Dec. 28, 1948. R. B. HARRISON 2,457,664

SAFETY SHOE

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Fig. 1.

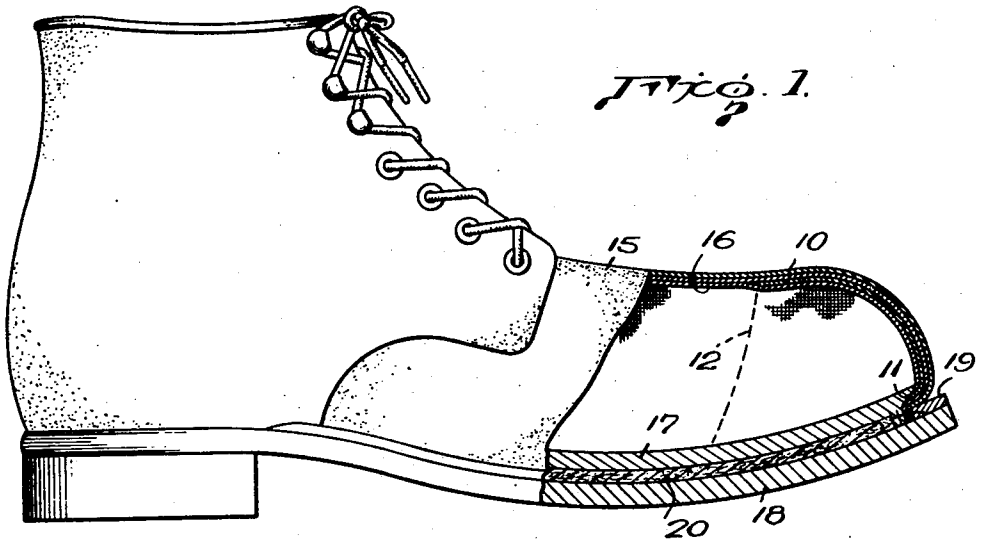

Fig. 2.

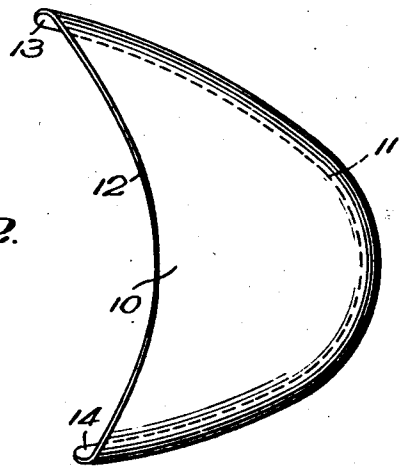

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Fig. 3.

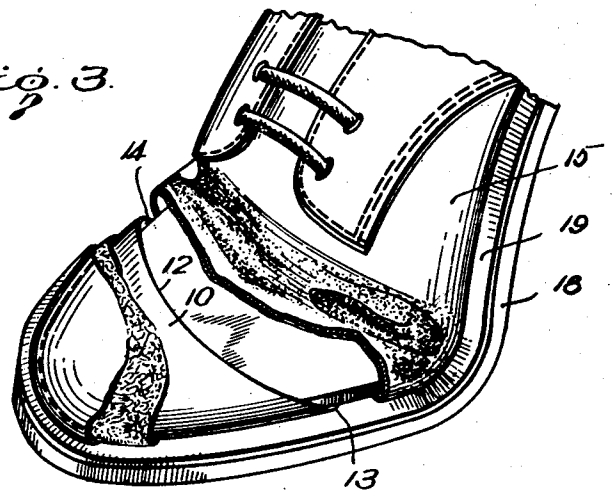
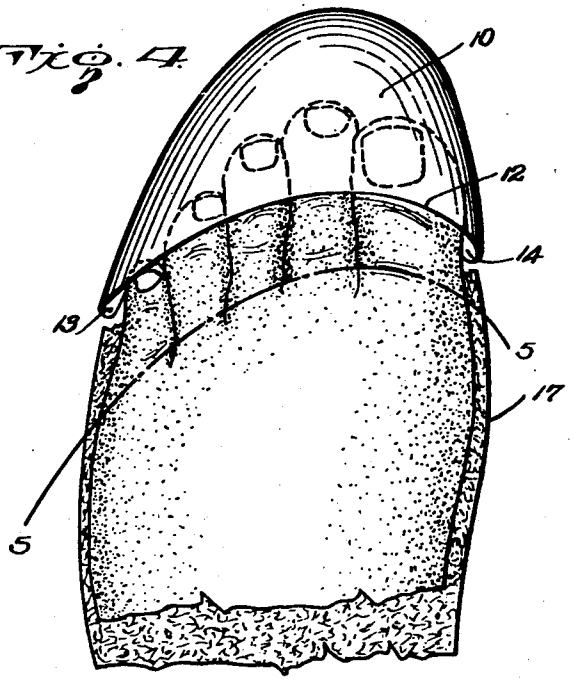


Fig. 4.



