PROTECTIVE DEVICE FOR SAFETY SHOES

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References Cited
UNITED STATES PATENTS

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A protective device for use in safety footwear which comprises a unitary sole-protecting portion and a toe-protecting portion secured along at least one side of the sole-protecting portion, and adapted to be formed into one or multiple layers of an open-ended arch as a toe-protecting portion.

14 Claims, 8 Drawing Figures
PROTECTIVE DEVICE FOR SAFETY SHOES

BACKGROUND OF THE INVENTION

Safety-type footwear of the protective type is often employed to protect the foot of the wearer from crushing weights or penetration of the footwear by sharp objects, such as nails. Protective footwear, although customarily worn by policemen, firemen, miners, construction workers or others working in industry, may also be usefully employed to prevent or minimize foot injuries to children or others. Protective footwear may be designed to protect the toes of the wearer, the metatarsal arch, the sole of the wearer and combinations thereof.

Protective footwear is typically fabricated by inserting in the footwear a protective device which has been formed by stamping a sheet material, such as stamping sheet steel in a die, less, to blank out flat material, and, thereafter, forming the blank into the protective device to be inserted into the footwear. Typically, the blank so prepared is of uniform thickness, the thickness of the material governed by the extent of protection desired. The sheet material thickness is often limited by the need of the wearer of the protective footwear, such as, for example, the requirement of the wearer to flex the sole of the shoe where sole-protective devices are used, and the bulkiness of any protective arch designed to protect the toe or metatarsal arch of the foot. A protective element for safety shoes which provides an open-toe protective arch open at the front or rear and a sole-protecting portion designed to underlie the sole of the wearer of the footwear is described in U.S. Pat. No. 3,410,007, patented Nov. 12, 1968, which is incorporated by reference herein.

The protective element described in U.S. Pat. No. 3,410,007, while satisfactory in providing a toe-protecting arch and a sole-protecting portion, has certain apparent disadvantages, both in use and in the method of manufacture. For example, the protective element requires the formation of a blank having equal wing-type portions which must be jointed together, such as by welding, along a straight-line portion to form the sole-protecting portion of the element. This technique, therefore, requires a seam along the sole-protecting portion with careful alignment of the two wing portions during manufacture, together with the inherent weakness of the portions so joined when struck by a very sharp object along the seam line, together also with the expense of joining the winging portion along the solem line, particularly where the sole-protecting portion extends substantially through the entire sole layer. More particularly, the blank must be formed of uniform material, and, thus, the arch-protecting portion and the sole-protecting portion are of substantially uniform and equal thickness.

SUMMARY OF THE INVENTION

My invention relates to a protective device for footwear and to a method of manufacturing the same, which device provides ease in manufacture and flexibility in the amount and type of protection given to a wearer of footwear containing such devices. In particular, my protective device for safety shoes consists of a sheet material, typically a hard, stiff sheet material, such as sheet steel, formed to provide a protecting-arch portion open in the front and rear thereof and a unitary integral sole-protecting portion which is designed to underlie all or a part of the wearer's foot. The sole-protecting portion, together with the arch-protecting portion, provides additional safety to the wearer, and has advantages in providing flexibility in the amount of protection and the ease of manufacture thereof.

My protective device provides many advantages in protection, manufacture and use. For example, the use of a unitary sole-protecting portion in my device provides for the advantage of greater strength in the unitary material, while it avoids the time and difficulty associated with the welding or joining composite sheet material together along a seam line in the sole-protecting portion as in the Peterson patent. The elimination of a seam line in the sole-protecting portion not only provides the greater strength, but avoids any discomfort to the wearer from a seam therein, such as a welding bead, or the improper joining of such composite materials together.

