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EUROPEAN PATENT APPLICATION

21 Application number: 84305558.3

51 Int. Cl.⁴: A 43 B 7/06

22 Date of filing: 15.08.84

30 Priority: 15.08.83 US 523265

43 Date of publication of application:
27.03.85 Bulletin 85/13

84 Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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54 Air shoe.

57 An air shoe has a sole having a plurality of channels longitudinally and laterally in the upper surface of the sole, forming a multiplicity of sections at least partially surrounded by such channels. This sectionalized structure improves air flow beneath the wearer's foot as he walks or exercises, increases massagic action, and makes the shoe lighter and more flexible. An air flow slip sole is also placed on the sectioned sole.

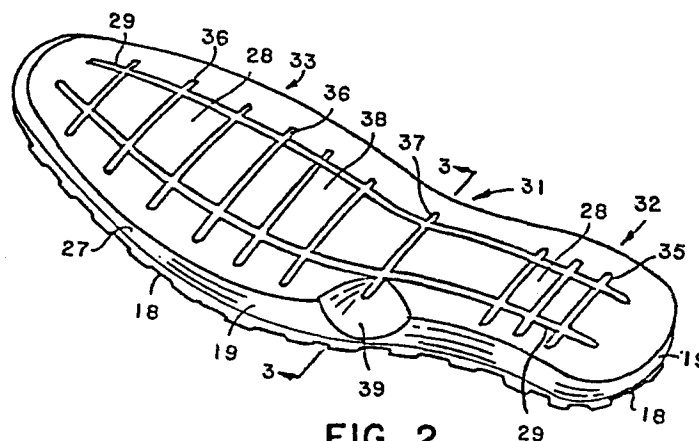


FIG. 2

An air shoe is herein defined as a shoe such as an athletic shoe or a sneaker, having ventilation passages to cause air to pass into the sole of the shoe and to cool the wearer's foot as the sole is alternately compressed and permitted to expand while the wearer runs or otherwise engages in sports or other activities. Air shoes are now quite common in commercial use.

According to the invention there is provided an air shoe as set out in claim 1 or claim 4 of the claims of this specification. The invention also includes a slip sole for a shoe as set out in claim 5 of the claims of this specification.

In one embodiment, a shoe has an outer sole of compressible material whose bottom surface may be designed or patterned as desired, for example to provide a desired tread for the shoe. An upper surface of such outer sole has at least one channel extending lengthwise from the heel portion of the shoe to the front sole or ball section and a multiplicity of channels in the lateral direction passing across the longitudinal channel or channels separating the upper surface or layer of the sole into a number of sections, each section having surrounding channels which both bring air across the foot and also contribute flexibility to the sole structure. In a preferred embodiment the sole has at least two longitudinal channels. At the instep or open mouth whose lower surface is curved downwardly forms an opening or orifice joining at least one lateral channel to the outside or ambient air, thus both providing a source of air for the channel structure and greatly reducing the possibility of water contamination.

The outer edge of the upper surface of the sole is generally solid, either being free from channels or having channels or reduced depth, and the upper sole thus provides a strong circumference support area. The lateral channels are generally of curved depth of indentation, being deeper at the centre of the shoe and more shallow as they approach the edges of the sole. The sole extends beyond the outer

line of the shoe.

In prior air shoes in actual public use there has been a solid intermediate layer or inner member positioned on the upper surface of the sole, this
5 intermediate layer compressing against the channels or air reservoir. According to the present invention such intermediate layer or member is eliminated; this structure combined with the multiple channels and sectionalization significantly decreases shoe weight
10 and further increases flexibility, particularly the ability of the individual sole sections to act individually on the sole of the foot. In the preferred embodiment of the invention, a porous inner sole is positioned directly on the upper surface of the sole.

15 In one embodiment of the invention there is a slip sole positioned on the upper surface of the outer sole, or this slip sole may be utilized in other forms of air shoes. This slip sole has a thin solid outer area or rim for "lasting" or fastening the shoe upper
20 to the sole. The central area within this rim is spongy or porous and has an upper thin layer of mesh across the top and a thin form body beneath the mesh, this foam body being made of polyurethane, rubber of the like. This slip sole is thin and exceptionally
25 flexible, this being of great importance to athletes, and it circulates air from the channel pattern underneath and across the foot. If another insole is used, this slip sole enhances such other insole, leaving it also flexible and improving air circulation.

