

Sept. 3, 1946.

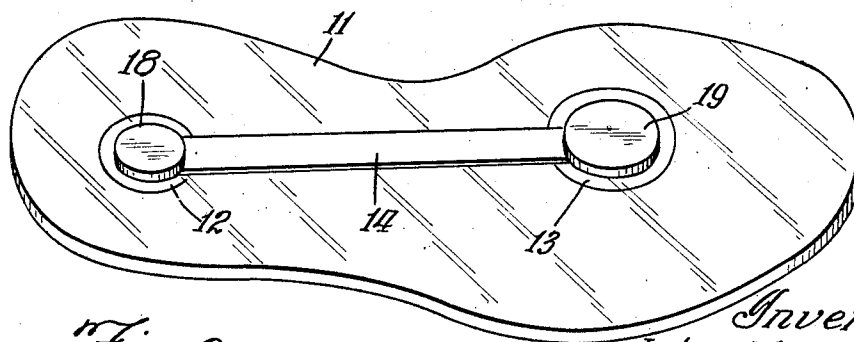
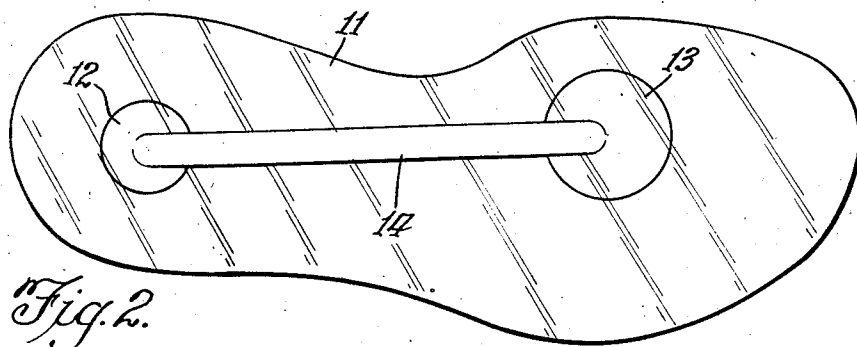
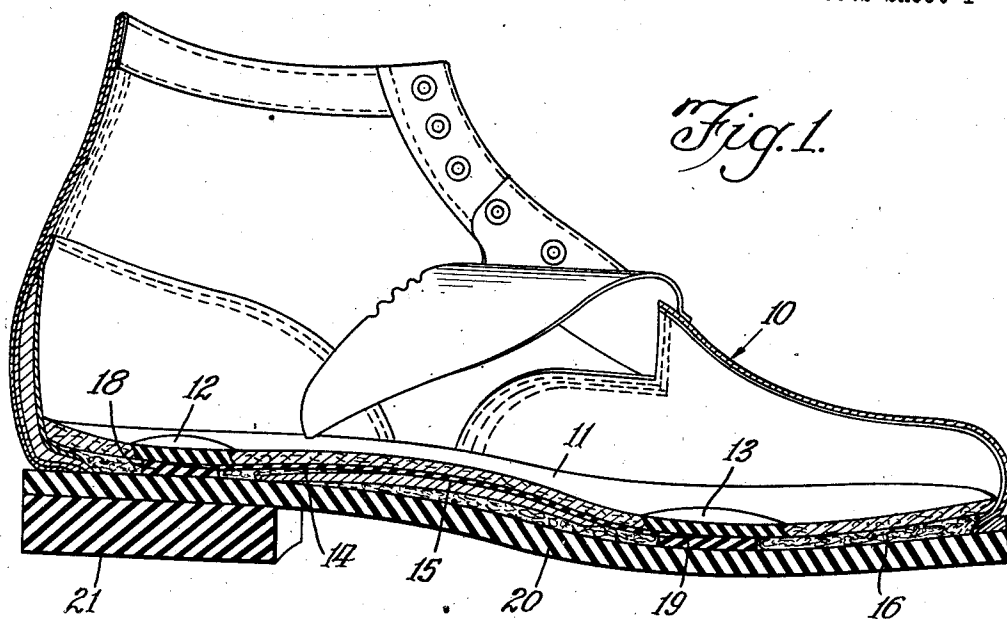
J. E. TABER, JR., ET AL

