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PROTECTIVE WEARING APPAREL

Filed Oct. 23, 1963

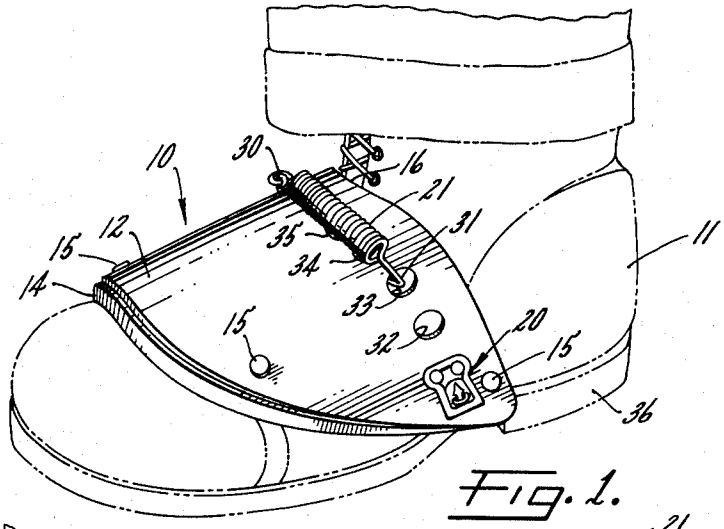


Fig. 1.

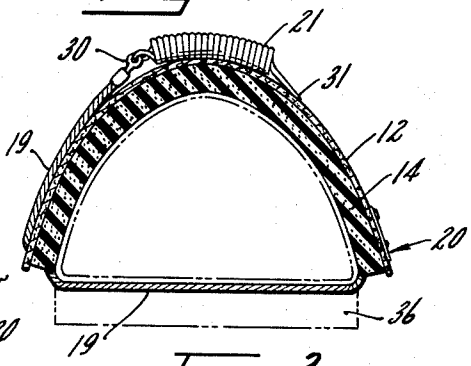


Fig. 3.

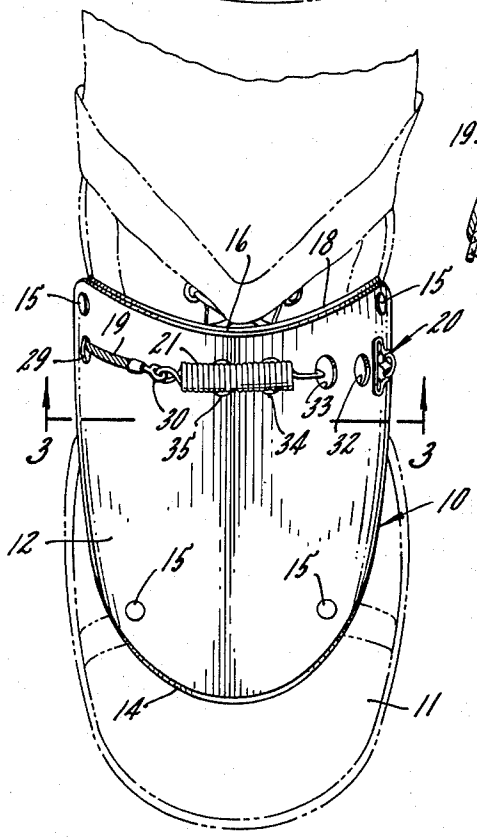


Fig. 2.

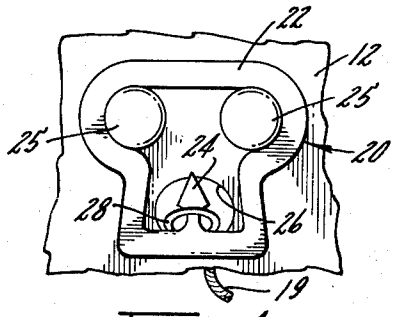


Fig. 4.

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PROTECTIVE WEARING APPAREL

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The present invention relates generally to wearing apparel and, more particularly, to improved protective wearing apparel suitable for use in industrial and other hazardous duty locations. In its principal aspects, the invention is concerned with an improved foot guard and fastener therefor which, when applied to the wearer's foot, serves to protect the instep or metatarsal arch from injury resulting, for example, from falling objects or blows caused by impacts between the upper surface of the foot and a solid object.

