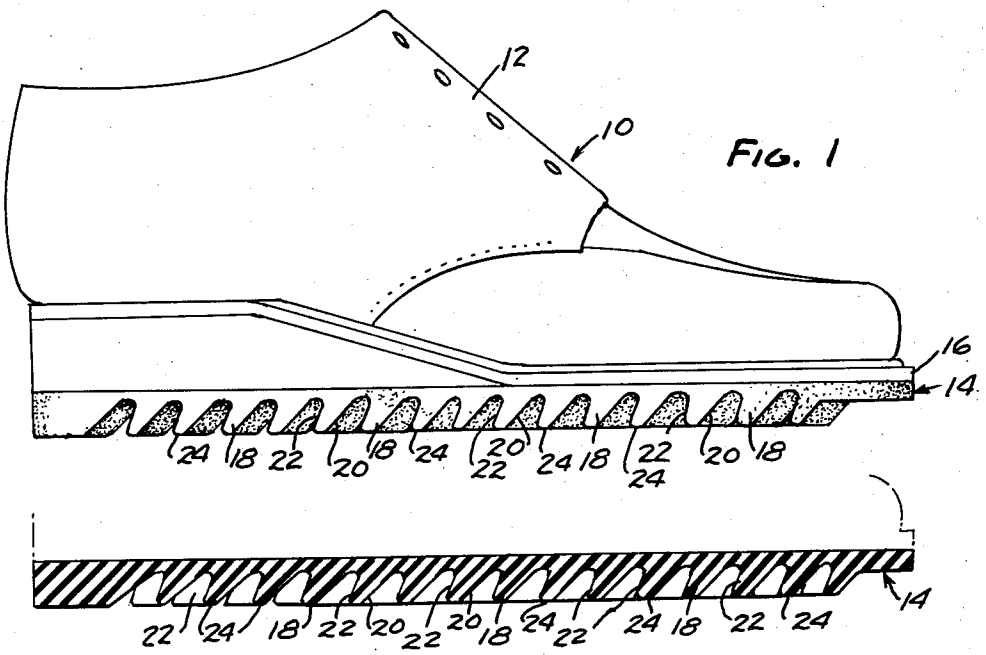

FIG. 1

FIG. 3

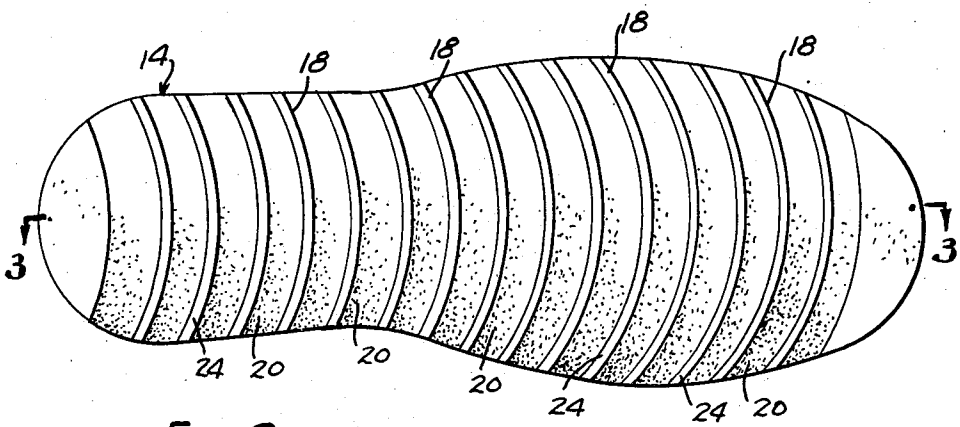

FIG. 2

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May 6, 1958 M. HACK 2,833,057