Examples of the invention will now be described with reference to the accompanying drawings in which:

Fig. 1 is a view of a shoe having an air cooled sole,

Fig. 2 is a top perspective view of a lower sole according
5 to one embodiment of the invention,

Fig. 3 is a rear cross section of the sole shown in Fig. 2,
taken along the line 3-3,

Fig. 4 is a side cross section of the sole shown in Fig. 2,

Fig. 5 is a top view of a slip sole according to one embodiment
10 of the invention,

Fig. 6 is a side cross section of the slip sole shown in
Fig. 5,

Fig. 7 is a top perspective view of a lower sole according to
another embodiment of the invention,

15 Fig. 8 is a fragmentary top view of a portion of an inner
sole according to Fig. 1.

In Fig. 1 is shown an athletic shoe generally designated 10 having an upper 11 of usual design including a casing 12, an opening (not shown) with a tongue 14, laces 15 and reinforcing elements 16.

- 5 Lasted or secured to the bottom of the shoe upper 11 is an outer sole 17 comprising two sole body portions secured together across the sole area. Inside the shoe upper 11 are an inner sole 23 positioned against the upper surface 24 of the upper sole body 19.
- 10 Positioned on inner sole 23 is a slip sole or lasting sole 25. The shoe upper 11 and the inner sole 23 are adapted to receive a wearer's foot in conventional manner in shoe design and construction, with or without slip sole 25. Both inner sole 23 and slip
- 15 sole 25 have openings leading from outer sole 17 to the shoe interior.

- In Fig. 2 outer sole 17 comprises tread body 18 secured to sole body 19 these two bodies 18 and 19 forming a unitary body. Tread body 18 extends forward
- 20 beyond the front of sole body 19 and is adapted to curve upwardly around the toe of upper 11 as shown in Fig. 1. Tread body 18 is of suitable material and design, such as a rubber sole with a conventional tread design adapted to meet a surface on which the
- 25 wearer is standing, walking or running. Tread body 18 takes the major wear from use of the shoe. Upper sole body 19 is of the same or different composition.

- The upper surface 27 of upper sole body 19 has two longitudinal channels 29 extending nearly the
- 30 length of the sole body, terminating at the front shortly behind the front end of sole 17 and terminating at the rear shortly in front of the heel end of sole 17. Sole body 19 has an instep area generally designated
- 35 31, slightly narrower than the rest of the sole body 19, with a heel area generally designated 32 and a

ball area generally designated 33 adapted to be positioned beneath the ball of the foot of the wearer. Longitudinal channels 29 extend largely through the areas of the heel area 32 and the toe area, passing through the instep area 31. Within the heel area 32 are several lateral channels 35, three such lateral channels being shown. Within the ball area 33 are several lateral channels 36, six such lateral channels being shown. In the instep area 31 is a lateral channel 37. In the embodiment of the invention shown in Fig. 2, the single lateral channel in the instep area 31 interconnects with a port or mouth 39 which in turn communicates with the external environment.

On the upper surface 27 or sole body 19 area, accordingly, the various longitudinal channels 29 and the lateral channels 35, 36 and 37 which divide the sole body into a multiplicity of raised sections 38. As shown, the segments toward the center of the sole are bounded on all sides by such channels 35, 36 and 37, whereas at the edges of the sole body 19 such sections are bounded on three sides by such channels and on the outer or edge side of the sections they are integrally formed into the sole body. Referring to Fig. 1 is observed that instep channel 37 is at the throat of mouth 39 and is well raised above the level of the ground and generally will be above the height of a shallow puddle. As shown in Fig. 9, the bottom of the mouth 39 slopes sharply down toward the mouth opening, providing drainage for any water picked up at a puddle during use.

In Fig. 3 is shown the sole body 19 of the article shown in Fig. 1, having an outer sole or tread 18. Longitudinal channels 29 and 30 are shown, having a depth approximately the same as the depth of lateral channel 36 in the central shoe areas. As shown, the ends of lateral channel 36 have upwardly

curving end portions 41 reaching the surface 27 of the sole body a small distance short of the edge of the sole. In the Fig. the ball portion of sole body 19 is wider than the body at the point of the cross section, thus conforming with a typical foot shape.

Similarly in Fig. 4 is shown the sole body 19 having a multiplicity of lateral channels 36 cut across the upper portion of the body. As can be seen in Fig. 4, the front section 42 of tread body 18 extends forward from the sole body 19, being adapted to be formed upwardly around the toe of shoe 10.

In Fig. 5 and Fig. 6 is shown a slip sole 25 having a solid outer frame 45 surrounding an inner air section having an upper foam layer 46 and a lower webbing area 47. Around the edges of the frame 45 is stitching 49 or other means to fasten frame 45 to webbing 47.

