March 30, 1965 C. MacQUAID ET AL 3,175,292

PROTECTIVE SHOE CONSTRUCTION

Original Filed July 7, 1961

Fig. 1.

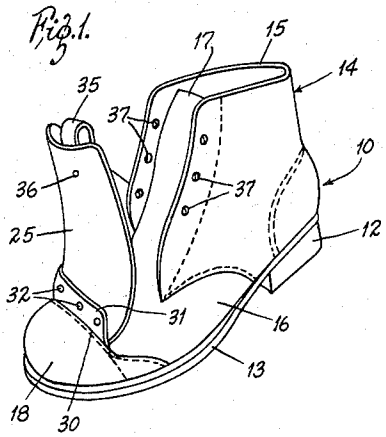


Fig. 2.

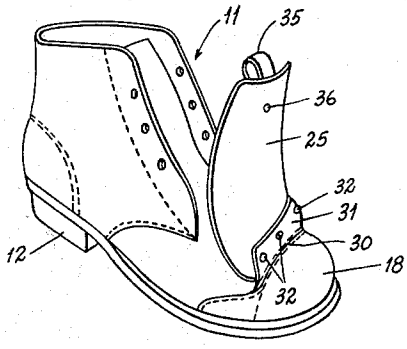


Fig. 3.

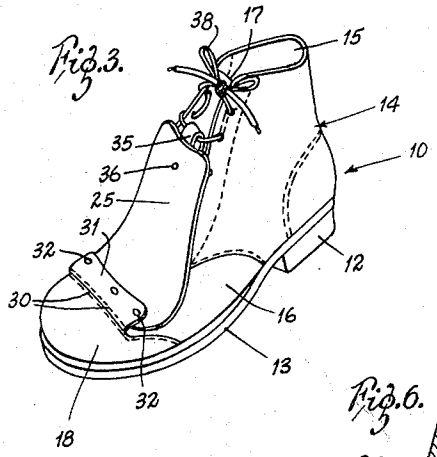


Fig. 4.

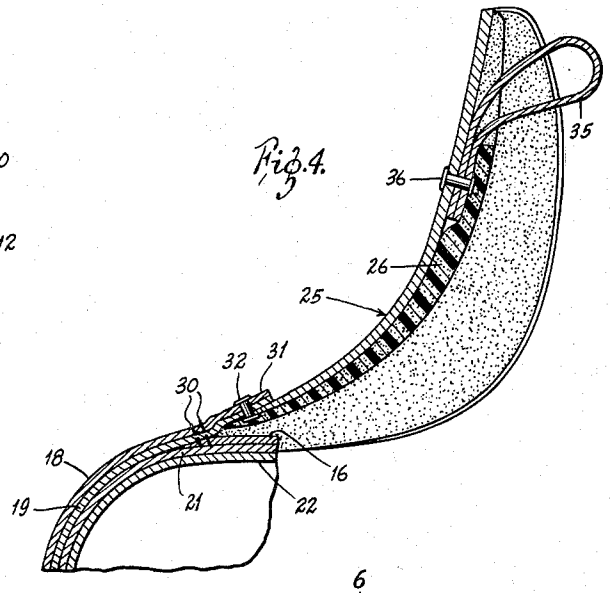


Fig. 5.

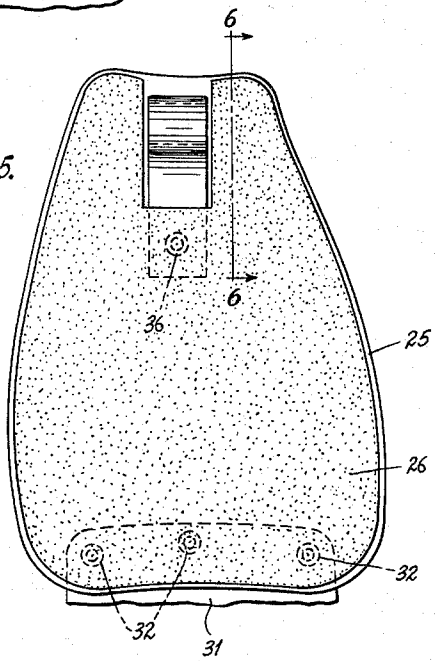
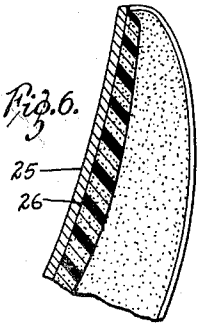


Fig. 6.



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3,175,292

PROTECTIVE SHOE CONSTRUCTION

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Original application July 7, 1961, Ser. No. 122,595, now Patent No. 3,108,386, dated Oct. 29, 1963. Divided and this application Feb. 21, 1963, Ser. No. 260,281

3 Claims. (Cl. 36—72)

The present invention relates to a protective shoe construction and is a division of application for United States Letters Patent, Serial No. 122,595, filed July 7, 1961, now Patent No. 3,108,386, granted October 29, 1963. Protective shoes are designed to be worn in places where the feet of the wearer may be subject to severe blows such as are caused by the fall of heavy objects. Various protective shoes have heretofore been offered but all of them are subject to deficiencies.