Furthermore, my protective device permits the open arch-forming portion to be formed in a simple and efficient manner from an integral blank material, and in certain embodiments described permits enhanced strength of the arch-forming portion from an integral uniform thickness blank material. In my device, the use of only one adjoining edge minimizes the possibility of failure of the device when the arch-protecting portion is struck by a crushing blow. For example, only one edge of each arch-protecting portion needs be joined to the opposite edge which is integrally joined to the sole-protecting portion. In addition, the multiple two or three arch-protecting portions in my blank material permit an overlapping and strong multiple layer effect in the open-arch portion. In the simplest embodiments of the multiple layer effect, a single material may be employed where minimal protection is desired, such as in children's shoes, or a multiple layer effect used where enhanced protection is desired, such as in heavy industrial-type safety footwear. In my device, a great portion of the strength for protection purposes is related to the structural configuration of the blank, whether a single or multiple layer at the arch-protecting portion, in combination with the integral sole-protecting portion, rather than in the past, relying on the particular construction of the shoe in which the protective device is embodied.

By the term “sole-protecting portion” as used herein, it is meant the protection of all or any part of the sole of the foot of the wearer in which my protective device is to be inserted and used. Where flexibility of the sole of the safety shoe is an important consideration, then the sole-protecting portion of my device may then only cover a selected portion of the sole of the shoe, such as a portion extending less than the instep, so that flexibility of the wearer's sole is maintained. Where the sole-protecting portion only partially protects the entire sole, then it may be composed of a thicker material to provide additional protection if desired in comparison to a sole-protecting portion which extends to cover all or substantially all of the sole, wherein thinner material must be used to maintain sole flexibility for the user.

By the term “toe-protecting portion” as used herein, it is meant the protection of the toes or the metatarsal arch, or both, of the foot of the wearer in which the protective device is to be inserted and used. The arch-protecting portion is open at the front and rear end thereof, and may be formed of a single layer of the blank material or multiple, adjacent, overlapping layers
of the blank material where enhanced protection is desired of the arch-protecting portion, but thinner material in a single layer is required for flexibility in the sole-protecting portion.

**BRIEF DESCRIPTION OF THE DRAWINGS**

In the accompanying drawings, several embodiments of my invention are illustrated by way of examples.

FIG. 1 is a representation of a blank formed of a bendable sheet material which may, in one embodiment, be formed into my protective device.

FIG. 2 is a cross-sectional view of the blank of FIG. 1 along the line of 2—2 of FIG. 1 when formed into a protective device of my invention.

FIG. 3 is another embodiment of a blank which may be formed into a protective device of my invention having a multiple layer toe-protecting portion.

FIG. 4 is a cross-sectional view along the line 4—4 of FIG. 1 showing the blank as formed into a protective device.

FIG. 5 is a blank of another embodiment of my invention.

FIG. 6 is a top elevation view of the blank of FIG. 5 as formed into a protective device of my invention.

FIG. 7 is a blank of another embodiment of my invention which combines the structural features of the preceding embodiments.

FIG. 8 is a cross-sectional view along the line 8—8 of FIG. 7 showing a multiple layer construction into a protective device of the blank of FIG. 7.

**DESCRIPTION OF THE EMBODIMENTS**

FIGS. 1 and 2 illustrate one embodiment wherein a flat stamped sheet material 10, such as 0.010 spring-tempered stainless steel, is formed comprising a sole-protecting element 12 which extends in this illustration to cover only a portion of the sole of the wearer, for example, extended as shown to just before the instep of the wearer, and an open arch toe-protecting element 14. The arch element 14 is integral with the sole 12, but is formable, such as by bending, along the foot contour line 16 of the blank, while the opposite free edge of the arch 14 is represented by an outer foot-contoured edge 18 adapted to be joined to the opposite outer first-contoured edge 19 of the sole 12, such as by welding or other means. As illustrated in FIG. 2, the arch-protecting element 14 forms an arch open at the front and rear, with edge 18 welded by a weld seam 20 to the opposite edge 19 of the sole element 12. The blank 10 is of uniform thickness and composed of a unitary integral material. The method of manufacture is simple in requiring only a single short weld seam 20 or other means to join the edge 18 to the outer edge 19 of sole 12. This construction avoids long weld seams along the sole-protecting portion, provides strength to the sole-protecting portion by being of integral construction and without any seams to provide discomfort or to reduce the protection of the sole-protecting portion.