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UNITED STATES PATENT OFFICE

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SAFETY SHOE

Raymond B. Harrison, Arlington, Mass.

Application November 4, 1948, Serial No. 58,193

2 Claims. (Cl. 36—77)

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This invention relates to shoes known as "safety" types which are designed to withstand unusually severe wearing conditions when worn in mines, foundries and all departments of heavy industry where occupational foot hazards exist. Safety shoes are so known because of the incorporation therein of a steel box toe upon which the element of safety for the user entirely rests and through which the toes of the wearer are protected against injury from the accidental fall of heavy articles. Work shoes made without steel box toes, though in every other respect identical to "safety" types are not generally accepted as "safety" shoes even though box toes of materials other than metal are used therein.

In its principal aspect the invention comprises a safety shoe embodying an improved rigid, metallic box toe affording better and more comprehensive protection than shoes heretofore available.

The shoe of this invention provides more comprehensive protection without loss of flexibility by employing a box toe of modified construction and associating this box toe with a shoe in a novel relation that permits maximum dimensioning of the box toe without restricting the comfortable flexing of the shoe in wear. This is accomplished in part by utilizing a rigid box toe having its rear side portions extended to provide force resisting corner portions or buttresses, and an intermediate rear edge portion recess. These extensions permit the use of additional metal and at the same time permit free flexing of the shoe upper. When this special box toe is incorporated in a shoe it will be entirely disposed in advance of the lateral flexing zone of the upper and the break line of the sole so that there will be no interference with the normal functioning of the foot or shoe. It has been found that failure of the box toe by crushing or collapse is accomplished by flattening and spreading the dome of the metal box toe, and accordingly the addition of metal in the manner above outlined strengthens the box toe against crushing and extends its range of protection.

The provision of supporting buttresses for the box toe located well to the rear of its arched edge recess is of great importance because safety shoes which incorporate the conventional steel box toes universally acquire an exaggerated toe spring

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after a reasonable wearing period, which spring imparts an initial rearward inclination to the box toe, rendering it unstable to resist vertical pressure. In this position the central rear edge portion of the conventional box toe is poised in cutting position with its rearward bearing points, which engage the insole, substantially forward of the central aloft portion of its rearward edge which, upon critical vertical pressure, bears downwardly unresisted by adequate reinforcement along the lower walls, resulting in severe toe injury and, in many cases, amputation of one or more toes. It is to be emphasized that under such conditions, the steel box toe itself and not the object of impact is the amputating medium.

Thus the rearwardly extended corner portions, which physically cover more of the toe members than conventional steel box toes having straight lateral edges, provide as well for the desired wall support lacking in conventional steel box toes when the same acquire an inclined position within the shoe through conditions of ordinary wear. The primary feature of my invention insures that the rearward bearing points of the steel box toe will always be in resisting position to impact occurring on the dome of the box toe.

An attempt has been made to increase the effective protection of safety shoes by providing them with external metal caps, but these are objectionable because they are unsightly and also because they tend to prevent proper and comfortable flexing of the shoe bottom in wear. Moreover, they can be safely used only by a limited class of wearer because of the danger that the exposed metal will cause sparking on impact, thus increasing occupational hazard in industries where explosive gases occur. External shields also form a space with the upper which is likely to pick up dirt and materially increase the weight of the shielded shoe.

The rigid metallic box toe of my invention, on the contrary, is streamlined in its general contour and adapted to be entirely enclosed within the upper of the shoe. Moreover, its rearwardly extending corner portions, while providing substantial additional protection to the foot, do not in any way interfere with the proper flexing of the sole since they do not extend to the break line of the sole. The improved box toe of my invention is therefore characterized

by an arched rear edge continuously and asymmetrically curved toward the toe end, and is thus further distinguished from the straight knife-like edge formation found in safety box toes heretofore used.

I have discovered that the desired results may be best achieved by using a box toe having a curved rear edge extending parallel to and in advance of the transverse curved line of the toe joints of a normal foot within the shoe. This curved line determines and defines the transverse line of bending in the foot of the wearer in taking a step and therefore provides the break line of the shoe sole. Thus by establishing a parallel relation between the rear edge of the box toe and the break line of the sole maximum coverage and protection are secured for the toes and at the same time as free flexing of the safety shoe is insured as is enjoyed even in dress shoes of usual construction.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawings, in which:

Fig. 1 is a view in elevation, partly in section, of a safety shoe equipped with a metallic box toe of the present invention,

Fig. 2 is a view of the box toe as seen from above,

Fig. 3 is a fragmentary view in perspective showing the forepart of the shoe, with portions broken away, in flexed condition, and

Fig. 4 is a diagrammatic plan view showing the relation of the box toe to the wearer's foot and the insole of the shoe.

