Oct. 31, 1961 C. MacQUAID, JR., ET AL 3,007,083

PERFORATED CONDUCTIVE INSOLE

Filed Aug. 28, 1957

Fig. 1.

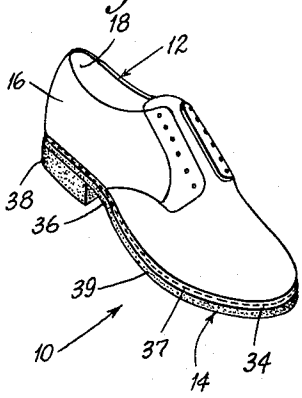


Fig. 2.

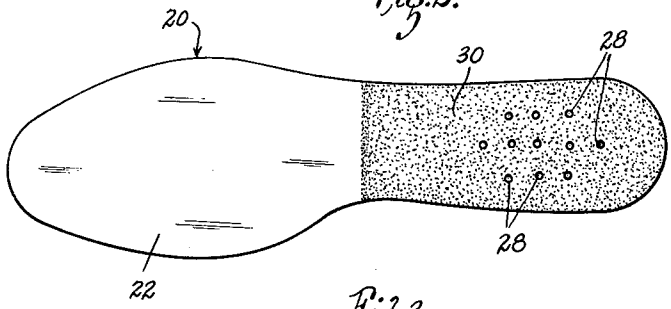


Fig. 3.

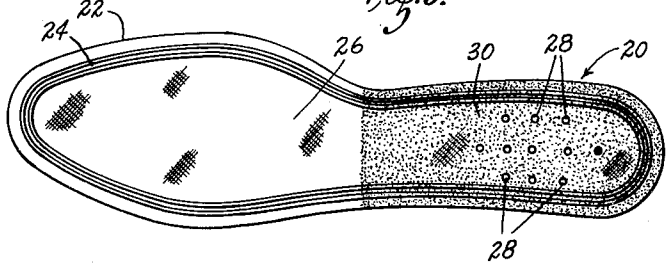


Fig. 4.

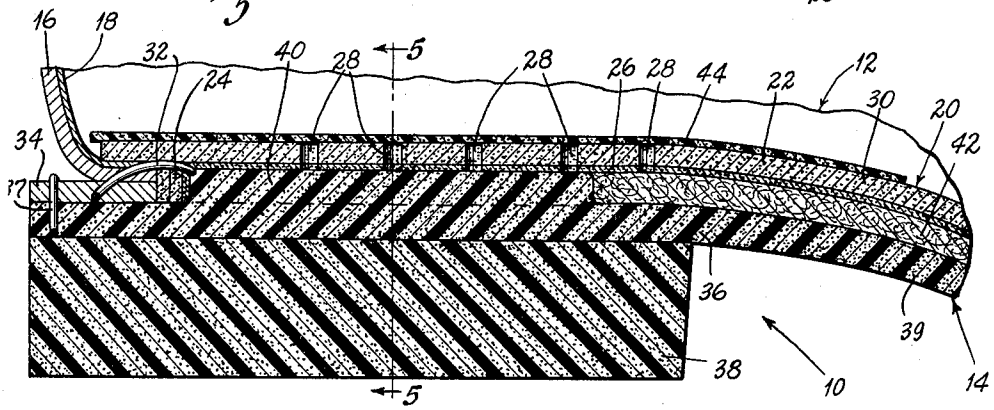
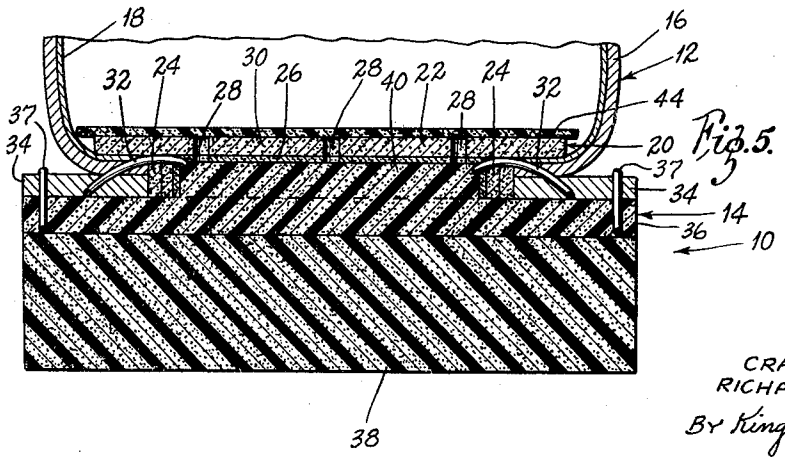


Fig. 5.



