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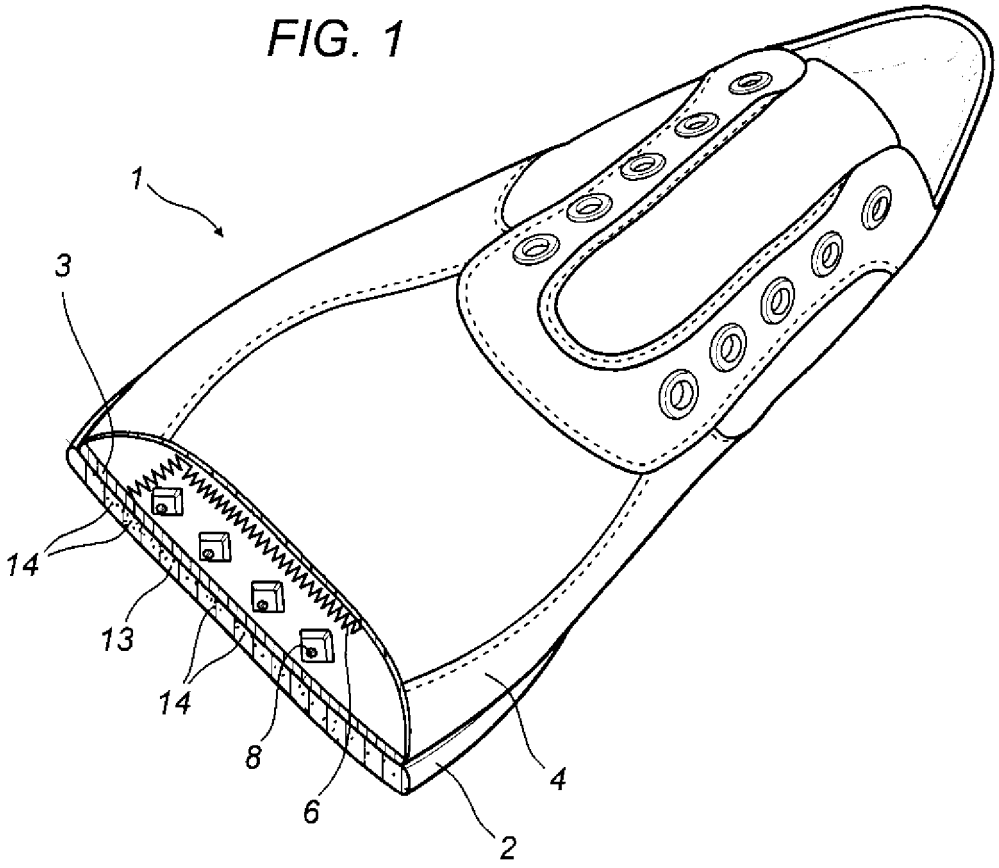
(54) **Antistatic sole, shoe with this sole and process for producing this sole**

(57) An antistatic sole (2), for conveying electrostatic charges to the ground, is made of antistatic material (14) comprising a matrix of polymeric material (13) and in which there are additives with antistatic properties. An antistatic shoe (1) comprises an antistatic sole made of the antistatic material described above. The process for producing the sole involves the addition of antistatic additives, such as carbon powder, to a matrix of polymeric material, for example synthetic rubber.

FIG. 1



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Description

[0001] The present invention relates to an antistatic sole, a shoe with this sole and a process for producing this sole.

[0002] Modern antistatic footwear was developed to allow the discharge to the ground of the static electricity which builds up on the body during the day if isolated from the earth.

[0003] There are many types of antistatic shoes. The best known prior art antistatic shoes comprise a rubber sole inside which there are inserted, in a point fashion, filaments of conducting material, for example copper filaments which, being inserted between the foot and the ground, discharge to the ground the electrostatic charges which build up on the human body.

[0004] Between the sole and the foot there is usually an insole, also fitted with conducting elements to create a connection between the foot and the sole and allow the passage of the electrostatic charges. The conducting filaments pass through the thickness of the sole, along holes or slits made in the sole. In this way the filaments are in contact, on the outside, with the surface on which the wearer treads and, on the inside, with the conducting elements of the insole.

[0005] The conducting elements of the insole are, for example, plates or stitching made of antistatic material. Such elements pass through the thickness of the insole and make contact with the conducting filaments of the sole on one side and with the foot on the other.

[0006] This creates, between the foot and the outer surface on which the wearer treads, an "electric" connection which allows the human body, through the conducting elements which are in contact with the foot and pass through the insole and the sole, to discharge electrostatic charges to the ground.

