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STATIC DISCHARGING FOOTWEAR

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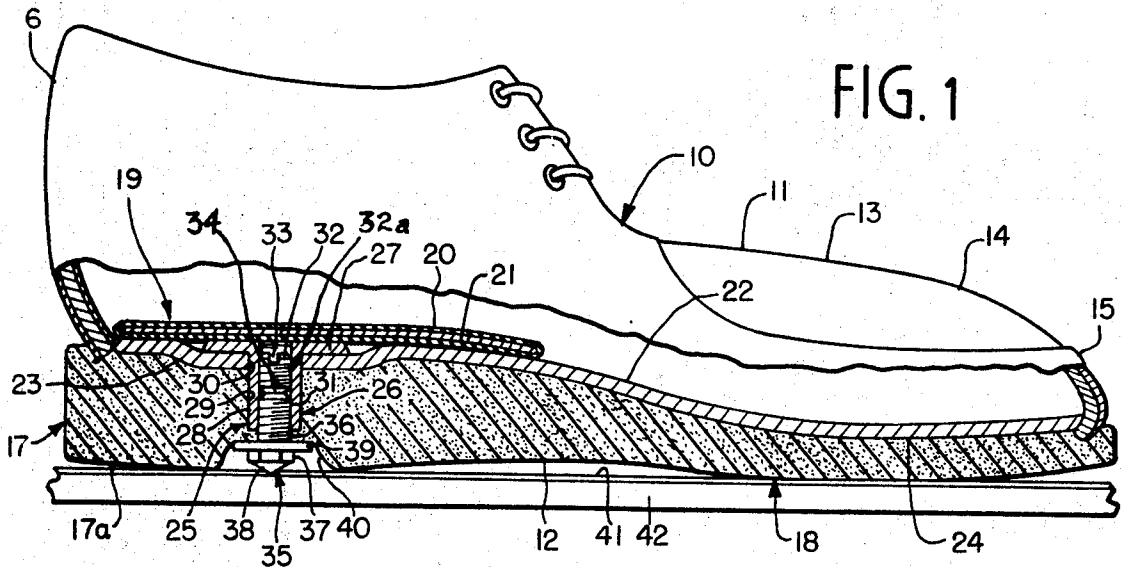


FIG. 1

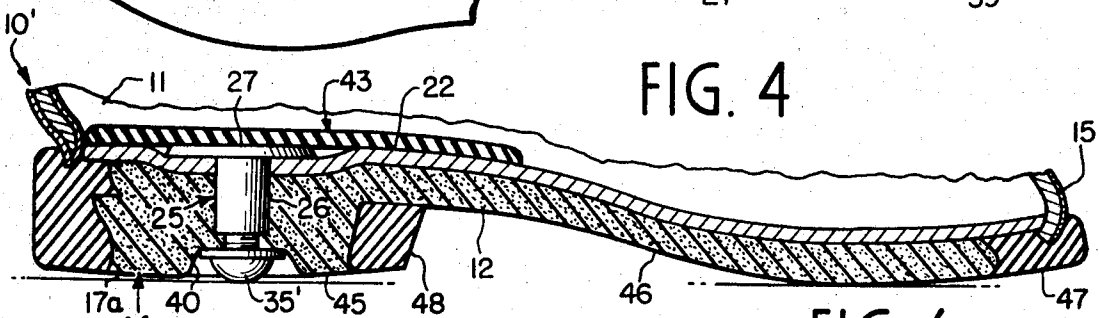
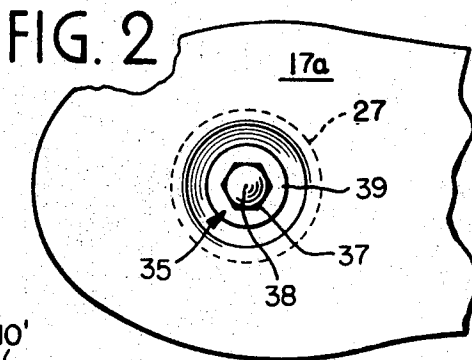