2,407,189

SHOE

Filed Jan. 26, 1942

3 Sheets-Sheet 1



Inventors:
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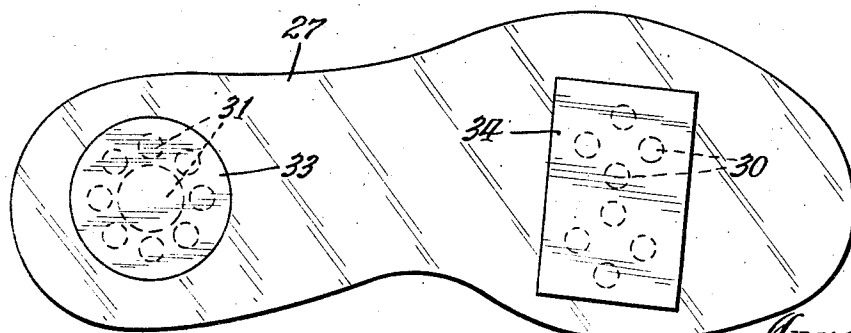
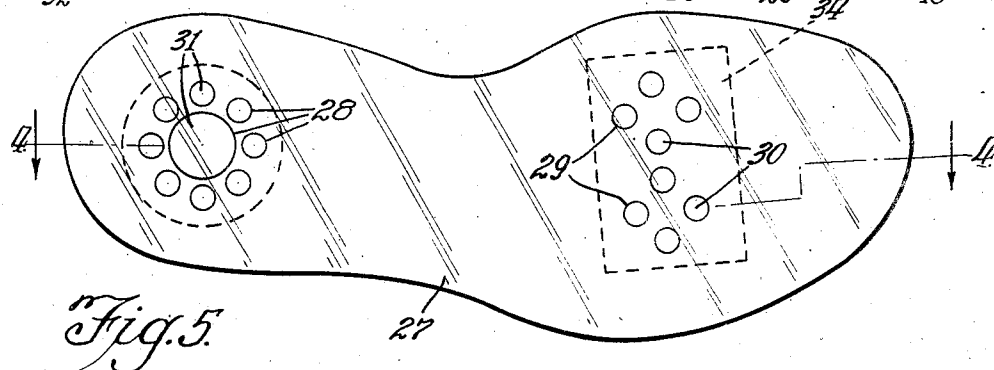
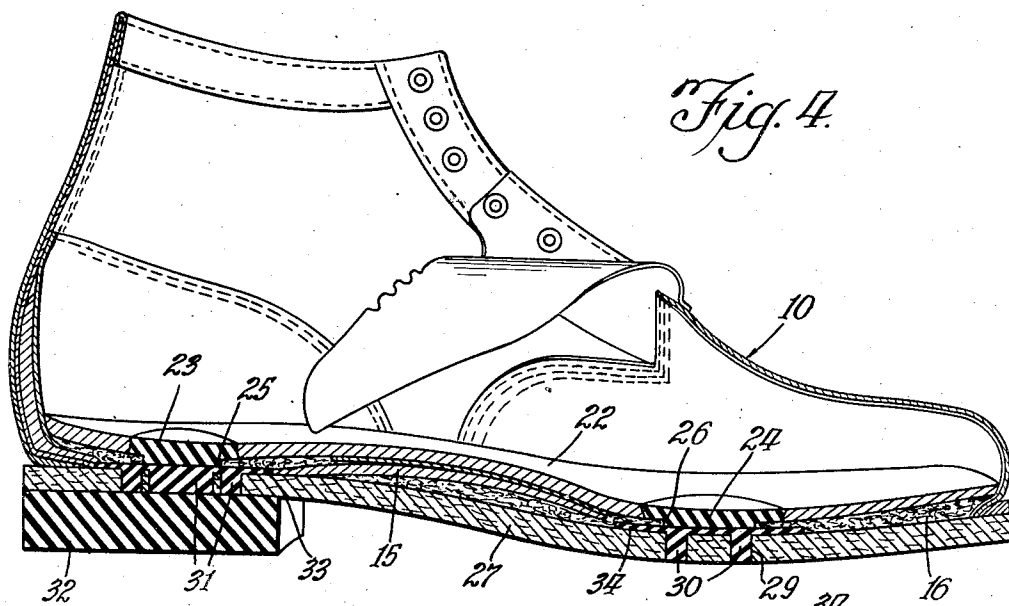
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SHOE

