SPiked SHOE SOLE

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

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This invention relates to a shoe sole or heel construction having downwardly projecting spikes with heads embedded in and supported by a layer of an elastomer composition with substantially the full lengths of the spike shanks projecting from the bottom of the layer.

This invention relates to a shoe sole or heel construction having downwardly projecting spikes with heads embedded in and supported by a layer of an elastomer composition with substantially the full lengths of the spike shanks projecting from the bottom of the layer. The invention has more particular reference to a spike mounting which is particularly suited for golf shoes by reducing the soil balling and other damage to greens that golf association agronomists have found attributable to the protrusion below the sole surface of the convex flange of the conventional screwed-in spike.

This application is a continuation-in-part of application Ser. No. 563,216 filed July 6, 1966 and now abandoned.

The general object is to provide an improved spike construction and mounting which provides a flat bottom sole surface around all of the projecting spike shanks and, as compared to prior constructions, is not subject to water damage, corrosion, or loosening of the spikes, which provides equal wear resistance, which offers equal resistance to the tilting in all directions when engaging a rigid ground surface, which provides less tendency for grass and mud to collect around the spike, and which provides greater comfort by virtue of more uniform distribution of pressure to the wearer’s foot.

Another object is to achieve the foregoing objectives and to provide a construction or reconstruction of golf shoes at minimum cost through the use of a spike construction and mounting which permits the efficient utilization of high production techniques in the cold forging of the spikes and in the molding.

A more detailed object is to form the spike as an integral single piece cold forging of steel and correlate the dimensions of the spike head and shank so as to achieve the foregoing objectives when the head is molded into and embedded in a relatively thin layer of a rubber-like material which is adapted to be cemented on and attached securely to a backing sole or heel and which is sufficiently flexible to provide walking comfort and yet tough and hard enough to hold the spikes securely.

Another detailed object is to provide a rubber-like sole having integral rubber spikes or cleats and which is adapted to be cemented to a shoe sole.

Another object is to increase the resistance to tilting of the solid steel spike relative to the sole in service use by employing a flat and thin spike head of optimum diameter and covering the entire surface of the head with and bonding the same to the molded material of the embedding and supporting layer.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a bottom view of a shoe sole and heel incorporating the novel features of the present invention.

FIGURE 2 is a fragmentary side elevation.

FIGURE 3 is an enlarged cross-section taken along the line 3—3 of FIGURE 1.

FIGURE 4 is a perspective view of a cold forged spike.

FIGURE 5 is a fragmentary sectional view like FIGURE 3 with the spikes arranged in a rubber sheet preparatory to molding.

The present invention is especially useful for golf shoes in which a series of sole spikes 10 and heel spikes 11 are laterally spaced in patterns such as shown in FIGURE 1 and formed with heads 12 secured against or within the sole 13 of a shoe 9. The sole may be an integral layer of molded composition but is shown herein as comprising a backing layer 15 such as leather of ordinary shoe thickness adhesively secured to a relatively thin layer 16 of a tough and somewhat flexible elastomer composition into which the heads 12 of the spikes are molded. The layer may be about ¼ of an inch thick, a thickness of .019 of an inch being preferred. The shanks 14 of the spikes are tapered and project downwardly below the flat bottom surface 17 of the layer 16. As in conventional golf spikes, the shank is about ¾ of an inch long and tapers from a diameter of about ¼ of an inch at the base 18 to about ½ of an inch at the tip 19.

In accordance with the present invention, steel spikes are formed at low cost in a high production cold heading machine from low carbon steel which is thus cold worked with a substantial increase in strength. The head 12 of each spike is relatively thin and flat, about .042 of an inch thick, with parallel end and under surfaces 21 and 22 which are substantially circular and about ¾ of an inch in diameter. This is about the maximum diameter obtainable in a cold heading operation but has been found to be adequate for achieving the several objectives enumerated above when combined with a shank of a length about one half the diameter of the head, the optimum ratio of shank length to head diameter being 5 to 12 as above described.

The shank projects axially from the center of the circular head so that each spike is a solid integral piece which, combined with the taper of the shank cross-section, offers equal and adequate resistance not only to lateral bending of the shank relative to the head but also to tipping of the spike as a whole and breaking out of its mounting in the final assembly in the shoe sole.