FIG. 3

FIG. 4

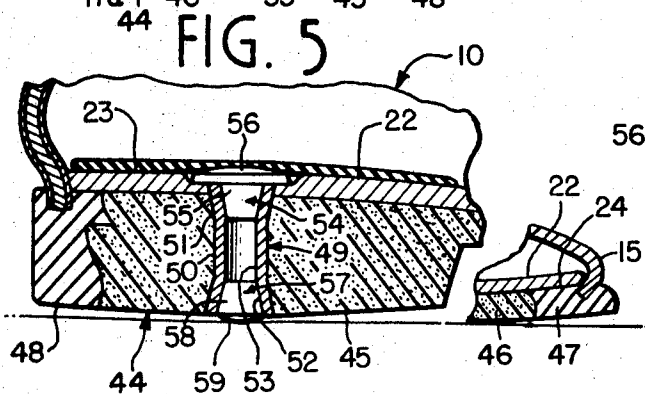


FIG. 5

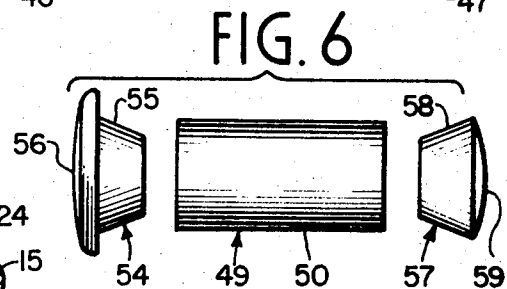


FIG. 6

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**STATIC DISCHARGING FOOTWEAR**  
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9 Claims

## ABSTRACT OF THE DISCLOSURE

A static discharging footwear in the form of a conductive shoe comprising a conductive inner heel pad and an outer non-conductive or conductive heel between a non-conductive insole, a shoe heel mounted ground piercing and contacting element conductive by coupling the heel pad with the outer heel, the conductive element being of metal or plastic and including a tubular element having an upper pad engaging edge portion with a set screw therein and a lower ground engaging cap screw threaded into the tubular portion and fixed by the set screw. The conductive element in the alternate comprises a shoe heel mounted conductive tube with opposed end plugs flaring the ends of said tube whereby the plugs and the tube communicate the conductive heel pad with the ground and/or conductive outer heel.

## BACKGROUND OF THE INVENTION

### Field of the invention

This invention relates to electrostatic discharge footwear and in particular the construction of conductive shoes whereby the static electric charge of the human body may be discharged through the foot to the conductive component in the heel of the shoe and to the ground. The shoe should be constructed to effect a good static discharge to ground even where the floor surface has deposits of oil, dirt, wax, etc. accumulated upon it. This invention is more particularly concerned with an improvement in the type of conductor element disposed within the heel of the shoe.

### Description of the prior art

This is an improvement of the shoe construction shown in my U.S. Pat. No. 3,274,442 granted on Sept. 20, 1966. A footwear of the type described herein finds its use by surgeons, nurses, and others in hospital operating rooms where the fumes of anesthetic gases such as ether or the like and other combustible vapors may be present and wherein extreme caution is required to prevent accumulation and accidental discharge of static electrical discharges from the human body or from clothing worn thereby, for if such accumulation of charges should occur and the discharge from the foot of the person to the ground causing an electric spark or arc, an explosion could result. This type of footwear is also found useful in industrial plants such as powder plants or places where explosives are manufactured as well as powder magazines on armed vehicles or vessels. It is therefore very important to have a good circuit for the discharge of the static electricity from the heel of the wearer to the ground. In my patent there is provided conductive heel pad for allowing electrical charges from the body or clothing of the person to be discharged from his foot through the conductive heel pad. However, there is needed a conductive element which will insure a good discharge with the least amount of resistance from the conductive heel pad to the ground. This is what my invention endeavors to accomplish.