INVENTORS:
CRAIG MacQUAID, JR.
RICHARD H. KOEHRMANN,
By Kingsland, Rogers & Ezell
ATTORNEYS

United States Patent Office 3,007,083 Patented Oct. 31, 1961

3,007,083

PERFORATED CONDUCTIVE INSOLE

Craig MacQuaid, Jr., Clayton, Mo., and Richard Henry Koehrmann, Alton, Ill., assignors to International Shoe Company, St. Louis, Mo., a corporation of Delaware

Filed Aug. 28, 1957, Ser. No. 680,703
7 Claims. (Cl. 317—2)

The present invention relates generally to footwear, and more particularly to a novel conductive shoe which incorporates a perforated conductive insole.

Conductive shoes adapted to ground static electricity accumulated in the body of the wearer, have long been used in industries where static charges may adversely affect the work efficiency of the workmen. Various means have been employed to provide an electrically conductive path from the inside of the shoe to the bottom or underneath side of the outsole. Originally, conduction was by way of metal nails or other metal inserts which extended completely through the several parts of the sole of the shoe. Improvements over direct metallic conduction have included provision of electrically conductive outsoles which eliminate the necessity for nailed construction and permit the more widely used stitch construction of the shoe. Inasmuch, however, as modern shoe construction of the better grades, almost universally employs a leather insole, the problem of extending the conductive path from inside the shoe to the conductive outsole remains. One method of extending the conductive path to the inside of the shoe has been to provide a hole in the heel portion of the insole so that an integral upstanding plug-like portion of the conductive outsole might make direct engagement with the foot of the wearer. In some cases, this construction has been found to be uncomfortable in that variations of insole thickness and compression of the insole in wear have caused undue pressure of the plug against the foot of the wearer. In general, other attempts to use special molded inserts of conductive material have proven equally unsatisfactory.

In the light of the foregoing experience, the present invention contemplates retaining a conventional type of insole in substantially its conventional form, and treating it to render it capable of conducting the electric charges. The treatment consists essentially in providing a plurality of small perforations in the heel portion of the insole and then coating this portion with a conductive solution which extends over the upper and lower surfaces, as well as through the aforesaid perforations. The solution dries to leave a solid conductive coating or film which, through direct engagement of the heel portion of the insole with an integral filler pad portion of a conductive outsole, then provides the required conductive path.

It is an object of the present invention to provide a novel conductive shoe for grounding static electric charges accumulated in the body of the wearer.

It is another object of the invention to provide a novel conductive shoe having direct electrical connection between an insole and an outsole.

It is another object of the invention to provide a novel conductive insole for a conductive shoe.

It is another object of the invention to provide a novel conductive coating for an insole constructed of leather.

The foregoing, along with additional objects and advantages, will be apparent from the following description of a specific embodiment of the invention as depicted in the accompanying drawing, in which:

FIGURE 1 is a perspective view of a conductive shoe conforming to the present invention;

FIGURE 2 is a top plan view of a perforated conductive insole;

FIGURE 3 is a bottom plan view of the insole of FIGURE 2;

FIGURE 4 is an enlarged fragmentary vertical section through the heel portion of a conductive shoe; and

FIGURE 5 is a fragmentary vertical section taken generally along the line 5—5 of FIGURE 4.

Directing more particular attention to the details of the drawing, the numeral **10** designates generally a shoe constructed in accordance with the teachings of the present invention. The shoe **10** includes an upper construction **12** and a bottom or sole construction **14**. The upper **12**, which comprises the usual leather or leather-like outer covering **16** and fabric lining **18**, is wholly conventional and does not contribute to the novelty of the instant disclosure.

Directing attention to the sole portion of the shoe **10**, FIGURES 2 and 3 show a removed insole **20** constructed to the principle of the well-known Goodyear welt construction. Thus, the insole **20** includes a main leather body **22** having an integral downwardly projecting rib portion **24**. A canvas reinforcement **26** is cemented to the underneath side of the body **22** within the rib portion **24**. To this point, the construction of the insole **20** follows conventional practice. Beyond this, however, the insole **20** has its heel portion provided with a plurality of perforations **28**, after which a conductive coating **30** is applied so as to cover both the upper and lower surfaces of the heel portion, as well as the interior surfaces of the several perforations **28**. The coating **30** preferably comprises electrically conductive carbon dispersed in a resinous vehicle cured to a solid state. It may be applied by dipping the heel portion into an appropriate liquid solution or dispersion of the conductor and vehicle so as to insure a continuous surface coating as above described.