The steel box toe shown in Fig. 2 is formed by molding under high pressure a sheet steel blank of suitable shape and of a thickness which may be .050–.060 inch, for example. It is formed with a rigid dome-like portion 10 having the contour desired in the shoe in which it is incorporated, the dome-like portion merging into an inturned lower edge 11. The arched rear edge 12 of the dome portion 10 takes the form of a continuous deep crescent providing rearwardly extending corner portions 13 and 14 which act as buttresses for the box toe as a whole.

Fig. 1 shows the steel box toe of Fig. 2 as incorporated in a safety shoe for the left foot and having an upper 15, a lining 16, and an insole 17. In making the shoe, the steel box toe is placed on the toe of the last over the lasted lining 16, and then the upper 15 is lasted over it while the base edge 11 of the steel box toe lies outside the insole 17. The shoe is then completed by attaching an outsole 18, herein shown as a welt outsole carrying a welt 19. The usual filler 20 is provided between the soles.

It will be seen that the lower rear corner portions of the metal box toe provide points of support which are located substantially to the rear of the crown of its dome-like portion 10 so that a stable situation is created and there is no tendency of the box toe to rock when subjected to pressure or impact from above.

It will be understood that the contour of the metal box toe shown in Figs. 2 and 4 may be varied within certain limits, for example, the outer rear corner portion 13 may be brought somewhat further toward the rear than the corner portion 14 of the box toe that is located at the inside edge of the shoe, thus affording increased protection to the little toe of the wearer and adjacent parts of the foot.

As shown in Figs. 3 and 4 the arched rear and continuously curved edge 12 of the box toe is disposed generally parallel to the transverse curved dot and dash line 5—5 which indicates the location of the toe joints, i. e., those at the metatarso-phalangeal connection, of a normal foot within the shoe. This determines the break line of the sole and it will be seen that the two rear corner portions 13 and 14 of the box toe do not overlap this line, and that the arched rear edge 12 the box toe is located sufficiently in advance of this line to permit the free formation of the tranverse wrinkles in the upper zone which accompany free flexing of the shoe.

It will be seen that in the illustrated box toe the dome-like portion 10 merges at each side into a rearwardly extending corner portion which includes in part the base edge 11 and is defined by the rear edge 12 of the dome-like portion 10. This rear edge 12 has a continuous and pronounced concave curvature with inwardly facing end portions. The rear edge curvature will be of such an extent as to substantially span the foot contacting surface of the insole 17, as indicated by Figs. 3 and 4. The two corner portions 13 and 14 thus provide points of support for the box toe as a whole which are located substantially to the rear of the crown of the box toe and so prevent rearward rocking of the box toe when subjected to vertical pressure on any part of its crown, caused, for example, by the fall of a heavy casting on the toe of the wearer's shoe.

This application is a continuation in part of my earlier application Serial No. 792,901, filed December 20, 1947.

Having thus disclosed my invention and described in detail two illustrative embodiments thereof, I claim as new and desire to secure by Letters Patent:

1. In a safety shoe, as a concealed inclusive part of its upper, a rigid, dome-like, metal box toe formed to the desired toe shape, such box toe being entirely disposed in advance of the lateral flexing zone of the upper and the break line of the sole and having a transversely arched rear edge continuously and asymmetrically curving toward the toe end of the shoe to provide rearwardly extended corner portions acting as force resisting buttresses at each rearward side of the box toe, the corner portion of the box toe wall located at the outside of the shoe extending rearwardly of the toe end of the shoe farther than the corner portion located at the inside of the shoe, and the curved rear edge of the box toe overlying the toes of a normal foot within the shoe and being generally parallel to but in advance of the transverse curved line defined by the metatarso-phalangeal joints of said foot, thus providing for maximum dimension of the metal box toe itself without limiting comfortable flexing of the shoe in wear.

2. In a safety shoe having an insole, an outsole and an upper, as a concealed inclusive part of the upper, a rigid, dome-like metal box toe formed to the desired toe shape, such box toe being entirely disposed in advance of the lateral flexing zone of the upper and the break line of the soles and having a transversely arched rear edge with a continuous, asymmetrical, concave curvature toward the toe end of the shoe to provide rearwardly extended corner portions acting as force resisting buttresses at each rearward side of the box toe, the corner portion of the box toe wall located at the outside of the shoe extending rearwardly of the toe end of the shoe

farther than the corner portion located at the inside of the shoe, and the rear edge curvature of the box toe substantially spanning the foot contacting surface of the insole and overlying the toes of a normal foot within the shoe and being generally parallel to but in advance of the transverse curved line defined by the metatarsophalangeal joints of said foot, thus providing for maximum dimension of the metal box toe itself without limiting comfortable flexing of the shoe in wear.

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