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3 Sheets-Sheet 2



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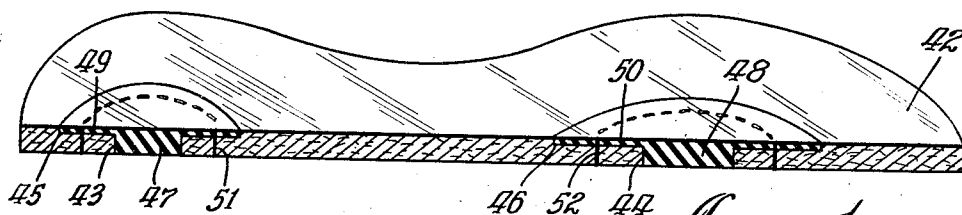
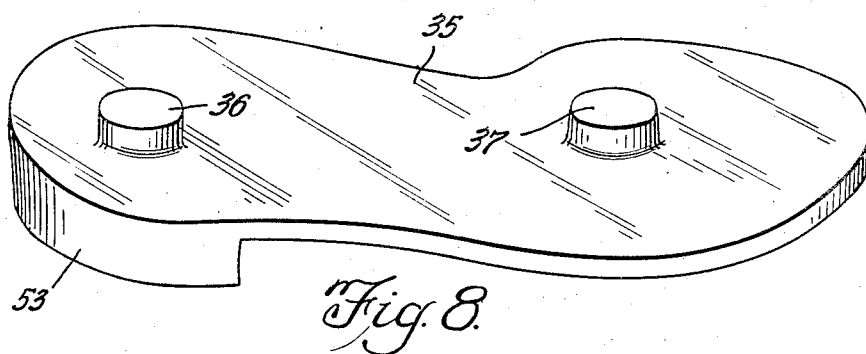
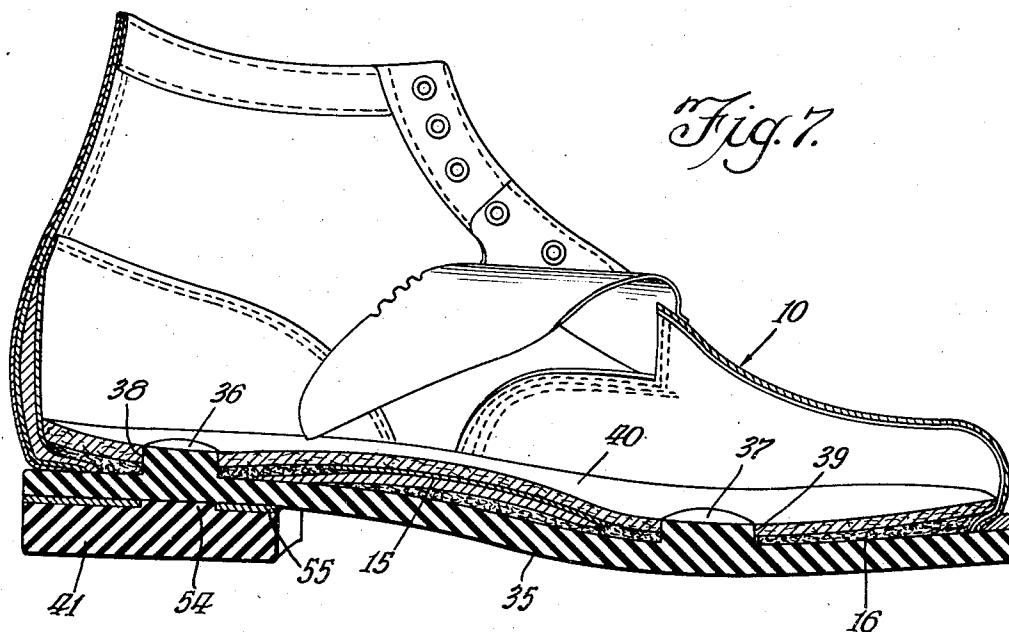
J. E. TABER, JR., ET AL

2,407,189

SHOE

Filed Jan. 26, 1942

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,407,189

SHOE

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Application January 26, 1942, Serial No. 428,172

3 Claims. (Cl. 175—264)

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The present invention relates to boots or shoes and other foot coverings and, more particularly, resides in a novel boot or shoe construction having an electro-conductive sole or bottom construction, adapted to conduct and discharge to the ground static electricity as it is generated in the body of the wearer. It also embraces novel methods for the production and manufacture of the shoe hereof.

In plants for the manufacture or storage of explosives, certain types of chemical plants, and other establishments wherein the atmosphere may contain volatile or explosive constituents in the nature of powder, dust, fumes or the like, there is an ever present danger of serious explosions or combustion occurring as a result of sparks caused by the sudden discharge from the bodies of workers of static electrical charges built up in their bodies. Attempts have been made to overcome this menace by providing the workers with shoes having metal inserts in the soles thereof, or other metallic elements extending through the shoe soles and contacting the ground. While such shoes may sometimes serve to avoid the accumulation of static charges in the body, the slightest scuffing of the metallic parts against stone, concrete or other metal will frequently cause sparks sufficient to set off serious explosions or conflagrations. On the other hand, insulating the body from the ground, by the use of ordinary rubber or rubber-soled shoes, permits the accumulating in the body of static electricity which may be discharged through the fingers and cause a spark sufficient to set off an explosion.

Now the present invention makes use of the properties and characteristics of certain types of rubber compounds to conduct electricity, at least in the form of static charges thereof. Thus the present invention embraces a novel shoe or foot covering construction wherein the ground engaging portion or sole, including the heel, is made entirely of rubber or rubber and leather, which has no exposed metallic parts which could cause sparks by striking or scuffing against an object, yet which will efficiently and completely ground the body of the wearer and thus carry off static electricity and prevent its accumulation in the body of the wearer.

It is an object of the present invention to provide a shoe or foot covering, of simple and economical construction, which will ground the body of the wearer and carry off and prevent the accumulation of static electricity therein.

Another object of the invention is to provide a shoe having an electro-conductive sole formed

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of rubber or rubber and leather or other suitable material and wherein portions of electro-conductive rubber extend entirely through the shoe sole to the ground engaging surface thereof.

A further object is to provide a shoe having an electro-conductive sole with portions of electro-conductive material extending entirely there-through and engaging the foot of the wearer, and having no exposed metallic parts.

Yet another object of the invention is to provide methods for the efficient and economical manufacture of the shoe hereof.

With these and other objects in view the invention comprises the novel combination and arrangement of parts and the procedure hereinafter fully described, illustrated in the accompanying drawings and particularly pointed out in the appended claims, it being understood that the invention is not to be limited in accordance with the particular embodiments shown, but that many variations thereof are possible within the scope of the claims without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the drawings:

Fig. 1 is a vertical longitudinal sectional view through a shoe equipped with a sole fabricated of electro-conductive rubber and embodying features of the present invention.