## SUMMARY OF THE INVENTION

The invention has for its advantages, purposes and objectives the presentation of a uniquely constructed conductive shoe and conductive element therefor to provide for a quick discharge of static electricity from the human body by way of the foot. A heel pad in the shoe, of conductive material, by my arrangement, is in contact with an electrical conductive element or structure which is in the form of a ferrule inserted through the heel of the shoe and being clamped and tightened within the heel and extending through the outside of the heel and allows for compression of the outer heel if it is of conductive material to increase the electroconductivity effect of the outer heel. Further the conductive element is provided with a conductive heel pad engaging with the ferrule which cooperates with a ground contacting part that is held in place by a locking or set screw means, the ground contacting part having a piercing edge for passing through dirt, grease, oil, wax, etc., for insuring good contact with the ground. My invention further provides for a tubular ferrule element for providing good contact between the conductive heel pad and the ground by the provision of wedging plugs within the ferrule tube which holds the tube in the heel or the like of the shoe. My invention further employs novel types of conductive heel pad construction. These and other objects, advantages and purposes will become apparent from the reference to the following description, accompanying drawings and the claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of a conductive shoe employing my novel inventive structure;

FIG. 2 is a bottom plan view of the heel portion of the shoe illustrating my novel conductive ferrule structure;

FIG. 3 is an exploded view of my novel conductive ferrule structure;

FIG. 4 is a modified form of the conductive element and modified heel in partial side elevation view;

FIG. 5 is a further modified form of my novel and inventive conductive structure in partial elevation sectional viewing; and

FIG. 6 is an exploded view of my modified conductive ferrule arrangement.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the disclosure of the invention as shown in the accompanying drawings of FIGS. 1 through 3, there is shown footwear in the form of a shoe 10 having an upper construction 11 including a leather covering 13, a cap 14, a toe 15 and a counter 16. The shoe 10 has a lower construction 12 comprising a heel 17 of elastomeric or rubber material or leather, etc., an outer sole 18 of similar material as the heel 17, a heel pad 19, an in-sole 22 and a conductive structure 25. The heel 17 and sole 18 is composed of electrically non-conductive material. The heel pad 19 is of conductive material in that the outer encircling skin or lining 20 which is as described in my U.S. Pat. No. 3,274,442 is of a conductive rubber and will conduct an electric charge whereas the foam plastic or rubber-like foam center portion 21 will not conduct an electric current. The in-sole 22, being a thin strip of material extending the length of the shoe, is composed of material that will not conduct static electricity and has a heel or rear portion 23 and a forward toe or sole portion 24. The conductive heel pad 19 is located generally in the heel portion of the shoe and is thin in cross section to minimize the resistance to the electric current because although it is of electroconductive mate-

rial, such as described in my U.S. Pat. No. 3,274,442, it, nevertheless, is not as electroconductive as say a metal such as copper.

The conductive element or structure 25 is usually of highly conductive material such as a plastic embedded with highly conductive particles or a metal such as copper, bronze or brass or other highly conductive metal material. The conductive element 25 is composed of three separable parts, namely, a ferrule or tube 26, a headless set screw 32 and a cap screw 35. The metal ferrule 26 is a tubular member having a top or flange part 27 and a shaft part 28 provided with a threaded bore 31 which extends through the heel bore 29 of the heel 17 and also extends through the insole bore 30 of the heel portion 23 of the non-conductive insole 22. The set screw 32 is located within the threaded ferrule bore 31 at the top thereof and has a screw driver accommodating slot 33 and a threaded exterior 32a cooperative with the threaded bore 31 for vertical adjustment of the set screw within the ferrule bore and is provided with a set screw seat 34 for engagement with the cap screw 35. The cap screw 35 is provided with a threaded shaft portion 36 that extends into the bottom portion of the ferrule 31 and engages with the set screw seat 34 for limiting movement of the cap screw. The cap screw 35 is provided with a head portion 37 including pointed or tapered end 38 and a flange 39 which abuts the heel pad 19 which limits upward movement of the cap screw when assembled in the shoe heel. The flange 39 causes the rubber or elastomeric heel 17 to be compressed inwardly to define a heel bottom groove 40. The pointed or tapered end 38 of the cap screw extends slightly below the bottom of the heel 17, say  $1/32''$ , and through the dirt or grease layer 41 on the conductive floor 42 to make a good ground contact with the conductive floor 42.