During recent years there has been an increasing demand for items of protective wearing apparel which are durable, suitable for their intended use, comfortable to the wearer, and yet which will not tend to restrain or otherwise interfere with movement of the wearer as he is engaged in his everyday work activities. While there is a widespread need for such protective wearing apparel in virtually all types of industrial locations, the demand is particularly prevalent in hazardous duty locations such, merely by way of example, as factories, machine shops, construction sites, warehouses and other areas where workmen must handle heavy or bulky items on a repetitive basis. Consistent with the increased demand for effective protective wearing apparel, manufacturers and other users of industrial equipment have implemented safety programs primarily directed at making employees "safety conscious" and convincing such employees of the value of and the need for utilizing protective wearing apparel.

However, experience has demonstrated that employee acceptance of and willingness to use protective wearing apparel is dependent upon many different considerations—considerations which are often conflicting in nature. Merely by way of example, metatarsal arch guards must be capable of cushioning blows or impacts that would otherwise be painful to workmen, and which occasionally incapacitate the injured person. To this end, such guards are, of necessity, somewhat bulky. At the same time, however, it is essential that the guard be easy to apply and remove, comfortable in use, and void of laterally or downwardly projecting portions that would tend to catch on machinery supports or similar foreign objects, thus interfering with normal walking of the wearer.

Heretofore, guards which have had sufficient bulk to provide the necessary degree of protection demanded, have at the same time utilized cumbersome fastening straps or similar fastening elements which are generally secured in some fashion to the outer surface of the shield portion of the guard. As a consequence, when the fastening strap includes an inwardly projecting portion, that portion tends to strike against and interfere with the inwardly projecting fastener portion on the wearer's other foot. If, on the other hand, the fastening element projects outwardly, it tends to catch on surrounding equipment, thus increasing the chance of stumbling or the like. Protective foot guards, for example, metatarsal arch guards, generally have employed fastening straps which either pass under the arch or instep and are fastened to the outerside surfaces of the guards, or pass both under the instep and behind the heel. Such straps have not proven satisfactory for a number of reasons. For example, these types of straps are subject to wear both under the instep and at the inside of the foot or heel where the strap rubs against the adjacent guard. Moreover,

when such straps are of the cloth or leather variety utilizing buckle-type fasteners, they are not only difficult to apply and remove, but they also tend to confine or restrict free movement of the wearer's foot. That is, such straps do not provide the necessary flexibility which is required, and indeed demanded, by workmen. And, of course, in the buckle-type strap, the portion of the strap that projects through the buckle provides an additional hazard in that it tends to catch on surrounding equipment.

In an effort to avoid the undesirable feeling of confinement resulting from cloth or similar non-yielding type straps, manufacturers and users of foot guards have turned to rubber straps which are generally detachably connected to the shield portion of the guard by snaps or similar fasteners. However, rubber straps have not provided a completely satisfactory solution since they wear rapidly, particularly on the side of the guard and on the strap portion which extends underneath the foot, thus requiring constant maintenance and upkeep. Moreover, rubber straps tend to deteriorate rapidly when subjected to oil and similar substances which are generally encountered in industrial hazardous duty locations. Additionally, in order for such straps to have a practical life expectancy, they must be quite bulky, and this is true even in the case of cloth or leather straps. Such bulky material passing under the foot serves not only to make the guard uncomfortable for the wearer, but the bulky portion thereof which passes under the wearer's instep increases the likelihood of the wearer tripping.

It is a general aim of the present invention to provide an improved foot protective device, and fastener therefor, which overcomes all of the foregoing disadvantages and which is not only characterized by its flexibility, thus making it more comfortable when worn than prior foot guards, but which is also safer in use for the wearer.

Another object of the invention is to provide an improved foot protective device which permits of ease in application to and removal from the foot, and which is readily adjustable for use with different size feet, yet wherein the fastener means employed does not project downwardly or laterally and hence does not increase the danger of the wearer tripping or catching his foot on surrounding equipment. A related object of the invention is to provide an improved foot protective device which may be adjusted to snugly conform to the shape of the wearer's foot by the simple expedient of coupling the free end of the fastening device to a selected one of a plurality of fixed fastening points, while at the same time insuring that the foot protective device retains its characteristic of flexibility at all possible fastened positions.

In another of its important aspects, it is an object of the present invention to provide a novel fastening arrangement for protective foot guards which has sufficient strength to insure that the guard fits snugly against the wearer's foot while at the same time is capable of readily and automatically yielding to permit freedom of foot movement, yet which is characterized by its compactness and its lack of bulky material, particularly in the areas beneath the instep and on the outside surfaces of the guard.