Fig. 2 is a bottom plan view of a shoe insole with plugs of electro-conductive rubber therein, showing an initial stage in the manufacture of one form of the shoe herein.

Fig. 3 is a bottom plan view, slightly in perspective, showing a shoe insole in a further stage of fabrication.

Fig. 4 is a vertical longitudinal sectional view through a shoe similar to that of Fig. 1, but wherein the outer or ground engaging sole is formed of leather with inserts of electro-conductive rubber.

Fig. 5 is a bottom plan view of the leather and rubber outer sole utilizable in the shoe of Fig. 4.

Fig. 6 is a top plan view of the outer sole of Fig. 5.

Fig. 7 is a vertical longitudinal sectional view through a shoe, similar to Figs. 1 and 4, but wherein the outsole and foot contacting portions constitute an integrally molded mass of electro-conductive rubber.

Fig. 8 is a top perspective view of the outsole used in the embodiment of Fig. 7.

Fig. 9 is a modified construction of an insole that may be used with the shoe of the present invention.

The electro-conductive shoe of the present invention comprises, generally speaking, an upper of any conventional or desired construction and having a bottom or sole assembly containing no exposed metallic parts and wherein there is electro-conductive rubber extending uninterruptedly through the bottom assembly from the foot contacting surface thereof to the ground engaging surface in order to effectually ground the body of the wearer and discharge static electricity therefrom. One embodiment of the invention contemplates an outer sole formed of vulcanized electro-conductive rubber compound and having plugs or integral protuberances thereon extending entirely through the bottom assembly of the shoe and through the insole thereof and exposed to provide good contact with the foot of the wearer, thus effectually grounding the wearer's body. The said plugs are also of electro-conductive rubber compound and may be formed integrally with the rubber outer sole or may be produced separately therefrom and subsequently joined or molded to the outer sole to ultimately provide a substantially integral arrangement. In another embodiment of the invention the outer sole may take the form of the usual leather or other relatively non-conductive sole but has openings or perforations therethrough through which extend inserts of electro-conductive rubber compound, this rubber compound extending uninterruptedly through the shoe bottom assembly and exposed at the foot engaging surface thereof for the purpose heretofore explained. Other possible embodiments, within the scope of the claims, will be ascertainable by those skilled in the art from the principles of the present invention which will be apparent as the following description of certain specific embodiments unfolds.

The electro-conductive shoe of the present invention is seen, in a preferred form, in Fig. 1 of the drawings wherein the reference numeral 10 designates a shoe upper of any conventional or desired construction. The shoe is provided with a foot engaging and supporting insole 11, preferably of leather or the like which has, centrally disposed at the heel and ball portions thereof, a pair of plugs 12 and 13 formed of electro-conductive rubber material and received snugly within appropriate openings through the insole, exposed at the upper surface thereof and extending completely therethrough. The plugs 12 and 13, beneath the insole 11, preferably are electrically connected together by a strip 14, also of electro-conductive rubber, and firmly joined to each of the plugs, preferably by having its respective end portions pressed into the lower faces of the plugs and vulcanized thereto. As in normal shoe constructions, there may be employed below the insole 11 and connecting strip 14 a shank stiffener 15, of wood or other material of substantial supporting power, as well as an insole bottom lining and customary filling material such as cork 16.

At its undersurface each of the plugs 12 and 13 has firmly joined thereto, preferably by vulcanization, a disclike member 18 and 19 which is of sufficient thickness to extend uninterruptedly through the midsole section or spacing between the insole 11 and outsole 20. This outsole 20 is molded or otherwise formed of electro-conductive rubber and is molded or substantially integrally joined to the disclike portions 18 and 19 and preferably vulcanized thereto. A heel 21 also of electro-conductive rubber may be provided and is preferably vulcanized to the outsole 20.

There is thus provided a shoe which has elec-

tro-conductive rubber, in the form of the plugs 12 and 13, the disclike members 18 and 19, the outsole 20, and the heel 21, exposed at the foot engaging surface of the shoe and extending uninterruptedly through the shoe bottom and exposed at the ground engaging surface to form an uninterrupted path of electrical conductivity from the foot of the wearer to the ground. As will be hereinafter more fully explained, the various electro-conductive rubber parts of the shoe of Fig. 1 are assembled and processed in a manner such that the plugs 12 and 13 and disclike members 18 and 19 become a substantially integral part of the sole 20 upon completion of the shoe processing operations.

There are several rubber compounds which possess the property, in a greater or lesser degree, of conducting or transmitting an electric charge, at least in the form of static electricity, and it is apparent that any such rubber compound possessing this property to a substantial extent is employable for the electro-conductive rubber portions or elements in the shoe of the present invention.