Essentially the present protective shoe includes in its preferred form a rigid box toe construction incorporating a metal protective element extending from the welt of the shoe over the toe area. Additionally, the construction includes a semi-rigid instep protector preferably made of a molded plastic having a contour approximating that of the instep of the wearer. This instep protective element is lined with a soft liner such as a shock absorbing cellular elastomer or plastic composition.

In the present construction the protective instep guard element is secured in a hinge-like manner to the leather toe cap cover of the shoe. The hinging is transverse to the shoe and is so arranged that there is no exposed forward edge of the protective element. It is an object of the invention to provide a protective shoe with an instep protecting element so arranged that the forward movement of the foot of the wearer cannot cause long objects such as stiff wires to be caught and driven between the front edge of the instep protective element and the box toe.

Furthermore, the forward transverse hinging of the instep protective element is disposed over the rigid box toe protector so that any objects dropping on the instep guard on the shoe and applying a force thereto does not seriously hurt the wearer because the force is transmitted through the instep guard to the toe protector and thence to the sole of the shoe and the ground.

Another feature of the invention is that with the instep guard transversely hinged at its lower forward end it can be swung forwardly so as to make the laced portions readily available to the user. Accordingly, the shoe can be readily laced, and can be made appropriately tight to suit the comfort of the wearer.

Another object of the invention is to provide a semi-rigid instep protector hinged transversely at its lower end as aforesaid, which can be connected with the lacing of the shoe at the upper part of the protector. To this end there is an especially designed loop on the inner surface at the upper end of the instep protector. This loop can be engaged with the lacing of the shoe. The loop has enough resiliency and length to accommodate relative movement between the upper end of the instep protector and the adjacent lacing of the shoe, which relative movement is caused when the shoe is flexed as its wearer walks.

In addition to the objects expressed in the foregoing, others will appear from the description to follow:

In the drawings:

FIGURE 1 is a perspective view of a left shoe of the present design, without a lace, and with the instep guard hinged outwardly from its position of use;

FIGURE 2 is a view of the right shoe similar to the view of FIGURE 1;

FIGURE 3 is a perspective view of the left shoe with the lacing in place;

FIGURE 4 is a sectional view somewhat enlarged medially of the instep guard and toe construction;

FIGURE 5 is a view of the back or under side of the instep guard; and

FIGURE 6 is a sectional view taken on the line 6—6 of FIGURE 5.

A left shoe **10** and a right shoe **11** are illustrated. The construction of the shoes is identical with modification only for their inherent difference.

The description will be related particularly to the left shoe of FIGURES 1 and 3. The shoe **10** has a heel **12**, a sole **13**, and an upper generally indicated at **14**. The upper **14** is here illustrated as including quarters **15**, a vamp **16** with a tongue **17** and a toe cap **18** that can be joined to the forward edge of the vamp. These parts may be conventional, and are subject to the familiar variations.

The feature of the protective portions of the shoe include a rigid toe construction and an instep guard joined together in a manner that gives maximum protection to the foot of the wearer. The toe construction includes the aforesaid toe cap cover **18** which may be of leather or the like. It is lined by a woven liner **19** of nylon or the like. Beneath the liner **19** and the forward part of the vamp is a metal toe protecting guard **21**. This is preferably rigid, and metal is the most desirable material to use because of its strength. This element extends to the sole of the shoe. Beneath the protective toe guard is a liner **22**.

The instep guard comprises essentially a semi-rigid plastic element **25** contoured to the shape of the instep of wearers, to which is cemented a lining **26** of shock absorbing cellular elastomer or plastic material. The part **25** is preferably semi-rigid with sufficient elongation to deform under a rapidly applied force so as to conform better to the shape of the foot and distribute the force over a wide area of the foot. The plastic essentially recovers its original shape when the force is removed because it is not generally stressed to the elastic limit or yield point. The plastic is chosen for its light weight, resistance to chemicals and sunlight, low rate of burning, impact resistance at service temperatures from —20° F. to 120° F., physical properties of tensile, elongation, hardness, and modulus of elasticity. A material suitable for the foregoing is an ABS polymer, such as Cycolac. The lining **26** may be of Ensolite A, made by United States Rubber Company, and comprises a cellular composition containing nitrile rubber and polyvinyl chloride. In the present shoe the outer surface of the instep protector **25** is molded with an appearance like that of the leather of the shoe and the soft lining **26** is cemented to the underside of the instep protector. This eliminates the necessity of an envelope surrounding these elements.