Yet another object of the invention is to provide an improved flexible fastener for protective foot devices characterized by its durability and its resistance to wear and which is not affected by oil and similar substances often encountered in hazardous duty locations.

A more specific object of the invention is to provide an improved foot guard and fastener therefor which employs only a few component parts and permits of economic fabrication from readily available materials, yet wherein the

fastening means and the shield portion of the guard are separably connected together and readily replaceable.

Other objects and advantages of the invention will become apparent as the following description proceeds, taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is a perspective view of a foot protective device embodying the features of the present invention, the device here being illustrated as a metatarsal arch guard applied to the foot of a wearer;

FIG. 2 is a plan view of the exemplary foot guard shown in FIG. 1, illustrating particularly the novel fastening arrangement used in conjunction therewith;

FIG. 3 is a sectional view taken substantially along the line 3—3 of FIG. 2; and

FIG. 4 is an enlarged fragmentary elevation illustrating details of the fixed separable connection between the guard shield and the fastening means of the present invention.

While the invention is susceptible of various modifications and alternative forms, a specific embodiment thereof has been shown by way of example in the drawing and will herein be described in detail. It should be understood, however, that it is not intended to limit the invention to the particular form disclosed, but, on the contrary, the intention is to cover all modifications equivalents, and alternatives falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more specifically to the drawing, an exemplary item of protective wearing apparel embodying the features of the present invention, shown in FIG. 1 as a foot protective device generally indicated at 10, has been illustrated. As the ensuing description proceeds, it will become apparent that the novel features of the present invention will find particularly advantageous, but by no means exclusive, use in conjunction with matatarsal arch guards and similar protective devices primarliy intended to be applied to the foot or lower leg of a worker engaged in activities in hazardous duty locations.

Upon inspection of FIG. 1, it will be observed that the exemplary foot protective device or metatarsal arch guard 10 is shown placed on the shod foot 11 of the wearer in such a manner that it overlies and substantially envelopes the instep or metatarsal arch of the foot 11. The guard 10 includes an impact resistant outer shield 12 which is shaped to conform generally with the outer and upper surfaces of the instep area of the shod foot 11. While the shield 12 may be made of a wide variety of materials suitable for providing the requisite degree of protection from falling objects or other impacts, the shield should be slightly flexible and light in weight so as to enhance comfort and minimize fatigue. A typical but non-exhaustive list of materials possessing the foregoing characteristics would include fiberboard, plastic, and similar synthetic materials.

To enhance the protective characteristics of the guard 10 and to provide a cushioning effect when the guard is subjected to impacts, a cushioning pad 14 made, for example, of sponge rubber or similar natural or synthetic material, is affixed to the inner surface of the shield 12. In the illustrative form of the invention, this is accomplished by utilizing a plurality of rivets 15 (there being four such rivets shown in FIG. 2) or other suitable fasteners of the type that are headed at each end, the rivets passing entirely through both the outer shield 12 and the inner pad 14. Of course, where headed fasteners are utilized, the pad 14 will be compressed beneath the inner head (not shown) so that the fastener will not project into or otherwise damage the wearer's shoe. For the purpose of enhancing comfort, the shield 12 and pad 14 are cut away or slightly arcuate adjacent their rearmost upper edges, as best indicated at 16 in FIGS. 1 and 2, thus insuring that the guard 10 more closely conforms to the

shape of the foot 11. Moreover, the shield 12 and pad 14 are preferably dimensioned so that the latter projects slightly rearwardly as indicated at 18 (FIG. 2) of the rearmost edge of the shield. This arrangement serves to prevent the rearmost edge of the shield from "biting" into the foot or lower leg area of the wearer, and is particularly important to the comfort of those persons who prefer to wear low cut work shoes of, for example, the oxford type.