However the following formula is given as one which is simple and which provides an electro-conductive rubber compound which has been found to be eminently satisfactory in the practice of the present invention. This formula is as follows, the figures given being parts by weight:

3#smoked sheet	70.0
#610 reclaim rubber	50.0
Shawinigan black (acetylene black)	80.0
Hard hydrocarbon	6.7
Pine tar	8.4
VGB	3.4
Litharge	20.0
Sulfur	2.2

In the fabrication of the shoe embodied in Fig. 1 the insole 11, which is preferably leather, is cut or otherwise formed from a suitable blank. A hole for each of the rubber plugs 12 and 13 is then cut, for instance by a suitable die, in the heel and ball portions of the insole. These holes may be of any desired size, for example, from about 1 inch to 2 inches in diameter, and they should be placed at points where pressure of the heel and ball portions of the foot is greatest, in order to insure good contact with the foot. The bottom edge of each cut or opening is preferably skived and coated with a cement comprising an electro-conductive rubber compound cut with or dissolved in an organic solvent such as gasoline.

From a body or sheet of electro-conductive rubber compound, for instance a compound such as set forth in the above formula and which has been mixed and milled in a manner common in the rubber compounding and milling art, are cut plugs of a diameter to fit snugly within the openings provided in the insole 11 as above set forth. To insure accuracy, these plugs may be cut or stamped with the same die used for perforating the insole. It is also preferable that these rubber plugs be slightly thicker than the insole, for instance, about .025 inch thicker. This is to insure that the plugs 12 and 13 will be at least flush with the faces of the insole 11 after a subsequent hot press cure.

After the plugs are inserted in the insole openings, the assembly is then placed in a hot press, such as a press consisting of two heated platens, and subjected to a forming operation for about one minute at temperatures approximating 240° F. Preferably both sides of the insole are covered

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with a material such as holland cloth before being placed in the press. If the insole is intended for use with a leather shoe, it may be put through a further vulcanization operation under customary conditions. However, if for use with shoes that will be subsequently subjected to a curing operation, no additional heat treatment is needed at this time.

In the next step of the shoe fabrication, the surfaces of the insole plugs 12 and 13 at the bottom side of the insole are buffed and somewhat softened with a slight amount of gasoline or other suitable solvent. A strip 14 of uncured electro-conductive rubber stock, similar to that used for the insole plugs, is laid along the bottom surface of the insole with its ends engaging the plugs 12 and 13 as clearly seen in Fig. 2. The ends of the strip 14 are firmly pressed into the surfaces of the plugs 12 and 13, which have been buffed and softened as above mentioned. This strip 14 serves to electrically connect the insole plugs to enhance the grounding effect of the shoe.

The shoe upper 10 is now assembled and lasted to the insole 11, seen in Fig. 2, in any convenient and well known manner. In putting in the filling material 16 care should be exercised so that none is put on either of the plugs 12 and 13. The plugs or disclike members 18 and 19, slightly smaller in diameter than the corresponding insole plugs 12 and 13 and formed of electro-conductive rubber compound, are warmed thoroughly, placed on the respective insole plugs 12 and 13, which have been previously softened with gasoline or other solvent, and hammered or otherwise firmly pressed thereto so that they are firmly united to the plugs 12 and 13 and the interposed ends of the strip 14. It is generally desirable that the disclike members 18 and 19 originally be at least .125 inch thicker than necessary to extend from the insole plugs through the midsole assembly to the outsole.

The outsole 20, which has been molded from an electro-conductive rubber compound, preferably one exemplified by the above formula, or which has been formed from a milled sheet of such a rubber compound, is treated on its upper face, at least in the vicinity to be contacted by the disclike members 18 and 19, with gasoline or other suitable solvent and is then placed on the lasted shoe and firmly pressed to the disclike members 18 and 19. The outsole is then permanently secured to the shoe, preferably by the well known Goodyear welt arrangement. The entire shoe may now be placed in a suitably heated chamber to effect vulcanization of the rubber portions of the shoe previously described, namely, the sole 20, the disclike members 18 and 19, the connecting strip 14, and the insole plugs 12 and 13, all of which are vulcanized into a relatively integral and homogeneous structure. In this connection it will be understood that the lines of demarkation between these various rubber components are exaggerated in Fig. 1 in order to illustrate the procedural steps of manufacture. The heel 21, formed of an electro-conductive rubber compound, may be applied before vulcanization and then cured along with the shoe to also form a part of the substantially integral structure. On the other hand the electro-conductive rubber heel 21 may be separately formed and vulcanized, and subsequently attached to the shoe.

Thus it will be seen that there is provided a shoe having an inner or foot contacting sole of leather or the like, which is necessary for foot

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comfort, but which has an outsole of electro-conductive rubber and which also has electro-conductive rubber extending from the outsole uninterruptedly through the shoe bottom and exposed at the foot supporting surface thereof for affording a good electrical grounding of the body of the shoe wearer. On the other hand there are no exposed metallic elements or other instrumentalities capable of causing sparks and subsequent explosions in atmospheres containing volatile constituents.