The lower end of the instep guard **25** is riveted to a hinge-like extension of the toe cap components **18** and **19**. As shown particularly in FIGURES 1 and 3, the toe cap protecting elements **18** and **19** are stitched through to the vamp by stitching **30** in a manner to provide a hinge tab **31**. This tab overlies the forward edge of the instep protector **25** and is riveted thereto at **32**. It will be seen that the liner **19** is included with the hinge tab **31**. The hinge tab **31** extends across substantially all of the bottom edge of the instep protector, whereby the lower part of the protector cannot present an edge forwardly of the foot.

The upper part of the instep protector **25** is provided with an upstanding loop **35** that may be of leather or like

material. The padding 26 is recessed to receive the loop. The loop is riveted at 36, at its lower end to the instep guard. It extends upwardly a substantial distance giving a wide loop that can move a considerable distance with respect to the instep protector.

The quarters 15 of the shoe are provided with lace openings 37 to receive a lace 38.

In use

The wearer can put on his shoe in conventional manner. Since the instep protector 25 is hinged at its lower end, it can swing outwardly as illustrated in FIGURES 1 and 2, thereby offering no interference to the operation of putting a shoe on the foot. The lower part of the lacing can be carried on in conventional manner completely without interference from the instep protector. At the upper of the lacing the wearer simply runs the ends of the laces 38 through the loop 35, completes the lacing, and draws the lace as tight as desired.

The shoe thus applied to the foot offers the maximum protection to the wearer. Any objects falling on the instep may slightly deform the instep guard 25. This deformation has the advantage that such forces are distributed over a wider area of the foot than would be true if the protector 25 were entirely rigid, and cutting of the foot by an edge of the guard is avoided. Furthermore, a large portion of such forces applied to the instep guard 25 are transmitted to the lower edge where they are directly carried by the rigid toe protector 21 to the sole and thence to the ground.

As the wearer of the shoe walks, flexing the toe of the shoe, the upper end of the instep guard 25 is moved lengthwise relatively to the adjacent quarters of the shoe. This movement is permitted by the loop 35. This loop 35 is of flexible material and has such a wide loop effect that there is complete freedom of the foot when walking in this shoe. If the loop were only at the upper edge of the instep protector and if it did not afford such freedom to the upper portion of the instep guard, it would interfere with the flexing of the foot in walking.

The overlapping of the hinge tab 31 across substantially the entire lower edge of the instep guard prevents wires or other stiff elongated objects from being caught between the lower edge of the guard and the toe cap and driven into the instep of the wearer. This is a safety feature of real advantage. Incorporating the hinge tab 31 as a part of the toe cap gives a neat appearance to the shoe.

The fact that the toe cover 18, which includes the hinge tab 31, is above the rigid toe guard and the fact that the instep guard is contoured so that it curves with the metatarsal arch, adds to the tendency of the instep protector to return to its rearward position. This is, of course, augmented by the liner 19, the lateral edges of which are distorted to a greater degree than the middle part when the instep guard is hinged outwardly. And the lack of resilience in the tip of the shoe enhances this effect.

Various changes and modifications may be made within the process of this invention as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is:

1. In a protective shoe: a sole, an upper having a toe portion permanently united at its edges to the sole and including a guard means permanently built into the shoe of material relatively stiff so as to transmit forces applied downwardly upon it to the sole; the upper also having instep-covering portions to fit over the instep of a wearer, the last named portions being united at their edges to the sole and to the toe portion, and extending from the toe portion upwardly over the instep; an instep guard of relatively rigid material fitting over the instep part of the shoe, at the top thereof, having its lower forward end overlying the toe portion toward the rear thereof, the forward edge of the guard extending transversely of the shoe across the toe portion; and means comprising a flexible cover over the toe portion of the shoe with a continuous upstanding flange adjacent the lower forward end of the guard, the flap overlying the edge of the guard across the same and being secured thereto.

2. The shoe of claim 1 wherein the guard is of semi-rigid plastic construction with a lining of resilient material adhered to its underside.

3. In a protective shoe: a sole, an upper having a toe portion permanently united at its edges to the sole and including a guard means permanently built into the shoe of material relatively stiff so as to transmit forces applied downwardly upon it to the sole; the upper also having instep-covering portions to fit over the instep of a wearer, the last named portions being united at their edges to the sole and to the toe portion, and extending from the toe portion upwardly over the instep; an instep guard of relatively rigid material fitting over the instep part of the shoe, at the top thereof, having its lower forward end overlying the toe portion toward the rear thereof, the forward edge of the guard extending transversely of the shoe across the top of the toe portion; and means including a hinge having an element extending outwardly from the permanent toe portion of the shoe, extending in a generally straight line transversely of the shoe at the back part of the toe portion, and at the top thereof, and means connecting the forward edge of the instep guard to the said hinge element of the shoe for swinging away from the instep portion and back over the same, the last named means comprising a flexible cover over the toe portion of the shoe with a continuous upstanding flap adjacent the lower forward end of the guard, the flap overlying the edge of the guard across the same and being secured thereto, said means also providing a closure across the forward edge of the guard at the top of the shoe that prevents foreign objects from penetrating beneath the guard above the instep.

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