In Fig. 7 is shown another embodiment of the invention having a sole body 59 with a tread section 18 as in the embodiment of the preceding Figures. Sole body 59 has two longitudinal channels 69 running nearly the length of the shoe, as with the embodiment in Fig. 2. A multiplicity of lateral channels 66 cross longitudinal channels 69 along the upper surface of sole body 59, the lateral channels 66 extending to the edges of sole body 59 and opening to the surrounding environment. An instep lateral channel 67 terminates in outlet part 39. Thus the network of crossing channels 66 and 69 is accessed to the surrounding environment or atmosphere.

Longitudinal channels 29 and 30 are of relatively uniform depth throughout the greater part of the length thereof, and may, if desired

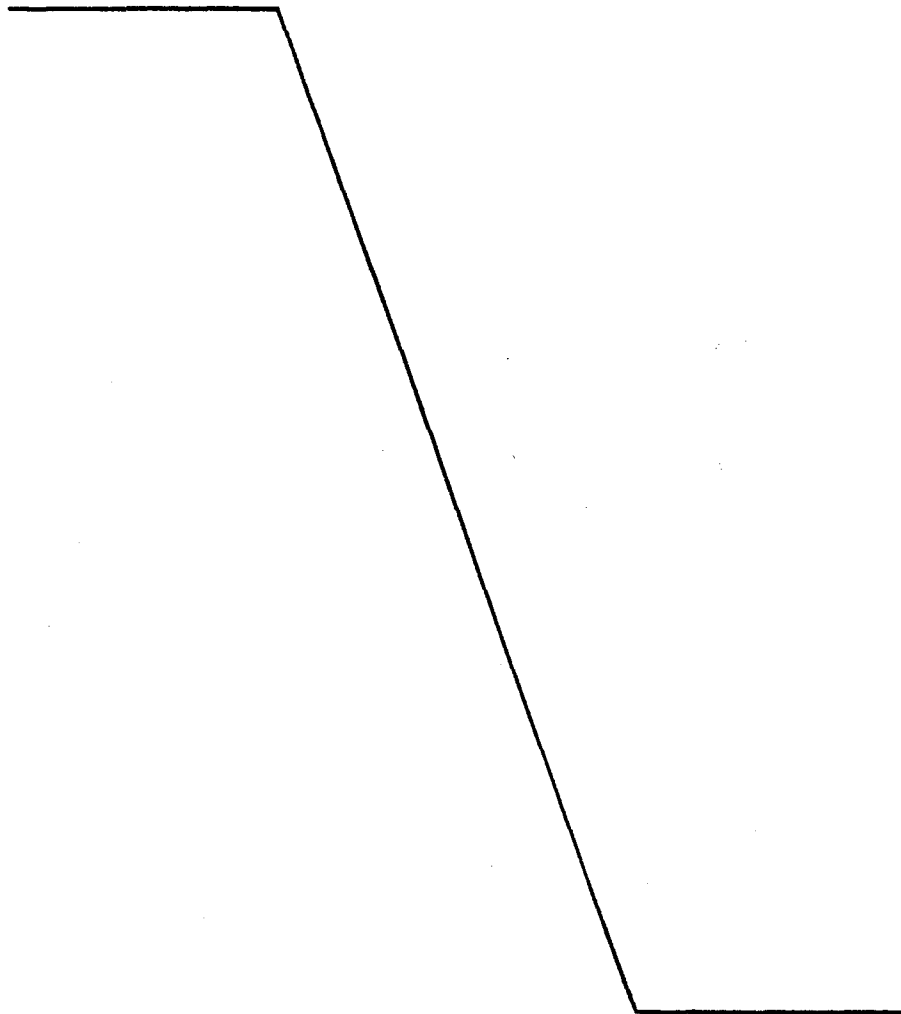
taper to shallower depth and thus taper to the level of the surface of body 19 at either end of the shoe body. Lateral channels 36, as shown in Fig. 5 may also be of relatively uniform depth, tapering up to the surface of sole body 10 at the ends of the channels. One procedure of manufacture contemplates that the channels may be cut into or ground into the sole body with a round grinding implement. Thus, through the greater part of the length and width of the sole, lateral channels 36 and longitudinal channels 29 and 30 present a cross design of relatively uniform depth and channel width. In the embodiment shown in Fig. 1, this network of crossing channels communicates with the outside environment through instep channel 37.

In the embodiments of the invention shown in Figs. 2 and 7, and in the other related figures, there is a network of crossing channels running substantially the length and width of the shoe, communicating with the outside air and carrying the air beneath the foot of the wearer. These channels 29, 35, 36 and 37 also divide the sole into sections 38, as shown. These individual sections 38 support the foot of the wearer at the individual areas of each channel. Between the sections, the channels carry air from one position to another, lend flexibility to the sole by virtue of providing thinner sole portions, and in addition significantly decrease the weight of the sole. Since the sole 19 is a significant portion of the weight of the total shoe, this produces a significantly lighter and therefore more desirable shoe.