RESILIENT SHOE SOLES

Filed June 21, 1957 2 Sheets-Sheet 2

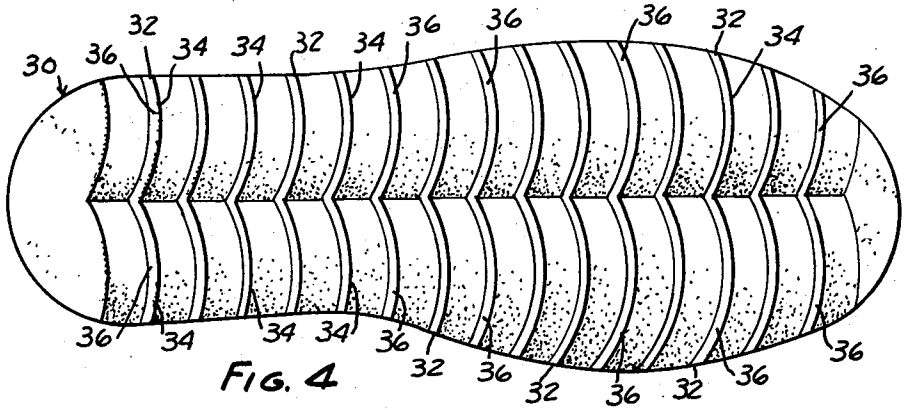

FIG. 4

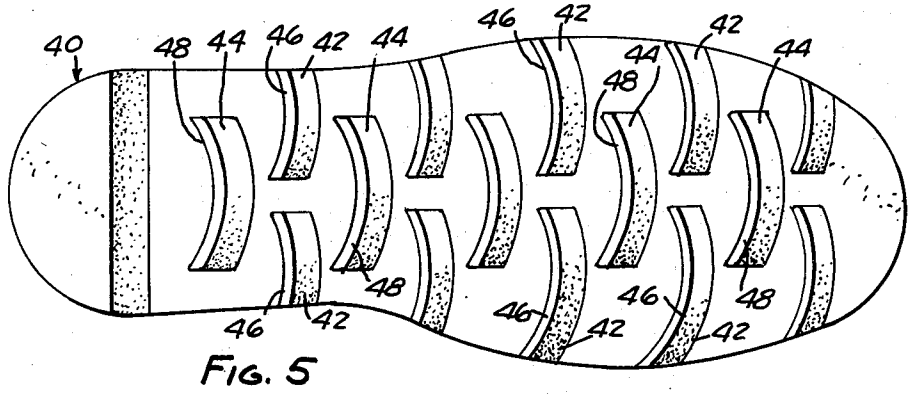

FIG. 5

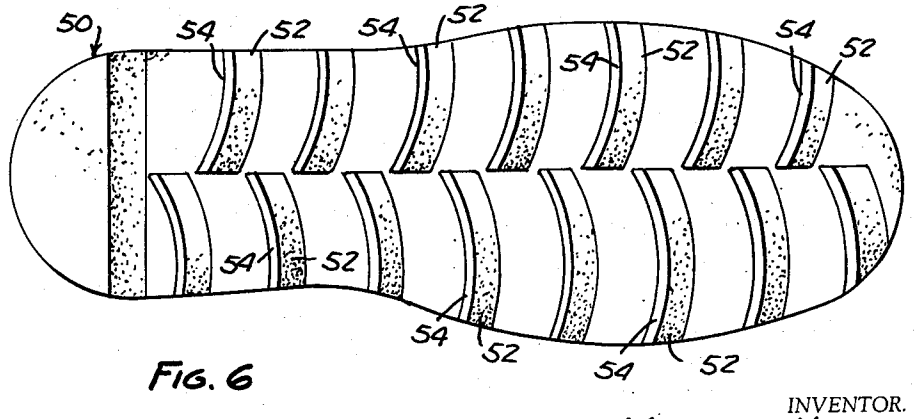

FIG. 6

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RESILIENT SHOE SOLES

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Application June 21, 1957, Serial No. 667,223

7 Claims. (Cl. 36—59)

This invention relates to resilient shoe soles and more particularly to such soles having corrugations, undulations or projections arranged transversely of the sole in a parallel curved arcuate arrangement.

This application is related to the construction disclosed and claimed in Hack Patent No. 2,710,461 issued June 14, 1955 for "Resilient Shoe Soles."