In the embodiment seen in Figs. 4 to 6 inclusive the shoe may include a conventional leather upper 10, a shank stiffener 15, and a cork midsole or filling 16, similar to the corresponding parts previously mentioned in connection with Fig. 1. In the present embodiment the shoe is shown to be equipped with an insole 22 preferably of leather and in most respects similar to that seen in Fig. 1, in that it has been provided with a hole or opening at the heel and ball portions thereof. Filling each of these openings and firmly secured therein are plugs 23 and 24 of electro-conductive rubber material. These plugs 23 and 24 are seen to include integral downwardly extending portions 25 and 26, somewhat smaller in diameter than the body of the plugs which is received within the insole openings. This is an alternate construction, however, and it will be understood that the downwardly extending portions 25 and 26 may take the form of separate discs of electro-conductive rubber similar to the discs 18 and 19 of Figs. 1 and 3.

In the embodiment of Figs. 4 to 6, the outsole 27 may be formed of leather, rubber or other flexible relatively non-conductive material. At the heel and ball portions of the sole 27 there are provided openings 28 and 29 respectively, which may be of any desired number and size and which may be arranged in any particular design. In the illustrated arrangement the heel openings 28 have been arranged in the form of a large central opening surrounded by a plurality of smaller openings, while the ball openings have been provided by a plurality of relatively small holes. This arrangement is, of course, merely illustrative, the principal object being to provide a large area of opening through the leather sole 27 while not necessarily weakening the sole by a single opening of relatively large size. All of the holes 28 and 29 are filled with electro-conductive rubber composition which extends completely through the respective openings and is exposed at the ground engaging surface, as clearly seen in Fig. 4, wherein the electro-conductive rubber material 30 in the openings 28 contacts the ground, while the electro-conductive rubber 31 within the heel openings 28 contacts the shoe heel 32 also formed of electro-conductive rubber composition.

Above the openings 28 and 29 at the upper side of the sole 27 there are layers or films 33 and 34 of electro-conductive rubber which are preferably integral with the rubber material 30 and 31 filling the respective sole openings. This arrangement may be accomplished by inserting appropriate plugs of the electro-conductive rubber within the openings 28 and 29 and then applying a thin layer or sheet of electro-conductive stock on the upper surface of the sole covering the upper ends of said plugs. On the other hand, a suitable flat blank of softened conductive rubber stock may be placed over the openings 28 and 29 and the rubber material thereof forced into the

openings by pressure, leaving a thin film of the material over the upper surface of the sole.

It will be appreciated that the openings 22 and 29 with the rubber layers 33 and 34 are positioned on the sole 27 to register with or coincide with the downwardly extending portions 25 and 23 of the insole plugs 23 and 24. The outsole 27 with its plugs or inserts of electro-conductive rubber, formed as just described, may be applied to the shoe after the same has been lasted with an insole 22 having the plugs 23 and 24 of electro-conductive rubber. The insole 22 may, of course, be provided with a strip similar to the strip 14 of Figs. 1 to 3, for electrically connecting plugs 25 and 26. The strip 14, however, is not essential in any phase of the invention, although it is desirable because it somewhat enhances the grounding effect.

After the shoe of Fig. 4 has been assembled as seen in the said figure, the shoe, or at least the sole assembly thereof, including the electro-conductive rubber heel 32, may be subjected to a suitable heat treatment for effecting vulcanization of the electro-conductive rubber components whereby the contacting rubber elements are vulcanized into a substantially integral structure. There is thus provided a shoe having a leather insole and a leather outsole and wherein there is electro-conductive rubber material extending uninterruptedly from the foot contacting surface to the ground engaging surface of the shoe for effectually grounding the body of the shoe wearer.

A somewhat simplified construction of a conductive sole shoe, as seen in the modification of Figs. 7 and 8, utilizes an outsole of electro-conductive rubber composition formed or molded with integral upstanding plugs adapted to extend through appropriate openings in a shoe bottom construction and to be contacted by the foot of the shoe wearer for electrically grounding his body. Thus, the shoe seen in Fig. 7 may include a conventional upper 10, shank stiffener 15 and a suitable midsole construction such as the cork filler 16. In the present instance the outsole 35 is formed of an electro-conductive rubber composition preferably similar to that of the formula hereinbefore given, and is provided with integral upstanding plugs 36 and 37, also of electro-conductive rubber, at the heel and ball portions thereof. These plugs are received snugly within and extend through suitable openings 38 and 39 which are provided in the heel and ball portions of an insole 40. This insole may be formed of leather or any other suitable material, and the height of the plugs 36 and 37 is such that the upper faces of said plugs are substantially flush with the foot contacting surface of the insole. A heel of electro-conductive rubber is preferably employed and may be molded integrally with the sole 35, as indicated by the heel 53 seen in Fig. 8, or may be separately formed and subsequently attached to the sole, for instance, in an adhesive manner as seen in Fig. 7, the nature of which will be presently described.

Thus the shoe construction of Fig. 7 will be seen to afford a simple and convenient arrangement wherein the shoe is equipped with an outsole of electro-conductive rubber material, at least a part of which material extends through the shoe bottom and is exposed at the foot contacting surface thereof for establishing a path of relatively low electrical resistance between the body of the shoe wearer and the ground. In addition, the molded sole of Fig. 8 may also be employed to resole ordinary shoes for the purpose of

affording them electro-conductive characteristics. Thus it is obvious that, upon the removal of the sole from an ordinary shoe, suitable holes may be provided in the midsole and insole constructions of the shoe and an electro-conductive rubber sole embodying the features of Fig. 8 may be applied to the shoe with the plugs 36 and 37 inserted through the shoe bottom openings provided therefor. As previously mentioned an electro-conductive rubber heel may form an integral part of the sole or may be subsequently attached in a suitable manner.