[0007] Disadvantageously, antistatic footwear made in this way requires holes or slits to be made in the sole of the shoe: this does not guarantee the foot perfect protection from water or cold.

[0008] Moreover, since the filaments of conducting material are positioned below the sole in a point fashion, if the foot is not put down correctly the conducting filaments may not touch the ground and therefore will not discharge to earth the static electricity built up on the body. In this case, when the wearer gets out of his car or touches electronic equipment, he may feel the unpleasant sensation of an electric shock which electrostatic footwear should prevent.

[0009] The process for production of antistatic footwear, such as that just described, is elaborate because, as well as making holes in the sole during moulding, small filaments of conducting material must be applied in a precise position, so that they make contact with the conducting elements present in the insole.

[0010] This means an inevitable increase in production costs. Finally, movement of the insole could result in less effective contact between the filament and the conducting element, defeating the object of the footwear.

[0011] The aim of the present invention is therefore to propose an antistatic sole and shoe which guarantee the foot total protection from the weather.

[0012] In particular, the invention also has for an aim to propose a simple process for the production of an antistatic sole, also allowing a reduction in production costs.

[0013] The present invention also has for an aim to provide an antistatic sole and shoe which guarantee, at any time and with any movement of the foot, the discharge to the ground of the electrostatic charge built up on the body.

[0014] Finally, the present invention has for an aim to produce an antistatic sole which, at any time, is in constant contact with the conducting elements in the insole, thus always guaranteeing the antistatic effect of the footwear.

[0015] The invention accordingly provides an antistatic sole having the features described in claim 1.

[0016] The invention accordingly also provides an antistatic shoe having the features described in claim 5.

[0017] Finally, the invention proposes a process for the production of an antistatic sole comprising the steps described in claim 11.

[0018] The present invention is described below with reference to the accompanying drawings, which illustrate a non-limiting embodiment, in which:

- Figure 1 is a cross-section of an antistatic shoe in accordance with the present invention;
- Figure 2 is a side cross-section of an antistatic sole in accordance with the invention;
- Figure 3 is a perspective view of the lower part of an antistatic insole;
- Figure 4 is a perspective view of the upper part of an antistatic insole.

[0019] With reference to Figure 1, the numeral 1 denotes an antistatic shoe as a whole.

[0020] In general, the antistatic shoe 1 comprises a sole 2, an insole 3 and an upper 4.

[0021] In the non-limiting embodiment illustrated in the accompanying drawings, the antistatic shoe 1 has an insole 3 rendered antistatic by the application of conducting means 5. The conducting means 5 comprise at least one set of stitching 6.

[0022] The stitching 6 is made using a thread with antistatic properties, that is to say, a conductor. Moreover, the stitching 6 passes through the insole 3, so that the antistatic material used to make it is in contact with the sole 2 at the lower part of the insole 3 and with the foot at the upper part of the insole 3.

[0023] Such stitching 6 is usually placed on the front half 7 of the insole 3, at the zone under the front of the foot.

[0024] In the preferred embodiment, illustrated in Figures 3 and 4, the stitching follows a winding path for improved distribution of the stitching. There are also preferably holes 8 in the insole 3, at the front zone 7, to allow

the foot to breathe.

[0025] The conducting means 5 also comprise at least one plate 9, also made of a material with antistatic properties.

[0026] The plate 9 is connected to the insole 3 by two tabs 10, which pass through two cracks 11 made in the insole 3 and which clasp the insole 3, meeting again at the lower part. In this way the plate 9, by means of the tabs 10, makes contact with the sole 2.

[0027] The plate 9 is usually located at the heel.

[0028] The conducting means 5 are therefore located at load-bearing zones of the foot 12, so that, during movement, they are constantly in contact with both the body and the sole 2 below.

[0029] Advantageously, the sole 2 is made of an antistatic material.

[0030] The sole 2 preferably consists of a mixture of polymeric material 13 in which antistatic additives 14 are evenly distributed.

[0031] Advantageously, without limiting the scope of the invention, such antistatic additives 14 may be more concentrated in the load-bearing zones 12 of the sole, for example those of the front of the foot and the heel.

[0032] The polymeric material 13 preferably comprises a synthetic rubber, whilst the antistatic additives 14 include superconducting carbon powder, commonly known as carbon black.

[0033] The process for the production of a synthetic sole, with the features described, involves the preparation of a matrix of polymeric material 13 in which antistatic additives 14 are added. Agents and additives for vulcanisation of the rubber and strengthening fillers are also added to the matrix. The compound obtained is cast in moulds, in which the rubber is vulcanised.