The conductive element or metal member 25 is assembled on the shoe 10 so as to pierce the heel of the shoe and ground the person or wearer to the floor electrically. The metal member 25 is adjustable in length and is capable of being locked at any setting positively with the three-piece assembly of the internally threaded ferrule, the headless set screw, and the cap screw, the ferrule receiving the cap screw from the bottom and the set screw from the top end as shown. For adjustment, the cap screw 35 is screwed into the ferrule until the head is flush with the bottom of the heel and then the set screw is screwed down from the top until it abuts against the cap screw. This will lock both screws from further turning until they are manually released. Thus, what is provided here is a unique adjustable metal plug arrangement for conductive shoes.

In FIG. 4 there is shown a modified form of shoe 10' wherein like parts of the shoe with respect to FIGS. 1 through 4 carry the same reference characters as shown in FIGS. 1 through 4. One difference from the above described embodiment is that modification shown in FIG. 4 is provided with a conductive outer sole and heel structure 44 having a heel portion 45 and a sole portion 46. The heel 44 is also provided with a non-conductive sole portion 47 and a non-conductive heel portion 48. Further the shoe 10' is provided with a conductive element or structure 25 that has a cap screw 35 that is provided with a rounded crown 35' of conductive elastomeric material rather than a tapered or pointed end 38 as shown in the first embodiment. In this FIG. 4 embodiment, the static electrical charges from the body of the wearer are not only transmitted from the conductive heel pad 19 to the conductive element 25 and then to the ground or the conductive floor 42 by the end 35' but also by way of the conductive element 25 to the conductive heel portion 45 and the conductive sole portion 46 to the ground 42. Also the conductive heel 43 is composed of foam plastic material with imbedded particles of electrical conductive material. In either of the two modifications, tightening of the cap screw relative to the ferrule causes the metallic conductor element 25 to compress the flexible heel to

provide for the bottom cavity portion 40 of the heel so that the tip or end of the cap screw extends slightly below the bottom 17a of the heel 44 with the result that the end tip of the conductive metal element pierces surface layers of floor dirt making electrical contact with the ground or conductive floor as the wearer walks across it insuring good and proper electrical contact with the ground or conductive floor to discharge any static electricity from the body of the wearer to the ground so that no arcing can occur between the wearer's shoe and the ground, which arcing could cause an explosion where there were explosive gases present such as in a hospital operating room or explosive dust particles such as in a magnesium or powder plant, etc. In the modification shown in FIG. 4 the tightening of the cap screw relative to the flange 27 for compressing of the conductive rubber-like material of the heel, increases the electrical conductivity of the conductive heel portions 45 due to shortening the metal conductor element 25. This is because the electrical conductive particles within the conductive heel portions are compressed closer together and the air spaces between them reduced insuring electrical resistance or higher electrical conductivity. The result is that if the end tip 35 should not touch the ground, the conductor rubber heel portion would be a good ground itself because it has been compressed by the metallic conductive element 25 to improve its electrical conductivity in the area of contact with the floor. The conductive element can be a material of steel or lead alloy and coated by a copper finish.

A modified form of the conductive element or structure 25, shown in FIGS. 1 through 4 or in FIG. 5, is shown in FIGS. 5 and 6 and is employed in a type of shoe with a conductive heel as shown in FIG. 5 and is identified by reference character 49. The conductor element of structure 49 comprises an annular tube part 50 which is cylindrical in shape in the unassembled condition, see FIG. 6. As assembled, as shown in FIG. 5, the ends of the tube 50 (in perforated heel of shoe) are flared out by plug portions 54 and 57 to define flared end parts 51 and 52. Plug 54 is inserted from the top of the tube 50 to define flared end 51 and comprises a tapered plug body 55 having a head 56. The plug 57 is inserted from into the bottom of the tube to produce flared end 52 and has a tapered body 58 and a conical end or crown portion 59, the plugs 54 and 57 being inserted in the ends 51 and 52 of the tube bore 53 of the shoe heel inserted tube 50 to cause the tube to go from the cylindrical end shape as shown in FIG. 6 to the flared condition in the assembled position in the shoe of FIG. 5. The tubing may be of metal or highly conductive non-metallic material of the type described above and the plugs 54 and 57 may be made of compressed paper or other material. The tube 50 is inserted into a hole bored in the heel portion of the shoe and then the plugs are inserted in their respective ends to flare out the tube, the plugs being wedged into place by a pressed fit. The plugs may be mechanically wedged in place or the tubing and plugs may be vulcanized to the sole of the shoe to provide a homogeneous mass between the conductive material of the tube and its plugs between the conductive part of the heel to reduce electrical resistance and increase conductivity between the conductive heel portion and between the conductive element 49. Thus, what is provided in the modification is a combination of conductive tubing being provided with a pair of conductive tapered plugs which afford an electrical path between the electrical conductive heel pad to the outer electrical conductive heel and the outer electrical conductive sole that is separated from the conductive heel pad by a non-conductive strip or heel pad and insole part. This construction is to effect a positive means to electrically connect an outside conductive heel and sole to an internal conductive heel pad by piercing a non-conducting insole. This grounds the body of the wearer to the conductive floor underneath as a static-electricity bleed off circuit. The wedging action of the conductive plugs force into the

