Nov. 1, 1949 K. L. KEENE 2,486,953

BOOT WITH REINFORCED TOE STRUCTURE

Filed May 2, 1946

Fig. 5.

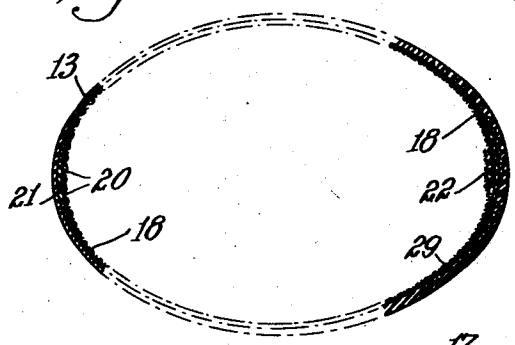


Fig. 1

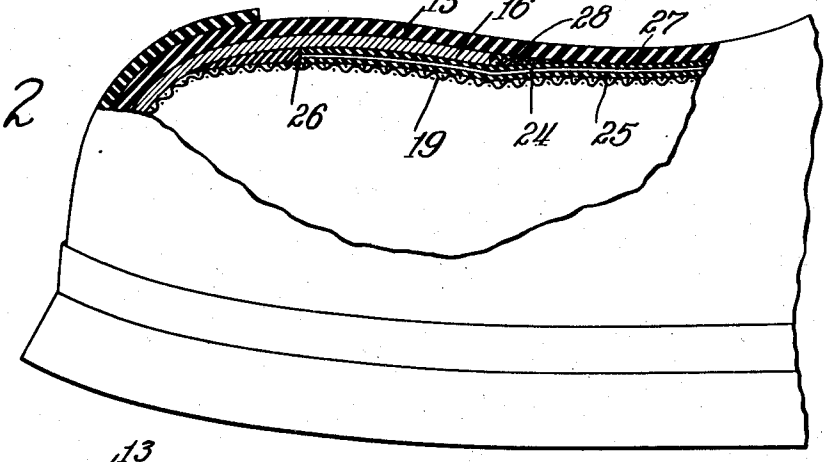


Fig 2

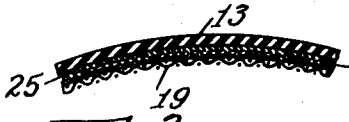


Fig. 3.

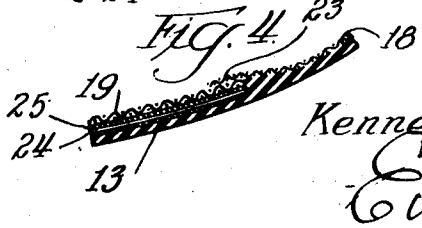


Fig. 4

INVENTOR.

Kenneth L. Keene

BY

Eugene M. Giles

Atty.

Patented Nov. 1, 1949

2,486,953

UNITED STATES PATENT OFFICE

2,486,953

BOOT WITH REINFORCED TOE STRUCTURE

Kenneth L. Keene, Mishawaka, Ind., assignor to Mishawaka Rubber and Woolen Manufacturing Company, Mishawaka, Ind., a corporation of Indiana

Application May 2, 1946, Serial No. 666,764

1 Claim. (Cl. 36—4)

1

My invention relates to footwear and has reference more particularly to a construction whereby those portions of boots and shoes which are subjected to severe or excessive bending strains in use may be adequately reinforced to readily withstand such bending strains and the flexibility thereof improved.

Particular difficulty has been experienced in safety boot and shoe structures, especially of rubber footwear types in avoiding premature breakdown thereof along the rear of the safety toe insert, and this invention is particularly advantageous in overcoming this difficulty.

In such rubber boot or shoe structures a rigid toe covering insert, usually of metal, is built into the toe portion of the boot or shoe to protect the toes and, as a result thereof, the toe flexing which takes place in walking is concentrated immediately behind the metal toe covering insert in substantially a hinge action which soon causes breakdown of the rubber and fabric at that place.

A heavier reinforcing fabric cannot be employed as this imparts greater stiffness where flexibility is particularly desired. I have found however, that if a reinforcing of cords is employed, with the cords embedded in rubber in adjoining parallel relation and extending down the instep portion of the boot and underneath the metal toe insert, this previous difficulty of breakdown immediately behind the metal toe covering is completely avoided.

