Feb. 27, 1973 R. L. ORNDORFF, JR 3,717,943

MUD RESISTANT ELASTOMERS

Filed Aug. 23. 1971 2 Sheets-Sheet 1

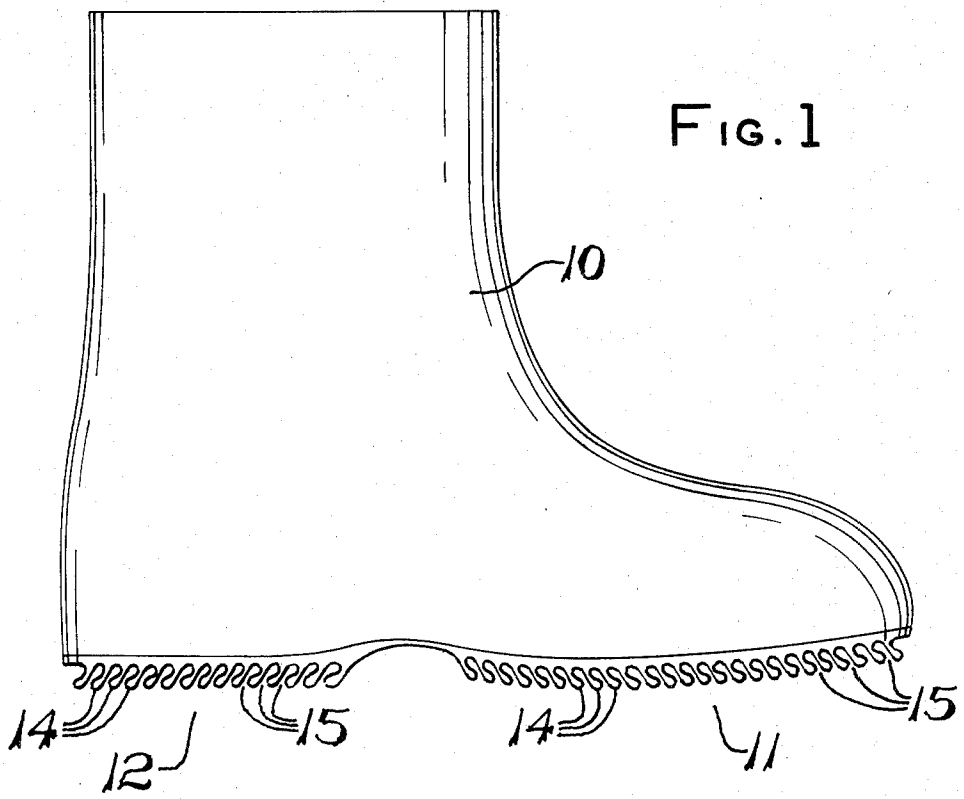

FIG. 1

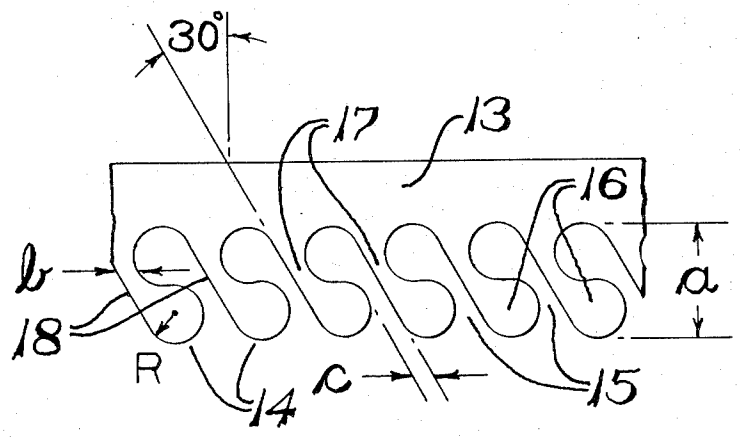

FIG. 2

INVENTOR.
ROY L. ORNDORFF, JR.
BY Joseph Janeczkiewicz
ATTY.