The instant construction provides for corrugations or projections on a sole platform having rearwardly inclined contact surfaces at their forward and rear faces, such that upon forward walking or running motion, the undulatory projections will yield rearwardly at their lines of contact and flex downwardly and forwardly at their upper portions. By providing these inclined and curved projections, the undulations, in turn, are caused to curl, bend, flex and yield rearwardly under the weight and force of forward motion of the foot in walking or running, and further to strongly resist side slip or sideward motion of the foot.

The purpose and function of the instant improvement in resilient shoe soles is to provide resistance to sidewise movement or slip upon hard, unyielding surfaces such as mine and factory floors, ship decks and similar hard, unyielding supporting base planes.

It is therefore an object of the invention to provide a resilient shoe sole having corrugations, undulations or projections arranged in a curved pattern upon a sole platform. A further object is to provide such curved projections in a variety of manners, so as to prevent sidewise slip or motion of the sole in any number of situations where the sole is particularly advantageous. Such situations include hard, slippery, unyielding walking or running surfaces including steel ship decks, hard rocky mine floors, concrete walks, factory floors, and surfaces of ice and snow, etc.

These and additional objects of the invention and features of construction will become more apparent from the description given below in which the terms are used for purposes of description and not of limitation. The description together with the appended drawings is a disclosure of a preferred form, with modifications, which the invention may take and is not intended to be a limitation of the variations which persons skilled in the art may make. For a visual understanding of the invention, reference is made to the accompanying drawings, in which

Fig. 1 is a side elevational view of a shoe embodying the inventive resilient sole of this invention.

Fig. 2 is a bottom plan view of the resilient shoe sole of Fig. 1.

Fig. 3 is a vertical sectional view taken substantially on the line 3—3 of Fig. 2.

Figs. 4, 5 and 6 are bottom plan views of modified forms of the resilient shoe sole of Figs. 1, 2 and 3.

As shown in the several views of the drawings, and in particular Figs. 1, 2 and 3, the shoe **10** comprises an upper portion **12** and a resilient shoe sole **14** having an upper platform **16** and integrally formed depending corrugations, undulations or projections **18** having rearwardly

inclined front and rear faces **20** and **22**, respectively, meeting at a rounded contact edge **24**.

As shown clearly in Fig. 2, each of the projections **18** are transversely curved or arced from one side edge of the sole to the other, and each of the yielding projections is parallel to and with the other projections on the sole. It is to be understood that the projections may terminate short of the side edges of the sole and still provide the desired function.

The curvature of the projections **18** may be varied in greater or lesser degree from that shown without departing from the essence of the invention. Curvature of the projections **18**, as above noted, is an essential element of this invention in avoiding side slip or sidewise motion as the sole makes contact, in walking or running, with the base plane. The degree of curvature will, of course, relate to the rearward flexing characteristic of the projections. Thus, curvature of the projections of such an order or degree as to substantially nullify the flexing characteristic and value of the projections is to be avoided.

The curvature of the projections, to accomplish the purpose of preventing sidewise motion or slip, may be embodied in a number of variations, some of which are included in the Figs. 4, 5 and 6, as representative examples.

In Fig. 4, the resilient shoe sole **30** is provided with transversely curved arced projections **32**, in parallel and having a common longitudinal median line demarking them into pairs of conjoined semi-projections or arcs **34**. Each of the arcs **34** has its forward and rearward faces rearwardly inclined, as in the sole **14**, and meeting at a contact edge **36**.

A further variation of the curved projection type sole is that shown in Fig. 5, in which the resilient shoe sole **40** is provided with aligned arced transversely arranged projections **42** alternating in rows with a staggered parallel arced transverse projection **44**. Each of the projections **42** has its forward and rearward faces rearwardly inclined, similar to that of sole **14**, and having a blended conjunction in a contact edge **46**. Each of the staggered projections **44** is similarly rearwardly inclined, its forward and rearward faces forming a conjunction at the edge **48**. Another variation of the sole, not shown in the drawings but easily understood from Fig. 5, would omit the staggered projections **44**, leaving only the aligned, spaced apart, transversely arranged, parallel and curved projections **42** to support the foot and prevent sidewise slip or motion.

