

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 847 707 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.06.1998 Bulletin 1998/25

(51) Int Cl.⁶: **A43B 7/36**

(21) Application number: **97309976.5**

(22) Date of filing: **10.12.1997**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Katan, Nico Louis**
Radlett, Hertfordshire. WD7 8PX (GB)

(74) Representative: **Curtis, Philip Anthony et al**
A.A. Thornton & Co.,
Northumberland House,
303-306 High Holborn
London WC1V 7LE (GB)

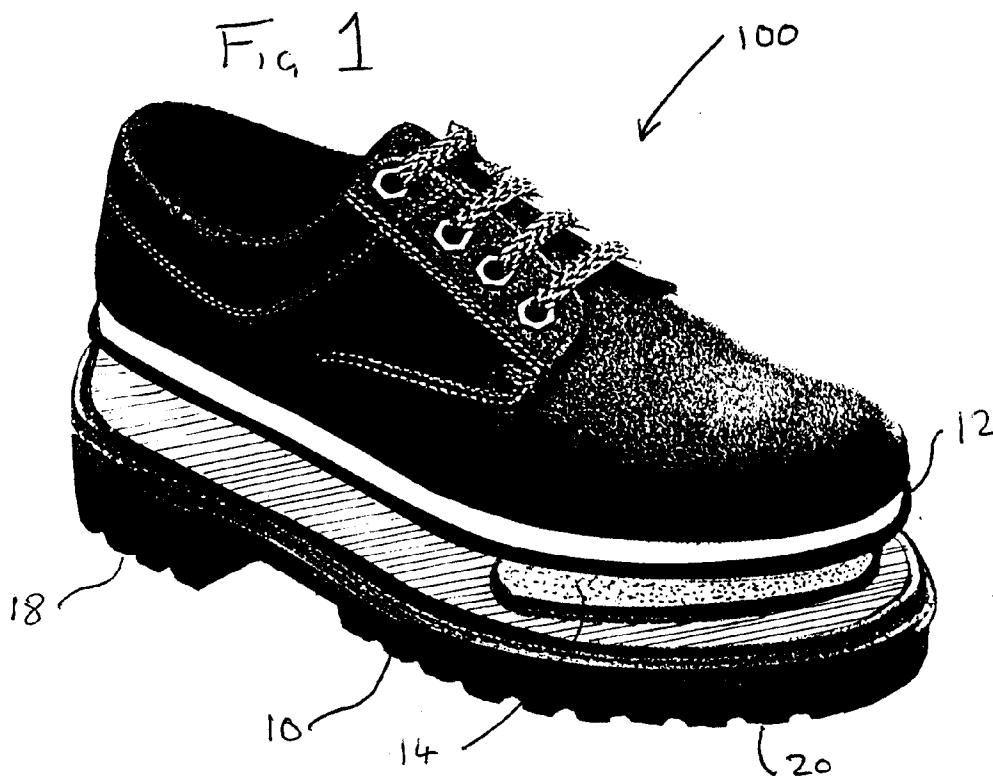
(30) Priority: **11.12.1996 GB 9625763**

(71) Applicant: **Shico Industrial Footwear Limited**
Wellingborough, Northants NN8 4SR (GB)

(54) **Anti-static footwear**

(57) Anti-static footwear comprising an outer sole (10) made of an anti-static material, an inner sole (12) made of an anti-static material, the inner sole (12) being

laminated with the outer sole (10), and an additional layer (14) made of an anti-static material, the additional layer being disposed between the inner sole (12) and the outer sole (10).



EP 0 847 707 A2

Description

This invention relates to anti-static footwear.

Anti-static footwear is required for health and safety reasons in many different working environments. In some environments, a spark created by the discharge of static electricity could be very dangerous, due to the risk of explosion or fire. For this reason, most countries set standards for the use of anti-static footwear in certain environments.

In the European Union, antistatic footwear must have a discharge rating of less than 1000 MΩ. However, in most industries where static electricity is a risk, footwear is used with a much lower discharge rating, typically 50 to 150 MΩ. However, even these levels are not low enough for the many industries where small levels of static discharge can cause destruction of sensitive components, or may be very dangerous. For example, 50 to 150 MΩ is too high for the electronics industry, particularly in the manufacture of computer components, in the explosives industry, and in the production of nylon fibres.

At present, there is no footwear available with a low enough discharge rating for these industries. As a consequence, workers in these industries need to be protected from static discharge by other means, such as an earthed wrist band. The use of an earthed wristband can be cumbersome, and it would be desirable to provide footwear that could provide a very low static discharge rating, so that the use of other means to protect against static discharges is no longer necessary.

We have now found a way to provide footwear which has a low enough static discharge rating that it can be used in the electronics industry, and which makes it possible to dispense with other means for protecting against static discharge. Broadly, we provide footwear having inner and outer soles, with an anti-static layer disposed within the inner and outer soles.

According to the present invention, we provide anti-static footwear comprising an outer sole made of an anti-static material, an inner sole made of an anti-static material, the inner sole being laminated with the outer sole, and an additional layer made of an anti-static material, the additional layer being disposed between the inner sole and the outer sole.

The composition of the additional layer is very important. Advantageously, the additional layer comprises particles of an anti-static material, at least some of said particles being disposed within said additional layer. It is particularly desirable that the anti-static particles are dispersed substantially homogeneously throughout the additional layer.