[0034] Adding antistatic material 14 in the composition of the mixture makes the whole sole 2 antistatic, unlike the situation in commonly known antistatic footwear where only some zones have points with such properties.

[0035] This guarantees that the electrostatic charge is always discharged to the ground, however the foot is put down.

[0036] Moreover, such a solution avoids the need to make holes in the sole to insert the conducting filaments. Thus the sole 2 is completely intact and cannot be infiltrated by water or penetrated by cold.

[0037] The process disclosed for producing the antistatic sole 2 is simple and reduces production times and costs.

[0038] The absence of conducting filaments eliminates the step of making holes in the sole for the passage of said filaments, as well as the step of positioning the filaments.

[0039] Moreover, the process for assembly of the antistatic shoe 1 is also simplified, since the absence of the conducting filaments facilitates the step of applying the conducting means 5 on the insole 3. This is because the latter do not need to precisely fit together with the conducting filaments positioned in a point fashion, but instead with a bigger conducting surface.

[0040] The presence of carbon black in the sole guarantees an excellent level of conductivity, whilst the electrical resistance value in the sole is within the limits recommended for the antistatic range.

[0041] As already indicated, the insole 3 conducting means 5 pass through the insole 3 from one side to the other and so act as a bridge between the foot and the sole 2. They are constantly in contact with the sole 2 on one side and with the foot on the other, allowing the passage of electrostatic charges from the foot to the sole 2, which disperses them to the ground by means of the antistatic components contained in it.

[0042] The other elements of which the shoe 1 consists also, in turn, allow the flow of electrical charges. For example, even the thread used to stitch the upper 4 to the sole 2 has antistatic properties.

[0043] Moreover, the end filaments 60 of the stitching may be brought into contact with the sole, below the insole, to discharge any other electrostatic charges.

[0044] The invention described is suitable for obvious industrial applications and can be modified and adapted in several ways without thereby departing from the scope of the inventive concept. Moreover, all details of the invention may be substituted by technically equivalent elements.

Claims

1. An antistatic sole, for conveying electrostatic charges to the ground, **characterised in that** it is made of antistatic material.

2. The antistatic sole according to claim 1, **characterised in that** the antistatic material comprises a mixture of polymeric material (13) and antistatic additives (14).

3. The antistatic sole according to claim 2, **characterised in that** the antistatic additives (14) comprise superconducting carbon powder.

4. The antistatic sole according to claim 2, **characterised in that** the polymeric material (13) comprises synthetic rubber.

5. An antistatic shoe, **characterised in that** it comprises a sole (2) according to claims 1 to 4.

6. The antistatic shoe according to claim 5, **characterised in that** it comprises an insole (3) having conducting means (5) for transmitting electrostatic charges to the sole (2).

7. The antistatic shoe according to claim 6, **characterised in that** the conducting means (5) comprise stitching (6) made using a thread consisting of anti-

static material, that is to say, a conductor.

8. The antistatic shoe according to claim 7, **characterised in that** the stitching (6) passes through and is visible from both sides of the insole (3).

9. The antistatic shoe according to claim 6, **characterised in that** the conducting means (5) comprise at least one plate (9) made of antistatic material, that is to say, a conductor.

10. The antistatic shoe according to claim 9, **characterised in that** the plate (9) passes through the insole (3).

11. A process for the production of an antistatic sole, **characterised in that** it comprises the steps of preparing a matrix of polymeric material, adding antistatic additives, incorporating additives for vulcanisation, pouring the matrix obtained into a mould, then vulcanising the matrix.