It is an important object of my invention, therefore, to provide an improved construction of rubber boot with safety toe wherein premature breakdown of the boot wall along the rear of the safety toe insert is avoided. Other objects are to provide a boot reinforcing of such flexibility that it is suitable for use in the vamp and toe portion of the boot or elsewhere where easy flexing is required and also having such strength that it will readily withstand severe and excessive bending strains such as imposed thereon in the vamp and toe portions of safety toe boot structures; to provide a reinforcing of this character which is readily incorporated in footwear at any desired location without change in the method of manufacture or increase in cost; and to incorporate the reinforcing in the boot in a manner to insure a snug fit and facilitate the application and removal of the boot—these and other objects being accomplished as pointed out more fully hereinafter and as shown in the accompanying drawing in which:

Fig. 1 is a side view of a rubber boot embodying my invention, with portions of the outer surface removed to show certain details of the construction;

2

Fig. 2 is an enlarged view of the toe portion of the boot of Fig. 1, and with a part broken away to show details of the construction in section.

Fig. 3 is an enlarged fragmentary section on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged fragmentary section on the line 4—4 of Fig. 1; and

Fig. 5 is an enlarged section on the line 5—5 of Fig. 1 with an intermediate portion broken away.

In the accompanying drawing which illustrates a type of boot to which my invention is particularly applicable, the reference numeral 10 indicates the boot upper as a whole which comprises a closed tubular leg portion 11 and a foot portion 12 and is composed of a rubber exterior 13 lined with fabric. A conventional rubber sole 14 and heel 15 are secured to the bottom of the foot portion 12 and a metal toe covering insert 16 is interposed between the rubber facing and the fabric lining at the toe portion of the boot and at its front and sides extends down to and is secured onto the sole 14 in the usual manner so as to be retained firmly in place thereon to sustain any impact that otherwise might injure the toes.

The lining of the boot upper around the inside of the leg portion 11 and within the foot portion 12 down to the line 17 of Fig. 1, which said lining is indicated at 18, is of knitted fabric, such as stockinet, with the wales thereof running up and down the boot so that it stretches appreciably in a direction circumferentially of the boot upper, and the rubber boot exterior 13 on this stockinet lining is sufficiently extensible so that the upper, above the line 17, stretches quite readily in inserting the foot into the boot and withdrawing it therefrom and accordingly may be made to fit the leg and foot quite snugly.

Forwardly of the line 17, however, the lining, indicated at 19, is of square woven cotton fabric such as a light weight duck, preferably rubberized, which is practically non-stretchy and quite strong, and this lining underlies and conforms to the metal toe covering insert 16 and beyond the metal toe insert conforms to the boot instep which is shaped to fit the foot quite closely.

Because the lining 19 is non-stretchy and the portion of the boot instep within which it is located is likewise substantially non-stretchy, this lining is extended only part way up the instep (about two-thirds of the way as shown) so that it terminates well below the ankle bend which accordingly is lined with the stockinet 18 and is stretchy so that it yields circumferentially to admit the foot and may be sufficiently snug fitting to hold the boot firmly on the foot.

Because the stockinet lining 18 is thus ex-

tended down beyond the ankle bend, it is made of two pieces joined together at the front as indicated at 20 preferably by a joining tape 21 and at the rear as indicated at 22 by overlapping, these two side pieces of the lining 18 being shaped at the front to afford the required fullness to conform freely to the ankle bend curvature and the upper part of the instep.

The toe instep lining 19 is joined along the rear edge to the stockinet lining 18 along the line 17, the forward edge of the stockinet lining 18 being preferably lapped over the rear margin of the instep lining 19 at the inside thereof as indicated at 23 in Fig. 4.

The various parts composing the boot upper 10 are combined by vulcanization into a substantially unitary assembly in the finished boot and by reason thereof the toe portion of the upper within which the metal insert 16 is located is so rigid that toe flexing of the upper that occurs in walking takes place entirely at the rear of the toe covering insert 16. This toe flexing is concentrated immediately along the rear edge of the toe insert 16 in substantially a hinge action which imposes such severe strains that such boots, as heretofore constructed, broke down prematurely at this place.