FIGS. 3 and 4 are illustrations of a multiple layer arch in a protective device of my invention which comprises a sheet of blank material 30 comprising an integral unitary sole-protecting element 32, and two oppositely spaced and substantially equally shaped arch-protecting elements 34 and 36 joined to the sole 32 along formable lines of adjoinment 38 and 40. The arch elements have free foot-contoured-shaped outer edges 42 and 44, and are each adapted to be formed into a separate arch, with the edge 42 joined to 38 and 44 to be joined to 40 through weld seams 46 and 48 to form a double-thickness layer arched toe-protecting portion. The double layer has been shown to be joined together at each edge 42 and 44; however, it is recognized that the overlapping arch elements 34 and 36 may be joined, such as by welding at the corners or top of the arches or in other locations. Either arch element 34 or 36 may be bent first and its edge joined to the sole edge, with the edge of the other arch element secured to the outside along the line adjoining the other arch element to the sole. This embodiment permits a thin unitary blank material to be used as the sole-protecting portion where flexibility is desired, such as where the sole-protecting portion is to cover all or substantially all of the wearer's sole, and yet provides a double layer for additional strength to the toe-protecting portion of my protective device.

FIGS. 5 and 6 illustrate another embodiment of my protective device which comprises a sheet blank material 50 containing a sole-protecting element 52 and an arch element 54, the arch element 54 formed as a part of the blank at the toe position of the sole element 52, and adjoining such sole element 52 along discontinuous lines 62 and 64. The arch element is fan-like in shape, with a contoured line 60, which forms the first open edge of the toe-protecting portion, defining an open space between the lines 62 and 64, and has outer opposite foot-contoured edges 56 and 58 adapted to be joined to each side, respectively, of the outer foot-contoured edge of the sole element 52. The open space forms the open front of the arched toe-protecting portion of my device. The arch element and edges 56, 58 and 60 are formed so that the arch element may be bent over axially of the sole element 52 along lines 62 and 64, and the edges 56 and 58 joined by weld seams 66 and 68 to the outer sole element edges 57 and 59 to form a protective device. The sole-protecting portion provides strength and protection due to its unitary property, while it is absent of any joining seams.

FIGS. 7 and 8 illustrate a further multiple layer protective device which combines the embodiments of FIGS. 3—6. A sheet blank material 80 comprises a sole element 82, and two arch elements 84 and 86 having outer foot-contoured edges 90, 92, 94 and 96 adapted to be joined together to the outer edge on each side of the sole element 82, such as by weld seams 98 for edge 96, 100 for edge 90, and 102 and 106 for edges 92 and 94. The arch elements may have element 88 formed first or last, followed by elements 84 and 86, and where element 88 is formed first, edges 92 and 94 need not be secured, but the element held in position when the elements 82 and 84 are joined to edges of the sole element 82. In this embodiment, the blank material may be formed of very thin material, since the overlapping arch elements provide increased thickness, strength and protection to the wearer in the toe-protection portion.

My protective device has been explained for the purposes of illustration employing sheet steel material; however, any sheet material including, but not limited to, thermoplastic and thermosetting-type polymers, such as glass-fiber-reinforced or molded or thermoset rigid plastic, may be used. The arch elements of my embodiments have been joined by welding and the use of weld seams; however, any suitable means of joining may be used to secure the arch elements in posi-
tion, such as adhesives where polymers are used, welding, ultrasonic welding techniques, sewing and the like. For example, the overlapping wing elements may be welded or joined by adhesive, etc. at the top of the arch or in one or more positions, leaving the edges free. My protective device overcomes many of the past difficulties in protective devices, and has the advantage of providing enhanced sole protection and increased arch protection through single or multiple layers.