FIG. 1

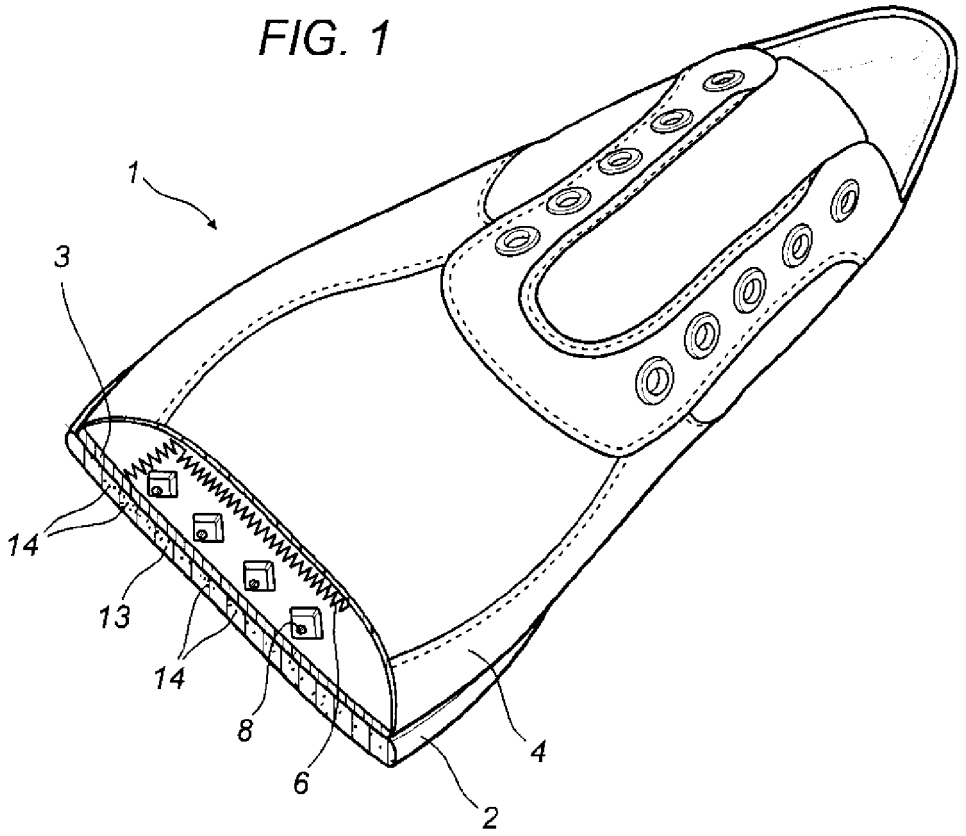


FIG. 2

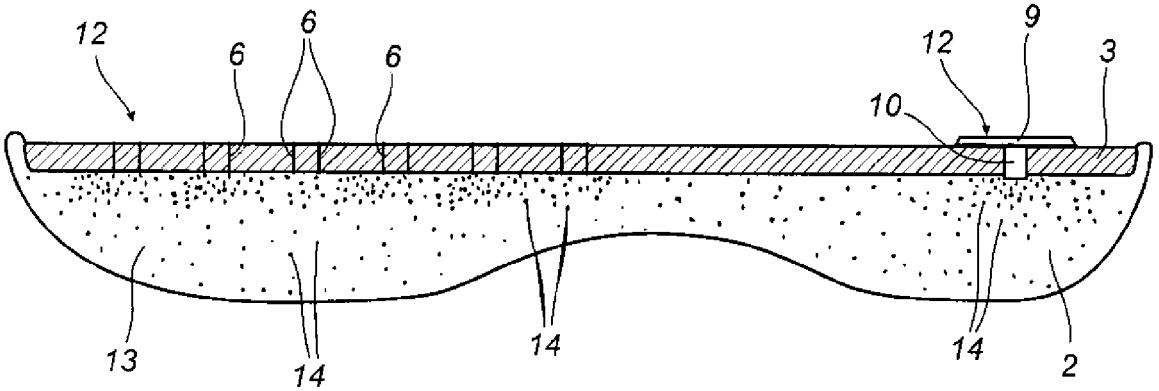


FIG. 3

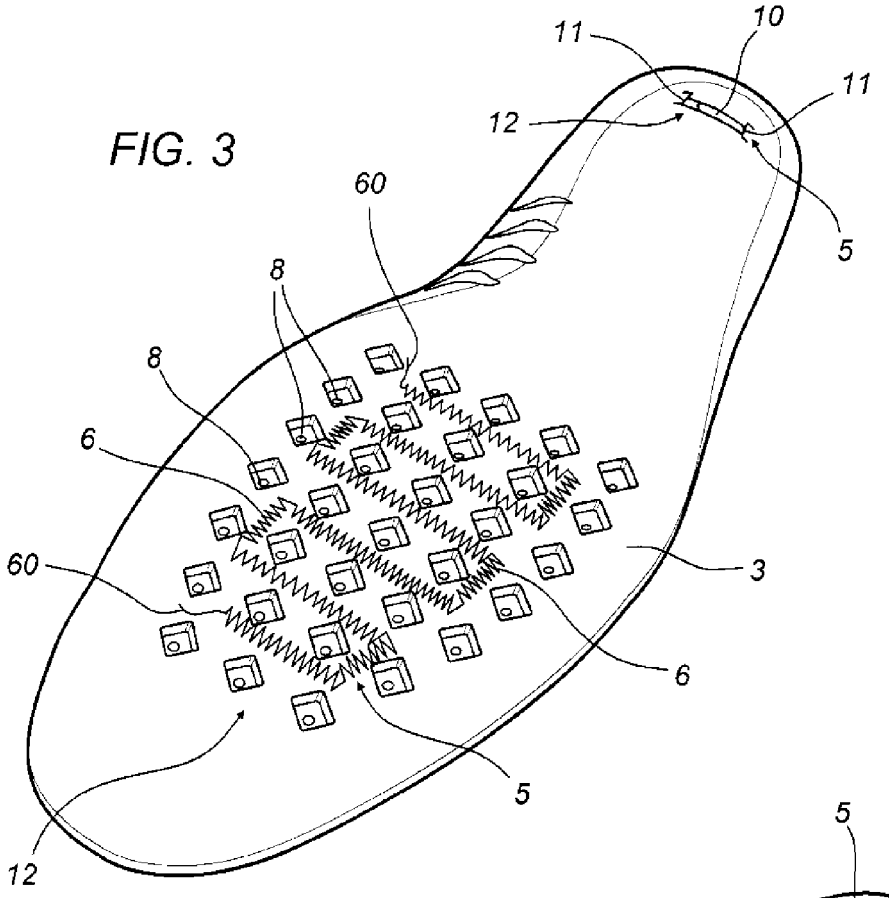
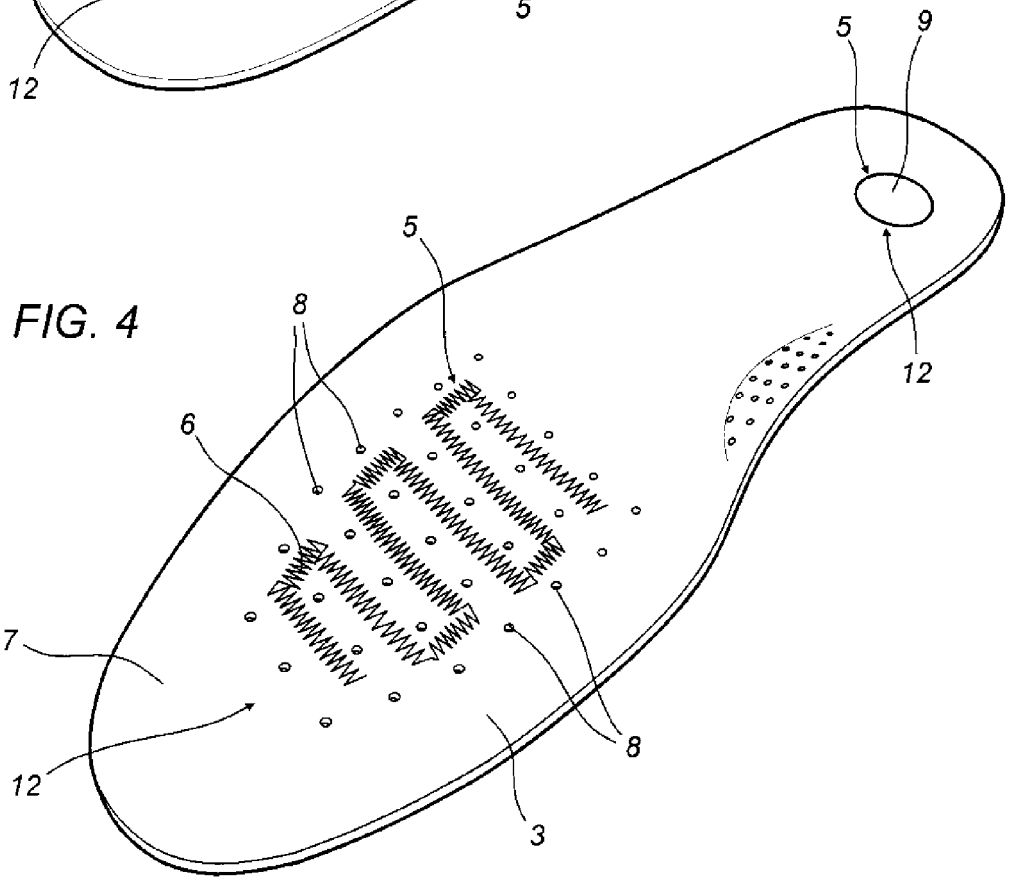


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 06 12 6533

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 April 2007	Vesin, Stéphane

CATEGORY OF CITED DOCUMENTS

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