It will here be explained that, in any form of the present shoe, the manner of providing or attaching a heel of electro-conductive rubber is a matter of choice, and several typical forms of this phase of the invention have been illustrated in the drawings. Thus, in Fig. 1 the heel 21, of electro-conductive rubber, is shown as vulcanized directly on to the outsole 20. This affords a satisfactory arrangement when the heel and sole are assembled in the unvulcanized state and subsequently jointly cured.

The joining together of parts of conductive rubber by ordinary rubber cements is not recommended as this destroys or greatly impairs conductivity from one part to the other. Thus, when it is desired to separately produce and separately cure the sole and heel portions, the same may be very satisfactorily assembled in the manner shown in Fig. 7. In this arrangement the separate heel 41 is formed with a centrally located slightly elevated protuberance or plug 54 on its upper surface. After the shoe upper has been lasted to the conductive outsole 35, to a conductive rubber heel 41 a coating of rubber cement is applied on the upper surface thereof surrounding the protuberance 54. A thin sheet of flexible material 55, which may be ordinary rubber, and having a central opening to register with the plug 54 is then placed over the cement layer. Rubber cement is applied to the upper side of the sheet 55 or to an area of the bottom of the shoe sole 35 surrounding the area to be contacted by the plug 54, or to both, and the heel is then placed on the sole in the position seen in Fig. 7, preferably after the top surface of the plug 54 and the area of the shoe sole to be contacted thereby have been softened with gasoline or other solvent. A C-clamp, or other suitable clamping device is now applied to press and hold the heel 41 firmly against the shoe sole. Then the heel part of the shoe is subjected to a suitable heat treatment to set and cure the cement and the rubber sealer strip 55 and substantially weld the plug 54 to the sole. Preferably a fast curing cement is used, such as one which will completely cure in about three to four hours at a temperature of the order of 160° F. After this operation the heel 41 will be found to be adhered to the shoe sole with ample strength, and the plug 54 welded to the sole in a good electrically conductive manner.

This latter arrangement will be found of particular value in attaching the heel to the leather outsole illustrated in Fig. 4, since it is ordinarily difficult to adhesively attach rubber directly to leather with any degree of permanence. In such embodiment a rubber sealing strip, similar to the rubber sheet 55 of Fig. 7 and having a central opening so as not to cover the conductive inserts 31 of the leather sole, is stitched securely to the sole so that it covers the area surrounding the inserts 31. A heel similar to the heel 41 is employed and is adhesively secured to the lower sur-

face of the stitched sealing strip with the plug 54 welded to the inserts 31, in the manner previously described. Thus a firm permanent attachment of the heel to the sole and a good electrical connection with the inserts 31 is assured.

Fig. 9 shows a modified insole construction, with electro-conductive rubber inserts or plugs, which may be conveniently utilized in place of the insoles 11 or 22 of Figs. 1 and 4. The modification of Fig. 9 may comprise an insole 42, of leather or other suitable material, in which are provided openings 43 and 44 at the heel and ball portions thereof respectively. Around the upper ends of the openings 43 and 44 the upper surface of the insole material is recessed or countersunk as indicated at 45 and 46 respectively. Received snugly within each of the openings 43 and 44 are plugs of electro-conductive rubber 47 and 48 the upper ends of which are provided with integral annular flanges 49 and 50 of a diameter substantially larger than that of the body of the plugs and, in fact, of a size to fit within the countersunk recesses 45 and 46. The thickness of the flanges 49 and 50 is such that the upper surface thereof and of the plug bodies lies substantially flush with the upper surface of the insole 42. While the plugs 47 and 48 and their respective flanges fit snugly within the insole openings, as previously explained, it will generally be preferable to provide an annular row or rows of stitching 51 and 52 through the plug flanges and the underlying portion of the insole material, thus securing the plugs firmly in place. The insole construction of Fig. 9, while somewhat more elaborate than that of the insoles illustrated in Figs. 1 and 4, assures a smooth foot contacting surface and prevents protrusion of the electro-conductive rubber plugs to an extent which would be uncomfortable to the foot of the wearer and also prevents recession of the upper surface of the plug such as might interfere with good contact thereof with the foot. It will be appreciated, therefore, that the insole of Fig. 9 is interchangeably employable in the shoes of Figs. 1 and 4 and is, in fact, utilizable with other types of shoes wherein there is desired an insole having plugs or inserts of electro-conductive rubber material.