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ends of the conductive tubing, without use of so-called conductive cement, give the whole assembly a compression effect necessary for good electrical transmission. Vulcanizing also insures further good electrical transmission.

The foregoing description and drawings are given merely to explain and illustrate the invention, and the invention is not to be limited thereto, except insofar as the appended claims are so limited, since those skilled in the art who have the disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

What is claimed is:

1. An electrically conductive shoe comprising a resilient heel having a hole extending therethrough, an internally threaded electrically conductive tubular ferrule positioned in said hole and having a large flange on one end thereof engaging the (inner) surface of said heel, the other end of said ferrule being entirely within said hole and spaced from the outer surface of said heel, an electrically conductive headed screw threadedly mounted in said other end of said ferrule with the annular portion of said heel defining said hole compressed between said flange and the head of said screw, the head of said screw being located relative to the outer surface of said heel to make good electrical contact with a floor, a headless set screw threadedly recessed in said ferrule and abutting against said headed screw to releasably lock the headed screw in position, and an electrically conductive heel layer overlying said flange in good electrical contact therewith.

2. The invention as defined in claim 1 wherein said ferrule and headed screw compress the annular portion of the resilient heel sufficiently to create depressions in the inner and outer surfaces thereof with said flange and the head of the headed screw positioned in said depressions.

3. The invention as defined in claim 2 wherein said head projects slightly beyond the outer surface of said heel in position to make good electrical contact with a floor.

4. The invention as defined in claim 1 wherein said annular portion of said heel is made of an electrically conductive material in intimate engagement with said ferrule and exposed on the outer surface of said heel in position to contact a floor.

5. The invention as defined in claim 4 wherein said annular portion of the heel comprises an elastomeric material having conductive particles dispersed throughout the

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material, the compression of said annular portion by said ferrule and headed screw decreasing the spacing between said particles to increase the conductivity of said portion.

6. The invention as defined in claim 5 wherein said electrically conductive elastomeric material extends into and forms a portion of the sole of said shoe, said sole portion being exposed on the outer surface of the sole to increase the electrically conductive area in position to contact a floor.

7. An electrically conductive shoe comprising a resilient heel having a hole extending therethrough, an electrically conductive tubular ferrule having outwardly flared ends press fit in said hole, and a tapered plug press fit in each of said flared ends and projecting from said ends, a layer of electrically conductive material overlying and in direct contact with the end of the plug adjacent to the inner surface of said heel, the end of the plug adjacent to the outer surface of said heel projecting beyond the outer surface in position to make good contact with a floor, the annular portion of said heel defining said hole being made of an elastomeric material having electrically conductive particles dispersed throughout the material, said annular portion being exposed on the outer surface of the heel.

8. The invention as defined in claim 7 wherein the portions of said annular portion surrounding said flared ends are compressed radially by said flared ends to decrease the spacing between said particles and thereby increase the electrical conductivity of said portions.

9. The invention as defined in claim 8 wherein a portion of the sole of said shoe is made of an elastomeric material having electrically conductive particles dispersed throughout the material, said sole portion being exposed on the outer surface of the sole and being electrically connected with said annular portion.

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