In accordance with one of the important aspects of the present invention, fastening means which are substantially impervious to wear and deterioration induced by oil or the like are provided for affirmatively securing the guard 10 to the foot 11 with comparative ease and in snug conformity thereto irrespective of foot size, while at the same time insuring that the guard retains its flexibility so as to permit freedom of generally universal foot movement. In the exemplary form of the invention, and as best illustrated by reference to FIGS. 2 and 3 conjointly, this is accomplished by providing a metal strap, here shown as a braided wire 19, which is separably yet rigidly secured adjacent one end, as indicated generally at 20, substantially flush with the outer surface of the shield 12. The wire strap or cable 19 extends inwardly through the lower edges of the shield 12 and pad 14, under the foot 11, outwardly through the opposite lower edges of the pad 14 and shield 12, and thence over the upper surface of the shield where the free end of the wire strap 19 is hooked or otherwise secured to a selected one of a plurality of attachment points on the shield through suitable tensioning means 21.

For the purpose of providing a positive yet separable fixed connection 20 between the wire cable or strap 19 and the shield 12, an attachment bracket 22 having an upstanding eared projection or bayonet type lug 24, is fixedly secured to the shield in face-to-face contact therewith by means of rivets 25 or similar fasteners. As will be noted upon reference to FIG. 4, the bracket 22 is permanently mounted on the outer surface of the shield 12 in such a manner that the lug 24 extends radially across alined openings in the shield and sponge rubber pad, such openings being designated by the reference numeral 26 and adapted to permit passage of the strap therethrough. An eyelet 28 is formed in or rigidly secured to one end of the strap 19 (for example, by crimping), the eyelet 28 being dimensioned to permit passage through the alined openings 26 and engagement with the lug 24. Thus, when it is desired to remove the wire strap 19 from the guard 10, for example, when it becomes desirable or necessary to replace the shield 12 or pad 14, it is simply necessary to disengage the eyelet 28 from the lug 24 and to withdraw the strap 19 inwardly through the alined openings 26.

The foregoing separable but positive fixed connection between the guard 10 and the fastening strap 19 provides a number of distinct advantages over the more conventional "snap-type" fasteners which are commonly used with foot guards and similar items of protective wearing apparel. Thus, while the strap 19 is separably coupled to the shield 12, it is virtually impossible to accidentally dislodge the strap therefrom when the guard 10 brushes against a machinery support or similar solid object. Moreover, not only is the separable fixed connection 20 substantially wear-resistant in and of itself, but it is also less likely to be subjected to rubbing when in use since it does not project laterally from the sides of the shield any substantial distance, if at all, and therefore, is less likely to contact foreign objects than either "snap-type" or "buckle-type" fasteners. Indeed, if desired, it would be entirely feasible to mount the attachment bracket 22 on the inner surface of the shield 12 (e.g., between the shield and the pad 14) with the lug 24 projecting radially across the alined openings 26, thus insuring that there are no fastening elements other than the rivet heads 25, which can be recessed, projecting laterally beyond the

outer surface of the shield **12**. On the other hand, in order for the more conventional "snap-type" and "buckle-type" fasteners to function usefully as separable connectors, they are generally placed on and project out of the outer surface of the shield **12**, thus defining wear points and at the same time increasing the danger of catching the guard **10** on foreign objects.

In keeping with the invention, the free end of the wire strap **19** is passed beneath the shoe **11** (FIG. 3) and passed outwardly through alined openings **29** formed in the lower opposite edge of the pad **14** and shield **12**. The free end of the strap **19** is secured to one end of suitable tensioning means **21**, which may conveniently take the form of an expansion type spring. To this end, the free end of the strap has formed thereon or rigidly secured thereto an eyelet **30** which is fixedly engaged with one end of the spring **21**. The opposite end of the spring **21** includes a hook-shaped portion **31** which is adapted to be selectively inserted into one of a plurality of spaced, alined apertures formed in the shield **12** and defining attachment points—there being four such apertures **32**, **33**, **34** and **35** formed in the exemplary guard (FIGS. 1 and 2). Thus, an individual with a relatively narrow foot would, in the exemplary guard, engage the hook portion **31** of the tensioning spring **21** in the aperture **32**, while those people having broader feet would engage the hook portion **31** with a selectable one of the apertures **33–35**. Of course, the particular aperture selected by the wearer as a fixation point will depend upon the size of his foot and the degree of snugness that is most comfortable to him. However, irrespective of what fixation point is selected, the tensioning spring **21** will permit the degree of flexibility necessary to accommodate universal foot movement.