A typical formula for a solution appropriate to provide the coating **30** may include 40 parts of acetylene black and 100 parts of type 8 nylon dissolved and dispersed in a concentration of 15% by weight in solvent comprising 35% water and 65% ethyl alcohol (by volume). The mixture, preferably formulated at a temperature of approximately 150° F., may be used at room temperature. It will be understood, of course, that the instant invention is not limited to the above formulation, which is here given only by way of illustration and example.

As clearly illustrated in FIGURES 4 and 5, the insole **20** is secured by conventional stitches **32** to the upper **12** and to a Goodyear welt **34**. An outsole **36** is then attached by means of stitches **37** to the welt **34**. A heel **38** is secured by any appropriate means, such as nailing, sewing, or cementing to the rear part of the sole **36**. Both the outsole **36** and the heel **38** are constructed of plastic or elastomeric material made conductive by the inclusion of acetylene black or the like in a well-known process. In making the sole **36**, the material is preferably compression molded to provide a sole portion **39** and a surmounting filler pad **40**, the latter extending upwardly the height of the rib **24** of the insole **20** so as to engage the coated underneath surface of the heel portion of the insole. The space between the outsole **36** and the insole **20** forward of the pad **40** accommodates the usual filler **42**. A sock lining **44** of conductive thermoplastic or cured elastomeric material is disposed over the coated heel portion of the insole **20** and cemented thereto by a suitable electrically conductive adhesive cement.

In use, the conductive shoe **10** clearly provides a continuous path for conduction of electrical charges from the sock lining **44** to the sole portion **39** of the outsole **36**, as well as to the heel **38** secured thereto. The path extends, of course, through the conductive sock lining **44** and continues along the coating **30** from the upper surface of the insole **20** through the perforations **28** to the

lower surface of the insole, thence by direct contact with the filler pad 40 through the sole portion 39 and the heel 38 to ground. The conductive characteristic of heel 38, while not essential, represents a preferred arrangement for providing immediate contact to ground with every step of the wearer.

Clearly, there has been provided a conductive shoe which fulfills the objects and advantages sought therefor. It is to be understood that the foregoing description and the accompanying drawing have been given only by way of illustration and example. It is further to be understood that changes in the form or the elements, rearrangement of parts, and the substitution of equivalent elements or materials, is contemplated as being within the scope of the present invention which is limited only by the claims which follow.

What is claimed is:

1. A conductive shoe comprising in combination, an upper, an electrically non-conductive insole and an outsole, all secured together, the outsole being electrically conductive from its upper surface to its lower surface and having engagement both physically and electrically with the lower surface of said insole, the insole having perforation means through it, said insole having a continuous thin surface, the surface of the perforation means being coated with the material in an unbroken film from the top thin surface to the bottom thin surface, to render it electrically conductive from its upper surface to its lower surface, the two soles thereby providing electrical conduction from the upper surface of the insole to the lower surface of the outsole.

2. The shoe of claim 1 with the addition of a conductive sock lining engaging the upper surface of the treated insole.

3. The shoe of claim 1 wherein the insole has a fabric layer attached to its bottom surface, and wherein the electrically conductive surface is on the fabric layer.

4. The shoe of claim 1 wherein the treated insole comprises a continuous electrically conductive film of carbonaceous material extending from the upper surface through the perforation means to the lower surface of the insole.

5. The shoe of claim 4 wherein the conductive coating comprises acetylene black as the principal conductive substance.

6. In a conductive shoe, an insole having a plurality of small perforations through it and constructed from electrically non-conductive material, and a coating of electrically conductive substance covering at least a portion each of the upper and lower surfaces of the insole and extending in an unbroken film over the inside surfaces of said perforations therebetween.

7. The combination of claim 6 wherein the conductive coating comprises carbon dispersed in a resinous vehicle.

References Cited in the file of this patent

UNITED STATES PATENTS

2,261,072	Monahan	Oct. 28, 1941
2,279,094	Siers	Apr. 7, 1942
2,305,542	Mason	Dec. 15, 1942
2,341,219	Jones	Feb. 8, 1944
2,433,384	McLarn	Dec. 30, 1947
2,650,327	Legge	Aug. 25, 1953
2,699,424	Nieter	Jan. 11, 1955
2,845,962	Bulgin	Aug. 5, 1958
2,850,681	Horton	Sept. 2, 1958
2,857,556	Price	Oct. 21, 1958