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FIG. 3

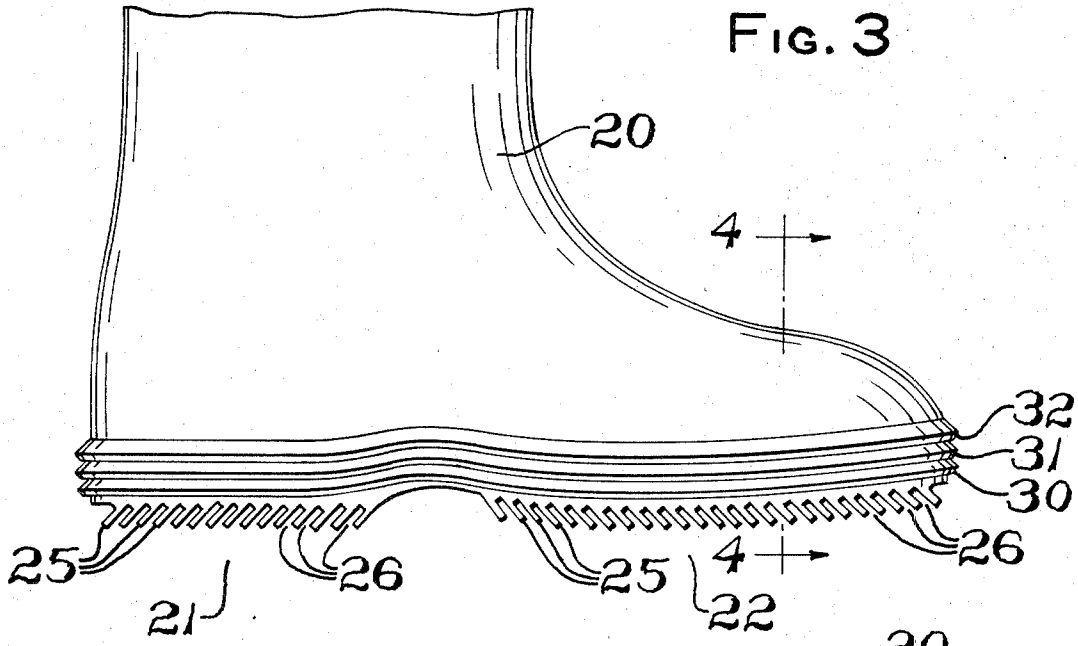


FIG. 4

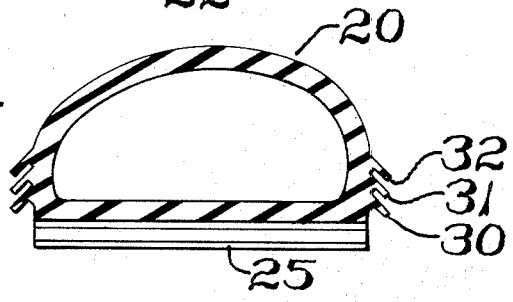
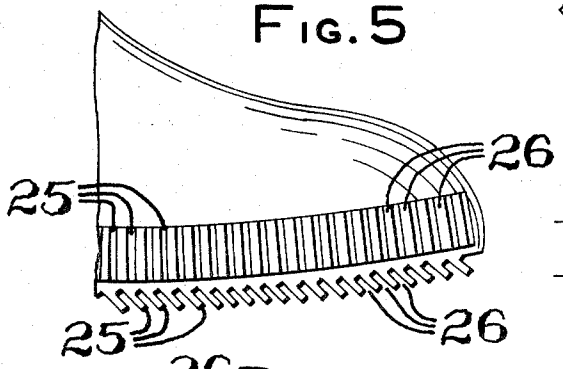


FIG. 5



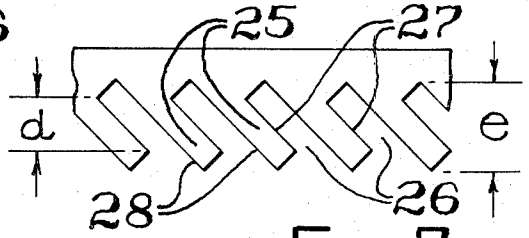


FIG. 7

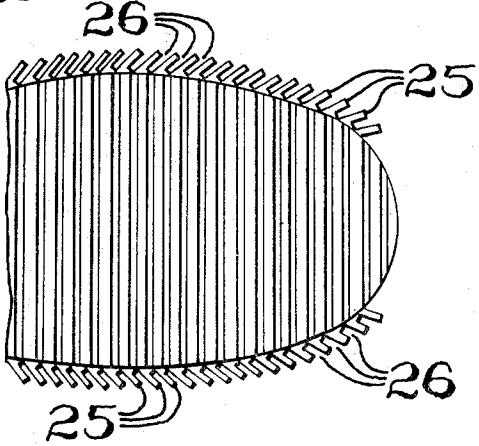


FIG. 6

INVENTOR.
ROY L. ORNDORFF, JR.
BY Joseph Jamusiewicz
ATTY.