In the manufacture of the electro-conductive rubber components of any of the forms of the present invention care should be taken that the rubber compound is milled or otherwise worked as little as possible, at least when the foregoing or similar formulas are employed. Experience has proven that the conductive rubber stock exemplified by this formula should have a minimum amount of milling. In production it is preferable that the stock mixture be sheeted to the proper gauge for use as it comes off the mixing mill so that no further milling or calendering would be necessary. It has been demonstrated that an electro-conductive rubber of the formula herein given, sheeted out with a minimum amount of milling, shows an electrical resistance of about 3,000 to 5,000 ohms, which is a sufficiently low resistance to successfully discharge static electricity from the body and prevent its accumulation therein, in line with the purposes of the present invention. On the other hand such conductive stock which has been calendered after milling frequently shows an electrical resistance of from 3,000,000 to 5,000,000 ohms, which insulates rather than grounds the body and would permit the accumulation of static electricity therein to an extent dangerous in volatile atmospheres

where a sudden discharge of static electricity from uninsulated body portions might be sufficient to cause an explosion.

As indicative of the electrical conductivity of the shoe hereof, when the conductive rubber components are fashioned of a rubber stock similar to that of the formula hereinbefore set forth, the results of actual tests are of interest. In one series of tests the ohmic resistance of the rubber sole of a shoe embodying features of the invention was measured by a commercial resistance testing instrument. Inserting one prod of the instrument into the heel insole plug and exploring the entire heel and sole bottom with the other prod measured resistances varying from 2,000 to 6,000 ohms. On the other hand, inserting one prod into the ball insole plug and exploring the heel and sole bottom with the other showed resistances running from 10,000 to 20,000 ohms. The results of this series of tests, as in any similar electrical tests, depend to a large extent upon the area of contact between the material being tested and the test prods as well as upon the pressure exerted. Since this is the case, the numerical values given above are considered to be reproducible within about a plus or minus 50%.

A second series of tests demonstrated the rate and extent of discharge of static electricity through the shoe bottom assembly. A 1 mf. condenser was charged to 400 volts from a power pack. One condenser terminal was connected to one conductive rubber shoe surface with the aid of a metal foil, to facilitate contact. A second metal foil was placed upon the other surface to be tested and the second terminal brought into contact with the foil for a period of approximately one-half second. The test was repeated in all instances with the duration of contact increased to approximately one second. There was no significant difference in the results for these two periods of contact. In no instance did the residual charge upon the condenser exceed one percent of the initial charge. In every instance the condenser discharged completely through the conductive sole assembly, within the one percent limit. Contacts were made with the heel insole plug and alternately with the heel bottom and outsole bottom, then with the ball insole plug and alternately with the heel bottom and outsole bottom.

Still another series of tests measured the amount of current passed through the conductive sole structure. Contact with the heel insole plug was made by means of a C-clamp, with a Celluloid insert between the heel bottom and clamp jaw. Contact with the sole bottom at the ball portion was made by means of a second C-clamp, the other jaw thereof contacting the leather shoe upper. Leads from a 220 volt A. C. line were brought to an ammeter, first clamp and second clamp. A current of approximately 0.1 ampere flowed. A 10 watt, 110 volt light bulb inserted in the circuit was lighted very brightly. The measured resistance of the conductive rubber sole structure, in this test arrangement, was approximately 2,000 ohms.

These tests clearly demonstrate the ability of the shoe hereof to pass an electric current through the sole structure. While the conductive rubber material offers some resistance, it is insufficient to materially interfere with grounding of the body of the shoe wearer and the dissipation of static electricity therefrom.

While we have described our invention in a

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preferred form, we are aware that various changes and modifications may be made without departing from the principles of our invention, the scope of which is to be determined by the appended claims.

What we claim as our invention:

1. A conductive shoe comprising a conductive outsole designed for direct contact with the ground, said outsole being formed of relatively soft flexible material which presents a relatively high resistance to static electrical charges, an insole substantially coextensive with the inner face of said outsole, said insole comprising a strip of relatively soft material including a ball portion, a heel portion and a connecting arch portion, there being openings extending completely through the ball and heel portions of said strip respectively, and an insert of relatively soft flexible conductive material disposed in each of said openings, said inserts also presenting a relatively high resistance to static electrical charges and conductively connected to said outsole whereby such charges are slowly and without an attendant spark conducted from the foot through the insole and outsole to the ground.

2. A conductive shoe for personal wear comprising a conductive outsole designed for direct contact with the ground, said outsole being formed of relatively soft flexible material which presents a relatively high resistance to static elec-

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trical charges, an insole substantially coextensive with the inner face of said outsole, said insole comprising a strip of relatively soft material including a ball portion, a heel portion and a connecting arch portion, there being openings extending completely through the ball and heel portions of said strip respectively, an insert of relatively soft flexible conductive material disposed in each of said openings, said inserts also presenting a relatively high resistance to static electrical charges and being conductively connected to said outsole, and a member formed of conductive material electrically connecting said inserts.

3. A conductive shoe for personal wear, comprising a conductive outsole designed for direct contact with the ground, said outsole being formed of relatively soft flexible material which presents a relatively high resistance to static electrical charges, an inner sole substantially coextensive with the inner face of said outsole, comprising a strip of relatively soft material having an opening therein, an insert of relatively soft flexible conductive material disposed in said opening, said insert also presenting a relatively high resistance to static electrical charges and being conductively connected to said outsole.

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