Obviously, it is essential that the instep and ankle portion of the boot be quite flexible so as to bend freely in walking, and in order to maintain the required flexibilty and at the same time afford ample strength to withstand the constant bending of the toe portion at the rear of the metal insert 16, I incorporate in the instep and toe portion of the upper a layer composed of parallel cords 24 laid up in adjoining side by side relation in or on rubber 25 and extending lengthwise of the instep as indicated in Figs. 1 and 2.

This layer of cords 24 is interposed between the lining 19 and rubber facing 13 and extends substantially from the upper edge 17 of the lining 19 a substantial distance under the metal toe insert 16, for example to the point indicated at 26 in Fig. 2, and also extends substantially throughout the width of the lining 19 so that the entire toe and vamp portion from the junction line 17 down to the point 26 is reinforced with this cord layer.

Cotton cords 24 such as used in cord tires have been found satisfactory, although cords of rayon or nylon may be employed for greater strength if desired, and preferably this cord layer 24, 25 is covered on the outside with a thin sheet 27 of rubber, especially if the outer rubber facing 13 is produced by dipping, so as to provide a smooth surface for the outer rubber layer and avoid any hill and dale effect on the outer surface of the finished boot that might otherwise occur.

A filler 28 of rubber and fabric is interposed between the cord layer 24, 25 and the outer rubber facing 13, along the rear edge of the metal toe insert 16 as shown in Fig. 2 and feathered at its rear edge to neatly fill the space beyond the metal toe insert rear edge, and after the parts have all been assembled on a last in the usual manner and the rubber surfacing 13 has been applied, either by dipping or otherwise, the entire boot structure is vulcanized, thereby consolidating the lining 18, 19, facing 13 and all interposed parts into a substantially unitary assembly.

Thus, the cords 24 are embedded in rubber between and consolidated with the lining 19 and facing 13, and it has been found that when thus incorporated in the boot toe and instep, they not only impart ample strength to prevent breakdown of the upper at the rear of the metal toe insert but in addition they provide exceptional flexibility so that the boot bends quite easily in walking.

Because of the flexibility of the corded layer 24, 25 and the strength thereof to withstand bending strains, such layer may also be used advantageously for reinforcing the boot around the heel and up the back.

Thus, a similar layer with upwardly extending cords 29 may be employed at the rear of the boot which extends around the rear of the boot and forwardly at each side thereof to a line 30, said layer being interposed between the lining 18 and the outer rubber facing 13 at this place and consolidated therewith in the same manner that the layer 24, 25 is incorporated in the instep portion of the boot.

Thus, the rear of the boot is greatly strengthened against bending strains and at the same time a more flexible construction is assured which contributes greatly to the comfort and durability of the boot.

Moreover, although the instep boot wall from the line 17 forwardly is substantially non-stretchy and close fitting, the foot may be readily inserted and removed from the boot because the upper is sufficiently stretchy down to the line 17 to permit stretching at the ankle bend and furthermore the added flexibility of the rear of the boot also contributes to greater ease in applying the boot on and removing it from the foot.

While I have shown and described my invention in a preferred form, I am aware that various changes and modifications in addition to those indicated above may be made without departing from the principles of my invention, the scope of which is to be determined by the appended claim.

What is claimed is:

In a safety toe boot the combination of a boot upper comprising a facing of vulcanized compound and a fabric lining, a sole vulcanized to the bottom of the upper, a rigid metal toe protector conforming to the toe portion of the upper and secured between the upper and lining, and a layer of reinforcing in the front of the foot portion of the boot and comprising a series of adjoining parallel cords which extend down the boot instep and project at their forward ends under the toe protector, said cords being embedded in a compound lying between and vulcanized to the lining and facing, said cords and last mentioned compound conjointly forming a composite layer of substantially uniform thickness between the lining and facing.

KENNETH L. KEENE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
170,767	Pienovi	Dec. 7, 1875
1,729,236	Wray	Sept. 24, 1929
1,826,645	Berquist	Oct. 6, 1931
1,837,518	Blair	Dec. 22, 1931
1,971,456	Manville	Aug. 28, 1934

FOREIGN PATENTS

Number	Country	Date
755,421	France	Sept. 11, 1933