United States Patent Office 3,717,943
Patented Feb. 27, 1973

3,717,943

MUD RESISTANT ELASTOMERS

Roy L. Orndorff, Jr., Kent, Ohio, assignor to The B. F. Goodrich Company, New York, N.Y.

Filed Aug. 23, 1971, Ser. No. 173,961
Int. Cl. A43b 13/06
U.S. Cl. 36—32 R 13 Claims

ABSTRACT OF THE DISCLOSURE

A sole construction such as used on overshoes, boots or shoes having a resilient planar body with a plurality of spaced fins that extend transversely across the body. The fins are evenly spaced and have lobes with relatively thin portions at the juncture to the planar body. All fins are identical and are inclined relative to a horizontal plane. The fin structure may be applied to the sides of the boot structure to reduce mud pick-up through the ability of the fins to trap air between adjacent fins.

BACKGROUND OF THE INVENTION

This invention relates to a molded, resilient self-cleaning piece of rubber and more particularly to a new and improved molded rubber sole which has a novel action of trapping air to clean itself when used in the environment of mud or like sticky materials.

It has been known to construct shoe soles and heels of resilient deformable materials such as rubber, flexible plastics and other suitable compositions which have a plurality of transversely arranged corrugated ribs, undulations which project downwardly from and formed integrally with an upper section that is secured to the base portion of a shoe. The ribs generally project rearwardly from the front or toe section of the shoe towards the heel and are inclined generally downwardly. Such ribs in shoe construtcion have been confined to the general use of facilitating the walking action or to ease the wearer's comfort in standing.

The sole construction of the present invention which is particularly adaptable to overshoes is an improved concept over such corrugated ribs by providing a plurality of transversely extending flexible fins that are thinner in construction and even in spacing and of such length that they trap air between adjacent fins upon deflection such that they spring back into original shape and will clean themselves if such fins come in contact with mud. One form of the invention is to have a plurality of fins disposed at approximately forty-five degree angle with respect to the horizontal plane and with the spaces between the fins being equal but with lobes at the forwardly most portion of the fin and with a relatively thin portion adjacent to the body portion to facilitate the trapping of air which aids in the self-cleaning action of the boot fins. In addition, fin structure may be placed around the side surfaces of the boot to inhibit mud build-up in that area adjacent to the sole of a boot. The fins are flexible such that the normal walking action of the overshoe will compress the fins easily to effect a trapping action of the air to clean the mud that is encountered on the lower most surface as well as the side surfaces.

Such invention is applicable to other rubber products wherein they inhibit the build-up of mud and their use in such an environment. The present invention is especially applicable to boots and shoes.

SUMMARY OF THE INVENTION

This invention relates to sole construction and side boot construction such as used on overshoes, boots, or shoes wherein the sole has a resilient body that is adapted to be

fixedly secured to the base of the shoe or an integral part of it as constructed. The sole has a plurality of transversely extending fins, which fins slant downwardly from the resilient body. All the fins' cross-sectional dimension is initially very thin and becomes progressively thicker to form a lobe. The grooves between adjacent fins are equal and similar in dimension defining lobes in inverse order to the lobes of the fins. The fins cooperate with each other such that on deflection the fins trap air to facilitate the self-cleaning feature whereby the sole of overshoes clean the mud. The action of the fins on the side surfaces of the boot, which may be flat thin fins or of the described lobe structure, perform a similar self-cleaning action. This invention is applicable to other uses that remove mud from their operating surfaces as in mud from tire surfaces.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a boot provided with a sole construction embodying the principles of the present invention.

FIG. 2 is an enlarged fragmentary side elevational view of a portion of a sole construction of FIG. 1, showing the construction approximately three times its normal size.

FIG. 3 is a side elevational view of a boot provided with a sole and side construction embodying the principle of the present invention.

FIG. 4 is a cross-sectional view of the boot shown in FIG. 3 taken along line 4—4 thereof.

FIG. 5 is a fragmentary view of the forward portion of a boot showing a novel side construction.

FIG. 6 is a bottom view of the sole and side construction illustrated in FIG. 5.

FIG. 7 is an enlarged fragmentary side elevational view of a portion of a sole construction.

DETAILED DESCRIPTION

Referring to the drawings wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIG. 1 a boot or overshoe **10** having a sole **11** and heel **12** construction made in accordance with the present invention. The sole **11** and heel **12** are shown attached and part of the overshoe **10**. It is to be understood that this sole and heel construction is particularly adaptable to an overshoe or boot construction which encounters mud and that this structure may be applied to shoes, tire or other surfaces to reduce or eliminate their mud pick-up. The sole **11** includes a solid planar portion **13** (FIG. 2) that is generally horizontally disposed having a plurality of downwardly and forwardly extending fins **14**. The fins **14** extend transversely across the sole defining grooves **15** between adjacent pairs of fins **14**. Each fin **14** is of the same uniform configuration, having a lobe **16** at the outermost end portion and a relatively thin narrow bridging portion **17** between the lobe **16** and the horizontally disposed portion **13**.