In another variation of the sole having transverse, curved or arced projections, Fig. 6 shows the sole **50** having staggered, alternate rows of semi-projections or arcs **52** terminating inwardly of the side edges of the sole at a median longitudinal line. As above described, the arcs **52** have their forward and rear faces rearwardly inclined and blending at their lower edge into conjunction to form a contact edge **54**.

Each of the resilient shoe soles here disclosed and described—**14**, **30**, **40** and **50**—have the common feature of a curvature construction for projections or arcs integrally formed with a sole platform, the projections being inclined rearwardly.

In certain instances, the median portion of each of the several projections and semi-projections are forward of the side edges thereof, so that greater resistance to sidewise movement is effected by the side or end portions upon flexure. In other cases, the outer side edge, or the inner side edge, of each of the projections or semi-projections is forward of the remaining portion thereof. In such case, the entire projection or semi-projection exerts a resistance to sidewise motion upon flexure in walking or running. A balanced arrangement of the projections and/or semi-projections, of course, is to be preferred for more effective support of the foot in motion or standing. The base plane

contact edges are also preferably made in a rounded blended conjunction of the forward and rear faces of the projections, to provide a smooth contact action when they meet the base plane.

The curvature of the various projecting members here shown and described are preferably formed so that the members or arcs on each sole are curved on the same radius. This provides a more balanced support for the foot along the length of the sole. However, under certain special conditions where more support must be provided for the heel portion of the foot, or for the toe portion of the foot, or where greater resistance to sidewise movement should be imparted at or toward the heel of the foot, or toward the toe of the foot, the radius of curvature of the projecting members in such areas may be modified over that employed for the remainder of the members.

The soles may each be secured to the upper portion 12 of the shoe by a cementation process, or by other suitable means, all well known in the art to which the invention pertains. The resilient shoe soles here disclosed are preferably formed of rubber, and of such compoistion that flexing action of the projections during walking or running motion is supportive to the wearer. The soles are preferably made of a resilient material considered a solid, i. e. relatively dense and free of open pockets or spaces therein. But this is not a restriction against the use of such materials that may contain minute air cells and cellular structures as, for example, foam rubbers or foam plastics. Such materials have been and are generally considered as solids. Various kinds of rubber, plastic and rubber, or plastic compositions may be used in fabricating the resilient shoe sole of this invention.

The resilient sole platform portion and the depending corrugations or projections operate by flexure under load of the shoe wearer. As the shoe is moved forwardly, under weight, the contact edge of each of the projections or semi-projections meets the base plane in a yielding fashion, suffering a rearward inclination from the sole platform to the lowermost extremity, the contact edge, and imparting a forward movement to the shoe sole and a sensation of gliding to the shoe wearer. As the curving contact edges of the projections or semi-projections meet the base plane, the tendency to side slip or sidewise motion is avoided and resisted by the creation of forces at the outer side edges of the projections which prevent movement transversely of the direction of motion, which is forward in walking or running.

Having described the invention in its simplest terms, it is to be understood that the features of construction may be varied in greater or lesser degree without departing from the essence of the invention.

I claim:

1. A shoe sole formed of resilient material having a body and a series of transversely extending, downwardly and rearwardly inclined members projecting from said body and spaced longitudinally along said body, said members being disposed in parallel relationship from the front end toward the rear end of said sole, said members also being curved transversely of said sole on substantially the same radius and having a substantially uniform cross-sectional area throughout their length, said members further having lower rounded ends and having front and rear forwardly inclined faces that diverge upwardly therefrom and form a rounded juncture with the body of said sole, whereby when said members are engaged with a hard, unyielding supporting surface, said members will flex under weight and produce straight, forward movement of said body relative to said surface, and simultaneously, the transverse curvature of said members will provide resistance to sidewise movement of said sole relative to said surface.