What is claimed is:

1. A protective device for insertion and use in safety footwear, which device comprises in combination:
a unitary one piece of hard stiff sheet material comprising a sole-protecting portion and a toe-protecting portion,
i. the toe-protecting portion characterized by open front and rear ends, and comprising at least one integrally joined extending element along one edge of the sole-protecting portion, the toe-protecting element having at least one foot-contoured outer edge adjacent to an outer foot-contoured edge of the sole-protecting portion, and formed into an integral toe-protecting arch extending across the sole-protecting portion,
ii. the sole-protecting portion having at least one complimentary shaped outer edge with the said outer edge of the toe-protecting element, and
iii. means to join the outer edge of the toe-protecting element to the complimentary outer edge of the sole-protecting portion, thereby forming a protective device having a unitary sole-protecting portion and a unitary toe-protecting portion characterized by open front and rear ends.

2. The device of claim 1 wherein the toe-protecting portion is joined at one side only to the sole-protecting portion, the toe-protecting portion secured at its outer edge to the outer opposite edge of the sole-protecting portion to form a protective device characterized by a single uniform layer of material forming both the toe-protecting portion and the sole-protecting portion.

3. The device of claim 1 wherein the sole-protecting portion extends to cover all or substantially all of the sole of the wearer.

4. The device of claim 1 wherein the sole-protecting portion extends from the toe of the wearer backward to a position such that the wearer may flex his foot without interference by the sole-protecting portion.

5. The device of claim 1 wherein the toe-protecting portion comprises two toe-protecting elements substantially equally shaped in dimension, each element positioned at opposite edges of the sole-protecting portion and integrally joined therewith, the elements contoured at their respective outer edges to fit the respective opposite outer edge of the foot-contoured portion of the sole-protecting portion, and means to join together the respective outer edges of the toe-protecting elements to the respective complimentary outer edges of the sole-protecting portion to form a toe-protecting portion open at the front and rear, the toe-protecting portion forming an overlapping double-layer toe-protecting arch with the protective device characterized by a single thickness for the sole-protecting portion.

6. The device of claim 1 wherein the toe-protecting portion comprises a toe-protecting element which is integrally joined to the front edge of the sole-protecting portion, the toe-protecting element integrally joined to the sole-protecting portion at either side thereof, and characterized by a crescent-like space therebetween which provides, on forming, the front open space of the toe-protecting arch, the opposite outer edges of the toe-protecting element having a contour approximately that of each side of the toe-protecting portion, the toe-protecting element bent backward so as to place the outer edges of the toe-protecting element adjacent the respective outer edges of the sole-protecting element, and means to join each of the outer edges of the toe-protecting element to the outer edges of the sole-protecting portion.

7. The device of claim 6 which includes the toe-protecting element comprising two toe-protecting elements of substantially equally shaped dimensions, each element integrally joined to the sole-protecting portion on the opposite sides thereof, and formed over or under the sole-protecting element to form a double-layer arch, the second and third toe-protecting elements adapted to be formed into a double-layer arch either before or after the formation of a single-layer arch by the first toe-protecting element, thereby providing a three-layer arch with a single-layer sole-protecting portion.

8. The device of claim 6 wherein the sheet material comprises a thermo-formed rigid plastic material.

9. A shoe into which has been inserted the protective device of claim 1.

10. A protective device for use in safety-type footwear, which device comprises in combination: a sole-protecting portion and a toe-protecting portion,
i. the sole-protecting portion formed of a unitary integral single-thickness sheet material, and
ii. the toe-protecting portion characterized by an open front and rear arch element, the arch composed of multiple layers of an adjacent, overlapping, arch-formed sheet material from which the sole-protecting portion has been formed, each of the arch-formed sheet materials integral with and along one foot-contoured outer edge of the sheet material, and
iii. means to secure the opposite foot-contoured outer edges of the arch material to the respective edges of the sole-protecting portion to form a multiple layer, toe-protecting portion.

11. The device of claim 8 wherein the sheet material comprises a hard stiff plastic material.

12. The device of claim 8 wherein the sole-protecting portion extends less than the full length of the sole of the footwear in which the device is inserted.

13. The device of claim 8 wherein the sheet material comprises steel and means to secure comprises a weld seam along the respective foot-contoured edges.

14. A shoe into which has been inserted the protective device of claim 8.