The height of lobed fin **16** is designated *a* and in the example illustrated is one-fourth of an inch (0.25"). The thickness of the bridging portion **17** of a fin **16** is two hundreths of an inch (0.020"), which is designated as *b* in FIG. 2. The radius of a lobe is designated as R in FIG. 2 and is six hundredths of an inch (0.06"). As viewed in FIGS. 1 and 2 the rear surface **18** of each fin is planar and make an angle of approximately thirty degrees with a line perpendicular to the horizontally disposed planar portion **13**. All of the rear surfaces **18** of the fins **14** are parallel to each other. The length of the fins **14** and the grooves **15** are determined by the width of the sole as viewed in plan of FIG. 6. The lobes **16** of the respective fins **14** cooperate with the grooves **15** to trap air to facilitate the self-cleaning action of the sole.

The heel **12** of the boot is constructed of the same type of fins **14** as the sole, however, the fins **14** of the heel **12** are sloping in a generally rearward direction, i.e. or leftward as viewed in FIG. 1.

The operation of the sole **11** and heel **12** construction as described in the environment of mud, as where an individual uses shoes or an overshoe with the sole constructed in accordance with the above described structure, is such that in walking the fins **14** yield as they are pressed into the mud, trapping air at the base of the fins. As the sole and heel is raised out of the mud surface the air acts to breaks up the suction that would ordinarily exist. The sides of the fins would open and allow the air to flow into the groove and facilitate the peeling off and breaking off of the mud. The precise action of the fins and phenomenon occurring is not fully understood, however, tests made of such surfaces in use have shown that because of the above described sole and heel construction, boots and overshoes reduce significantly the amount of mud picked up, compared with boots having conventional soles.

With the construction shown, the lobes provide a much greater wear depth due to the thickness of the lobes than other types of lugs. The distance between the lobe and the adjacent rear surface **18**, designated *c* in FIG. 2, is in the order of 0.02", the air trapping action is instantaneous and effective especially in low-viscosity mud to inhibit the pick-up of mud. With such action, the grooves **15** do not plug up. The thinness of the bridging portion provides for more flexibility and acts as a hinge point to assure a quicker closing response of the lobes in their air trapping action.

The fin structure in FIG. 1 is larger than actually proportioned; however, such sole and heel construction in FIG. 1 is shown to illustrate the general overall structure in use. The proportions are shown in FIG. 2 wherein the size is magnified three times. The height of the lobed fin is designated *a,* thickness of the fin *b,* width of the groove between lobe **16** and surface **18** is *c.*

A modified structure is shown in FIG. 3 wherein a boot **20** has a heel **21** and a sole **22** constructed so that each has a plurality of downwardly inclined fins **25.** The fins **25** extend transversely across the sole as shown in FIG. 6 defining grooves **26** between adjacent pairs of fins **25.**

Each fin **25** is of uniform thickness throughout its height. The fins extend downwardly and rearwardly with respect to the heel portion and downwardly and forwardly on the toe portion of the boot, with each fin having a front surface portion **27** and a rear surface portion **28.** All of the front and rear surfaces **27** and **28** respectively of the fins **25** of the sole portion are parallel to each other and disposed at approximately 45° with respect to the horizontal. However, such angle may vary from 25° to over 55° with respect to the horizontal and still function to provide a novel result as set forth above. The height of the fin designated as *d* in FIG. 7 is .115 of an inch whereas the height as measured along line *e* is 0.160 of an inch. The height of the fins and that of the grooves are identical in height and width wherein width is taken as the cross-sectional dimension running perpendicular to the surfaces of **27** and **28.** The length of the fin **25** and the groove **26** is determined by the width of the sole as viewed in plan view of FIG. 6. The grooves **26** cooperate with their respective adjacent fins **25** to trap air which facilitates the self-cleaning action of the sole and the heel. The entire circumferential side portions of the boot as depicted in FIG. 3 has a plurality of rows of fins w hich are identical in construction to that depicted by FIG. 7 and disclosed by the respective heels and soles to perform a cleaning action of mud along the side surfaces of the boot. Although three rows of fins are disclosed as **30, 31,** and **32,** any number may be employed and as an example six rows of such fins were employed which were found to be very effective in the elimination of mud build-up along the side surfaces of the boot. Such fins along the side surfaces

operate in the same manner as described above on the sole and heel wherein the respective grooves of the fins trap air to facilitate the self-cleaning action thereof. The dimensions of the fins in FIG. 4 are larger than designated by the dimensions *d* and *e;* however, such enlargement is for clarity purposes.