The additional layer preferably comprises a blend of a polymeric material with the antistatic particles.

It is especially advantageous that the additional layer is a solid foam material. In a particularly advantageous embodiment the additional layer is a closed cell foam, preferably formed of an ethylene homopolymer or

copolymer. We have obtained particularly good results when the additional layer is a low density polyethylene homopolymer or a copolymer of ethylene and vinyl acetate.

The additional layer preferably has a volume resistivity in the range 100 to 10000 ohm.cm, more preferably 500 to 2000 ohm.cm, most preferably substantially 1000 ohm.cm.

It is preferred that the foam is manufactured by blowing with nitrogen gas, preferably with substantially pure nitrogen gas. Suitable processes for producing the foams useful in the present invention are described in US-A-3640915, and in GB-A-899,389. Broadly, antistatic foams produced in accordance with the methods disclosed in these references are useful in the present invention.

One particularly suitable additional layer comprises a material sold under the name EVAZOTE by Zotefoams plc of Croydon, England. This is an ethylene-vinyl alcohol copolymer, which is made into a foamed product by expansion using pure nitrogen gas. The product has a density in the range 18 to 120 kg/m³. The most useful grade of EVAZOTE is the CN (ie "conductive") grade.

During manufacture of the footwear according to the invention, the inner and outer sole are laminated with the additional layer being disposed therebetween. The additional layer can be compressed between the inner and outer sole. Before compression, the additional layer may have a thickness of, for example, 5-10 mm, typically 6 mm.

In practice, the inner and outer soles have heel and toe areas. It is especially preferred that the additional layer is disposed between the toe areas of the inner and outer soles, and is not disposed between the heel areas of the inner and outer soles.

The use of inner and outer soles of an anti-static material is known in footwear. The anti-static inner and outer soles may be made of any conventionally available material.

For example, the inner sole may be made of cellulose fibre, latex and at least one anti-static additive. Typically there would be 60 to 90 wt% cellulose fibre, and 10 to 30 wt% latex and additives. One particularly suitable inner sole is available under the trade name Bontex 38 from Bontex S.A. This inner sole comprises 75 wt% cellulose fibre and 25 wt% latex and additives.

The outer sole may be made of a polymeric material with an anti-static additive. The outer sole may include other additives, such as plasticisers, accelerators, antioxidants and fillers (eg silica). The polymeric material is usually a rubber, such as nitrile rubber, and typically makes up over 50 wt% of the composition of the outer sole. The anti-static material typically comprises 5 to 10 wt% of the composition of the outer sole. There are many suitable materials for the outer sole; one suitable outer sole material is available from Procalcado under the trade name FOREVER

The footwear according to the invention may, of

course, be provided with other components required for footwear, such as an upper, shoe laces etc.

The footwear according to the invention has a much lower anti-static discharge rating than any other footwear available. We have obtained discharge ratings as low as 2 MΩ, which is more than low enough to be used in the electronics industry.

Reference is now made to the accompanying drawings, in which:

Fig. 1 is a perspective view of anti-static footwear according to the invention;

Fig. 2 is a plan view of an insole of the footwear shown in Fig. 1; and

Fig. 3 is a plan view of an additional layer of the footwear shown in Fig. 1.

In the drawings antistatic footwear generally designated 100 comprises an anti-static outer sole 10, an anti-static inner sole 12 and an anti-static foam layer 14. The inner sole 12 is arranged on top of the outer sole 10, with the additional layer 14 sandwiched between the soles 10 and 12. The footwear 100 also includes a conventional upper 16.

The footwear has a heel portion 18 and a toe portion 20. The foam layer 14 is provided only in the region of the toe portion 20, not the heel portion 18.

The foam layer 14 can be partly or completely disposed in a recess formed in the inner sole 12 and/or the outer sole 10.

It will be appreciated that modifications may be made to the footwear disclosed above.

Claims

1. Anti-static footwear comprising an outer sole made of an anti-static material, an inner sole made of an anti-static material, the inner sole being laminated with the outer sole, and an additional layer made of an anti-static material, the additional layer being disposed between the inner sole and the outer sole.
2. Antistatic footwear according to claim 1, wherein the additional layer comprises particles of an anti-static material, at least some of said particles being substantially homogeneously dispersed throughout the additional layer.
3. Antistatic footwear according to claim 1 or 2, wherein the additional layer comprises a polymeric material.
4. Antistatic footwear according to claim 1, 2 or 3, wherein the additional layer is a solid foam.
5. Antistatic footwear according to claim 4, wherein the solid foam is formed by expanding a polymer

with substantially pure nitrogen gas.

6. Antistatic footwear according to claim 4 or 5, wherein the additional layer is a closed cell solid foam.
7. Antistatic footwear according to any preceding claim, wherein the additional layer comprises an olefin homopolymer or copolymer.
8. Antistatic footwear according to any preceding claim, wherein the additional layer comprises a low density polyethylene homopolymer or a copolymer of ethylene and vinyl acetate.
9. Antistatic footwear according to any preceding claim, wherein the additional layer has a density in the range 18 to 120 kgm⁻³.
10. Antistatic footwear according to any preceding claim, wherein the additional layer has a density in the range 30 to 80 kgm⁻³.