After formation by cold forging, the spikes are hardened to provide the desired wear resistance in service use and also are treated for corrosion resistance. This may be achieved at low cost by conventional case-hardening followed by cadmium plating.

The single piece cold forged spikes are secured to the shoe by molding the heads 12 into the sole layers 16 which is a strong and relatively hard elastomer composition, preferably rubber, with the under surface 22 of the heads completely covered and disposed adjacent but spaced above the flat bottom surface 17 of the sole a distance, .037 of an inch in the present instance, thus forming an under layer 31 which is strong enough to contribute substantially in holding of the spike against tipping under the severest conditions of service use. To provide a maximum cementing area and some cushioning while accommodating variations frequently present in the contour of the backing surface 23 of the sole proper, the upper surface 21 of the head is spaced a short distance, .020 of an inch, below the upper surface 24 of the layer 16 to form a cushion layer 20 of uniform thickness between the head and the backing surface.

The security of the spike head anchoring is increased substantially by chemically bonding the material of the
layer 16 to all of the embedded surfaces of the spike and particularly the upper and lower surfaces 21, 22 of the head 12. For this purpose, the cold forged spikes are first coated with a solution which at vulcanizing temperature is uniformly integrally with the metal surface of the spike. After drying, the spikes are again coated with a solution of a bonding agent which will, during vulcanization of the rubber, unite chemically with the first bonding layer and also with the rubber. The entire surface of the spike including the shank 14 is thus coated with the double bonding film that wears off from the exposed part of the shank in the initial service use. Conventional and well-known agents may be used to impart the desired strength to the rubber to metal bond. A material made by Hughsound Chemical Co. and sold under the trade designation Chemlock 205 is suitable for the first coating of the spike while the outer coating may be a bonding agent made by the same manufacturer and sold under the designation of Chemlock 220.

In an alternative embodiment the spikes are formed at the same time the sole is formed and of the same material. Such soles are preferably formed by placing a molding mold such as rubber, into a mold which contains apertures corresponding to the desired spike configuration. The mold is then closed and heated to the vulcanization temperature of the rubber.

The integral rubber spike is particularly useful for shoes employed by boys in various sports, especially baseball. For example, Little League rules do not permit the use of steel spikes but do allow rubber. Such spikes are generally flattened at the tip rather than pointed as in the case of the steel spikes. Preferably, the heel spike is somewhat thicker than the sole spike, as the thin rubber spike is less easily torn loose at the edge of the sole. Preferably, such soles are cemented to sneakers.

Enough flexibility in the composite sole for walking ease while holding the spikes securely against dislodgement under the severest conditions of service use may be achieved by employing rubber as the elastomer in a composition having the following approximate properties:

- Tensile strength 1600-1800
- Elongation at break 300-425
- Tear strength, as per ASTM Method B 375-400
- Modulus at 300% elongation 1575-1650
- Shore "A" Durometer hardness 85-95

These properties may be obtained by using a Government Reserve Styrene (GR-S) rubber compound similar to that used in the present-day automotive tire treads but with the addition of enough carbon black to increase the hardness and elongation modulus to the above values.

To accommodate a range of different shoe sizes while facilitating attachment of the layer 16 to a shoe sole of leather or a composition, the spikes are disposed within an area covering nearly the entire length and width of a sole of the smallest size, and the peripheral margin 26 is reduced at 25 to a thickness of about .050 of an inch. The outer part 30 of this margin projecting beyond the edge of a sole to which the layer 16 has been cemented may be trimmed off easily to the exact size of the backing sole surface 23.

The ingredients of the elastomer composition are mixed by conventional procedures and converted to a sheet of the desired thickness. The sheet is then cut into pieces of the proper thickness, peripheral size and shape to fit into the present-day automotive tire treads and with the addition of enough carbon black to increase the thicknesses to the cushion 20 and the under layer 31 in the finally vulcanized molding. During the vulcanizing, the rubber becomes bonded securely to the entire surface of the spike head.