A modification of the invention is shown in FIG. 5 which depicts only the forward portion of the boot disclosing the fins as running vertically along the side edges of the boot wherein such fins may be inclined forwardly as disclosed by FIG. 6, i.e. the grooves **26** are open toward the forward portion of the toe of the boot. A variation on this is to have the respective fins slanted rearwardly towards the heel portion in an opposite direction to that shown in FIG. 6. The height of the fins as disclosed in FIG. 5 is determined by the extent to which the side surfaces of the boot are covered. Although the modifications shown in FIGS. 3 through 7 disclose the thin fins, it is within the purview of the invention to provide the side structure of the boots to have fins disclosed in FIGS. 1 and 2 which have the lobes on the forward portion of the fin which performs the self-cleaning action as described above.

Various modifications are contemplated and may obviously be resorted to by those skilled in the art without departing from the described invention, as hereinafter defined by the appended claims as only a preferred embodiment thereof has been disclosed.

What is claimed is:

1. In a ground contacting element which covers substantially the entire bottom surface of a boot, overshoe, shoe or the like, comprising a resilient body adapted to be fixedly secured to the base of an overshoe, said resilient body having a plurality of transversely extending flexible fins, said fins extending generally downwardly from said resilient body at an acute angle therefrom, each of said fins having a front and a rear face portion said rear surface being planar, said forward surface having a curvilinear portion cooperative with said planar surface to define a lobe at the end portion and a thin narrow portion at the juncture of said fin to said base of a overshoe, each of said rear surfaces being parallel to each other, each of said fins cooperative with an adjacent fin to define a groove therebetween.

2. In a ground contacting element as set forth in claim **1** wherein each of said grooves is similar in dimension to each other groove, and the distance between the thickest portion of a lobe and the adjacent rear surface is 0.020 of an inch.

3. In a ground contacting element as set forth in claim **2** wherein said rear surfaces of said fins make an angle with a horizontal plane between 25° and 50°.

4. In a ground contacting element as set forth in claim **2** wherein said height of said fins is approximately 0.25 of an inch.

5. In a shoe construction having a shoe upper, said upper having side portions that encompass the entire peripheral bottom edges thereof, said shoe having a bottom surface portion, said upper portion being integrally formed with said bottom surface, said bottom surface having a sole portion and a heel portion, each of said sole and heel portions having a plurality of transversely extending flexible fins, all of said fins on said heel portion extending downwardly and rearwardly therefrom, all of said fins on said sole portion extending downwardly at an acute angle therefrom, all of said fins having an enlarged lobe portion at the end portion and a thin bridging portion that facilitates the flexing of the said fins, and said fins on said respective heel and sole portion cooperative with adjacent fins to define a groove therebetween.

6. In a shoe as set forth in claim **5** the distance between the thickest portion of a lobe and the closest adjacent fin surface is 0.020 of an inch.

7. In a shoe as set forth in claim **6** wherein said sur-

faces of said fins make an angle of thirty degrees with a horizontal plane.

8. In a shoe construction as set forth in claim 5 wherein said side portions have a plurality of rows of fins encompassing the entire area thereof.

9. In a shoe construction as set forth in claim 8 wherein said rows extend in generally horizontal alignment.

10. In a shoe constrnction as set forth in claim 8 wherein said rows extend in generally vertical alignment.

11. In a ground contacting element for use in environments of mud and the like comprising a resilient flat body having a lower portion, said body having a plurality of spaced transversely extending flexible fins integral with said body, said fins extending downwardly and at an acute angle from said lower portion, each of said fins having a lobe in cross section with a thin bridging portion connecting said lobe to said lower portion.

12. In a ground contacting element as set forth in claim 11 wherein adjacent fins define a longitudinally extending groove therebetween, and each of said grooves being inverse in shape compared to said fins with the greatest dimension of said groove extending from said bridging portion to an adjacent planar surface.

13. In a ground contacting element as set forth in claim 12 distance of said lobes of said fins at its thickest portion from the closest adjacent planar surface is between the ranges of 0.020 and 0.040 of an inch.

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ALFRED R. GUEST, Primary Examiner

U.S. Cl. X.R.

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