2. A shoe sole formed of resilient material having a platform portion and a series of transversely extending, downwardly and rearwardly inclined members projecting from said platform portion and spaced longitudinally along said platform portion, said members being disposed in parallel relationship from the front end toward the rear end of said sole, said members being curved transversely of said sole, said members further having lower rounded ends and having front and rear inclined faces that diverge upwardly therefrom to form a rounded juncture with the platform portion of said sole, whereby when said members are engaged with a hard, unyielding supporting surface, said members will flex under weight and produce straight, forward movement of said platform portion relative to said surface, and simultaneously, the transverse curvature of said members will provide resistance to sidewise movement of said sole relative to said surface.

3. A shoe sole formed of resilient material having a body and a series of transversely extending, downwardly and rearwardly inclined members projecting from said body and spaced longitudinally along said body, said members being disposed in parallel relationship from the front end toward the rear end of said sole, each of said members being arranged in curved conjoined arcs transversely of said sole, said members further having lower rounded ends and having front and rear forwardly inclined faces that diverge upwardly therefrom and form a rounded juncture with the body of said sole, whereby when said members are engaged with a hard, unyielding supporting surface, said members will flex under weight and produce straight, forward movement of said body relative to said surface, and simultaneously, the transverse curvature of said members will provide resistance to sidewise movement of said sole relative to said surface.

4. A shoe sole formed of resilient material having a body and a series of transversely extending, downwardly and rearwardly inclined members projecting from said body and spaced longitudinally along said body, said members being disposed in parallel relationship from the front end toward the rear end of said sole, said projecting members being arranged in staggered rows of independent aligned arcs curved transversely of said sole, said members further having lower rounded ends and having front and rear forwardly inclined faces that diverge upwardly therefrom and form a rounded juncture with the body of said sole, whereby when said members are engaged with a hard, unyielding supporting surface, said members will flex under weight and produce straight, forward movement of said body relative to said surface, and simultaneously, the transverse curvature of said members will provide resistance to sidewise movement of said sole relative to said surface.

5. A shoe sole formed of resilient material having a body and a series of transversely extending, downwardly and rearwardly inclined members projecting from said body and spaced longitudinally along said body, said members being disposed in parallel relationship from the front end toward the rear end of said sole, said projecting members being arranged in staggered overlapping rows of independent aligned arcs curved transversely of said sole, said members further having lower rounded ends and having front and rear forwardly inclined faces that diverge upwardly therefrom and form a rounded juncture with the body of said sole, whereby when said members are engaged with a hard, unyielding supporting surface, said members will flex under weight and produce straight, forward movement of said body relative to said surface, and simultaneously, the transverse curvature of said members will provide resistance to sidewise movement of said sole relative to said surface.

6. A shoe sole formed of resilient material having a platform portion and a series of transversely extending, downwardly and rearwardly inclined members projecting from said platform portion and spaced longitudinally along said platform portion, said members being disposed in parallel relationship from the front end toward the rear end of said sole, said members being curved

transversely of said sole, said members further having front and rear inclined faces diverging upwardly therefrom to form a juncture with the platform portion of said sole, whereby when said members are engaged with a hard, unyielding supporting surface, said members will flex under weight and produce straight, forward movement of said platform portion relative to said surface, and simultaneously, the transverse curvature of said members will provide resistance to slidewise movement of said sole relative to said surface.

7. A shoe sole formed of resilient material having a platform portion and a series of transversely extending, downwardly and rearwardly inclined members projecting from said platform portion and spaced longitudinally along said platform portion, said members being disposed in parallel relationship from the front end toward the rear end of said sole, said projecting members being curved transversely of said sole and having laterally facing portions disposed on opposite sides of a medial line passing longitudinally through said sole, said members further having front and rear inclined faces diverging upwardly therefrom to form a juncture with the platform portion of said sole, whereby when said members are engaged with a hard, unyielding supporting surface, said members will flex under weight and produce straight, forward movemet of said platform portion relative to said surface, and simultaneously, the laterally facing portions of the transversely curved projections will provide resistance to sidewise movement of said sole relative to said surface.

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