The layer 16 as finally vulcanized in a mold having the proper cavity dimensions is of uniform thickness over the area 17 and not capable of denting curvatures to form the cushioning areas 20 above the heads 12 and the confining areas 31 beneath the heads, these areas being of uniform thicknesses and bonded integrally to the head surfaces so as to contribute substantially to and equalize the resistance to tipping of the shanks 14 and dislodgment of the spikes in service use.

The spiked sole and heel coverings formed as above described may be fastened securely to an old or new pair of shoes. To this end, the sole or heel surface is covered over its entire area with a generous film 33 of an adhesive suitable for cementing the upper rubber surface 24 securely to the backing surface 23 of the sole proper 15. Numerous cements such as those commonly used in shoe repair shops may be employed. The layer 16 is pressed firmly against the backing surface 23 during setting of the cement after which the thinned margins 30 projecting beyond the edges of the sole proper are trimmed off flush with the edges of the backing as shown in full in FIG. 3. With the sole and heel spikes constructed and mounted as above described and secured to a shoe sole proper, it will be apparent that only the shanks 14 project beyond the bottom of the attached layer 16 which bottom is a flat surface and not capable of denting or marred the surface of a golf green under the golfer's weight. A major objection to the conventional screw-in spikes is thus overcome. In addition, the shoe sole, whether it be on a new or old shoe, is completely waterproofed thus avoiding changes in the contour of the leather backing by water seepage beneath the spike head and eventual loosening of the screw and loss of the spike.

Although the layer 16 is relatively hard, it is thin enough to preserve the flexibility needed for walking ease. It does provide greater walking comfort as compared to conventional golf shoe constructions since the pressure, during walking on a rigid surface, are transmitted to the wearer's foot through the spike heads which are many times the areas of the screws of conventional golf shoe spikes. Because of its flexibility, the layer 16 fits the contour of new or old shoe soles and completely waterproofing the latter. Also, with only the spike shanks projecting below the bottom surfaces 17, there is less tendency for mud and grass to collect around the spikes and that which does collect is easily removed.

Most important, of course, is the novel correlation of the large diameter of the spike head 12 and the shorter but conventional length of the spike shank in combination with the properties of the rubber mounting which, in spite of its thinness, provides adequate and equal resistance in all directions to lifting of the spike in all directions and dislodgement under the severest conditions encountered in the service use of golf shoes.

The use of the word "high," in referring to the physical characteristics of the rubber compositions above described, contemporates and includes variations within the following ranges:

- Modulus at 300% elongation 1575-1650
- Shore "A" Durometer hardness 85-95

The word "thin" in reference to the layer 16 contemplates a thickness on the order of one-eighth of an inch.

In introducing the basic idea, it is understood that plastic materials such as polycarbonate, nylon, Teflon, and the like can also be employed.

What is claimed is:

1. A shoe sole having, in combination, a vulcanized single layer of tough and relatively hard elastomeric composition possessing substantially parallel and flat upper and bottom surfaces, said composition possessing a modulus at 300% elongation of 1575 to 1650 and a Shore "A" Durometer hardness of 85 to 95; and a solid integral and single piece spike having a thin, flat and generally
circular head with a shank having a length substantially equal to about one-half the diameter of the head and projecting axially from the center of the head and beyond said bottom surface, said head being embedded in said layer with the upper and lower surfaces disposed adjacent and parallel to the upper and lower surfaces of said layer, said shank being in cross-section substantially equal to about one-third the diameter of the head and of progressively decreasing transverse cross-section beyond said bottom surface and coating with said circular head and said embedding layer in providing substantially uniform resistance in all transverse directions to tipping of said shank relative to a backing supporting said layer.

2. The shoe sole of claim 1 wherein the elastomeric layer is about 1/4 of an inch thick, the spike head is about .042 of an inch thick, and the spike head is about 3/4 of an inch in diameter and said sole is adapted to be cemented to an existing sole.

3. The shoe sole of claim 1 wherein said spike is metal and further comprising a first coating of a bonding agent united integrally with such surfaces of said spike as are embedded in the layer of elastomeric composition and a second coating of a bonding agent united chemically with said first coating and said layer of elastomeric composition.

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