Those skilled in the art will appreciate from the foregoing description that there has herein been disclosed a particularly practical and useful article of protective wearing apparel which is not only more resistant to wear and deterioration resulting from contaminating substances than conventional items of protective wearing apparel, but in addition it is considerably safer in use. Thus, it will be observed upon inspection of FIG. 3 that when the guard **10** is applied to the area to be protected, the wire strap or cable **19** substantially girdles that portion of the body being protected, in this instance the metatarsal arch or foot, and serves to hold the guard **10** in snug conformity thereto. Moreover, the relatively thin strap or cable **19** which, of course, could be in the form of a flat metallic ribbon, is also held substantially flush with the bottom or sole of the shoe **11**, the strap passing transversely under the shoe just forward of the heel **36** thereof. Consequently, the strap is maintained well above floor level where it is less likely to cause tripping and less likely to be subjected to wear. The absence of laterally projecting "snap-type" or "buckle-type" fasteners on the sides of the guard materially reduce the danger of the guard catching on foreign objects which might otherwise cause stumbling of the workman or accidental removal of the guard. In the present invention, as contrasted with conventional foot guards, the strap **19** is adjustably and removably fastened to the shield **12** at a selected one of a plurality of attachment points located substantially on top of the foot **11** where the strap is least likely to catch on surrounding equipment.

Protective foot guards made in accordance with the present invention are also considerably more comfortable for the wearer. Thus, the guard and fastening strap **19** may be readily adjusted to accommodate virtually any size foot, while providing the requisite degree of snugness and flexibility. Moreover, the tensioning means **21** permits flexibility of the guard and fastening strap so as to allow freedom of universal foot movement without affecting blood circulation in the foot, thus minimizing the danger of cramps and fatigue. The absence of bulky and confining rubber or cloth straps passing under the foot enhances the comfort of the guard, while at the same time minimizing the danger of catching the strap on an object, an undesirable occurrence that may result in tripping.

I claim as my invention:

1. A foot guard comprising, in combination, a shield made of impact resistant material and shaped to generally conform to the upper surface of the wearer's foot, said shield having first and second opposite lateral edges, a metallic strap fixedly secured adjacent one end to said first edge of said shield and projecting inwardly therefrom, an aperture formed in said shield adjacent said second edge thereof, said strap adapted to pass beneath the instep portion of said foot and outwardly through said aperture, a spring secured to the free end of said strap, means defining an attachment point disposed on the upper surface of said shield, and means for detachably securing said spring to said attachment point so that said strap is held in snug conformity to said foot with the portion of said strap passing outwardly through said aperture formed in the second edge of said shield lying in snug conformity to the upper surface of said shield.

2. A foot guard comprising, in combination, a shield made of impact resistant material shaped to generally conform to the upper surface of a human foot and having apertures formed in the opposed lower edges thereof, cushioning means secured to the undersurface of said shield, means defining a fixed first attachment point intersecting the aperture formed in one edge of said shield, a wire strap separably secured to said first attachment point and extending inwardly through the associated aperture, said strap adapted to pass beneath the instep portion of said foot and outwardly through the aperture formed in the opposite edge of said shield, tensioning means secured to the free end of said strap, means defining a plurality of second attachment points generally disposed on the upper surface of said shield at diverse spaced distances from said last named aperture, and means for detachably securing said tensioning means to a selected one of said second attachment points so that said wire strap substantially girdles said foot with the portion of said strap passing outwardly through said last named aperture lying in snug conformity to the upper surface of said shield.

3. An article of protective wearing apparel of the type adapted to protect a portion of the human foot from impacts and the like comprising, in combination, a shield made of impact resistant material and shaped to generally conform to the upper surface of the wearer's foot, said shield having first and second opposite lateral edges, cushioning means secured to the lower surface of said shield, a first aperture formed in said cushioning means adjacent said first edge of said shield, alined second apertures formed in said cushioning means and said shield adjacent said second lateral edge of said shield, a wire cable, means for detachably securing said cable adjacent one end to said first edge of said shield, said cable projecting inwardly through said first aperture in said cushioning means from said first edge of said shield, said cable adapted to pass beneath the instep portion of said foot and outwardly through said second alined apertures, a spring secured to the free end of said cable, a plurality of openings formed in the upper surface of said shield at diverse spaced distances from the second edge thereof and defining attachment points, a hook formed on the free end of said spring adapted to be separably engaged with said shield at a selectable one of said attachment points by passing said hook through one of said openings so that said cable substantially girdles said foot with the portion of said cable passing outwardly through said alined apertures formed in the second edge of said shield and said cushioning means lying in snug conformity with the upper surface of said shield.

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