The entire sole 19 is more flexible as a result of the channel flexibility, permitting the

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sole to bend more easily with flexing of the foot during walking, running, or other activity. In addition, the individual sections 38 are flexibly movable with respect to one another. Thus, one
5 section 38 may be raised as a result of pressure from the surface on which the person is standing or moving, while an adjacent or



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nearby section is not thus raised. As a consequence, the sole partly
massages the foot during use, as each section individually moves in a
massaging motion, and each section is individually compressed or released
from compression, thus increasing the compression and expansion of the
5 channels and the air in such channels. As the wearer moves, stepping
from one foot to the other, the sole in general and the individual sections
38 are slightly compressed and expanded causing channels 29, 35, 36 and
37 (or channels 66 and 69 of Fig. 7) to draw air into sole body 19 and
spreading the air across the entire foot area. These channels are
10 relatively shallow and the absence of a large reservoir as in employed
on certain air shoes causes the air to spread rapidly across the entire
foot area.

Insole 23 shown in fragment in Fig. 8 is of a suitable material
such as leather, plastic or the like. A very satisfactory material is
15 a soft flexible molded plastic material covered on its upper surface with
a soft fibrous layer fitting comfortably against a wearer's foot. A
number of holes 30 passing through the insole from its upper surface
through its lower surface to permit the passage of air therethrough.
These holes 30 may be of relatively small size such as pinhole size or
20 moderately larger than pinhole size.

The slip sole shown in Figs. 5 and 6 can be used separately in
ordinary shoes of other types and in air shoes of other kinds to carry
air to the sole of the wearer's foot, breathing as the wearer's foot
presses on the slip sole and releases pressure. It is well adapted to be
25 joined with the shoe of Fig. 1 and with the sole of Fig. 2 and Fig. 7 to

assist in foot breathing and in rapid spread of air throughout all foot and shoe areas. In particular, as air enters channels 29 and 36 of the shoe in Fig. 2, slip sole 25 promptly leads such air through all the channels and to all foot areas.

C L A I M S :

1. In an air shoe having a shoe upper and a sole joined to the upper,

an outer sole having a predetermined tread design on its lower surface,

5 an upper surface on said outer sole,

at least a pair of longitudinal channels in said upper surface extending from a position within the heel portion of said sole to a position within the ball portion of said sole.

10 a multiplicity of lateral channels in said upper surface crossing said longitudinal channels to divide said upper surface into a multiplicity of individual sections, each section at least partially surrounded by channels, at least one of said lateral channels being in said heel portion, a plurality of
15 said channels being in the ball portion and at least one of said channels being in the instep portion of said sole, to provide an intercommunicating network of channels as an air passage to the various longitudinal and lateral channels across a substantial
20 area of said sole,

the channel at said instep portion leading from said intercommunicating channel network and terminating in an enlarged mouth at said instep
25 location,

said mouth having a bottom surface declining downwardly from said channel to an open end at the edge of said sole.

2. A shoe according to Claim 1 having an inner
30 sole located on the upper surface of said sole and extending beyond the edges of the upper surface of said sole, providing lasting between said sole and said shoe upper.

3. A shoe according to Claim 1 wherein a plurality of said lateral channels extend to the edge of said sole to communicate with the external ambient atmosphere.

5 4. In a shoe, in combination,
a sole body having a predetermined tread design
on its lower surface,
an upper surface on said sole body,
a multiplicity of longitudinal and lateral
10 channels in said upper surface forming a network of
intercommunicating channels and dividing said upper
surface into a multiplicity of sections, each section
at least partially surrounded by said channels,
at least one of said channels being at the
15 instep portion of said sole and leading to an external
enlarged mouth at said instep portion, and
an inner slip sole having an upper mesh layer
adapted to contact a wearer's foot and a lower foam
layer,
20 an exterior frame on said slip sole attached
to the shoe upper to provide lasting thereto and to
the lower foam layer.
The communicating network of channels and the
foam layer of the slip sole being adapted to provide
25 air flow across substantially the entire foot area.

5. A slip sole for a shoe comprising
an outer frame surrounding a sole area corresponding to the foot area of a shoe,
positioned within said frame a breathing area
30 having
an upper mesh layer providing structural
strength to said breathing area and

a lower foam layer comprising a plastic foam material bonded to the upper mesh layer,

the outer frame, the mesh layer and the foam layer being secured together to form a unitary
5 structure.

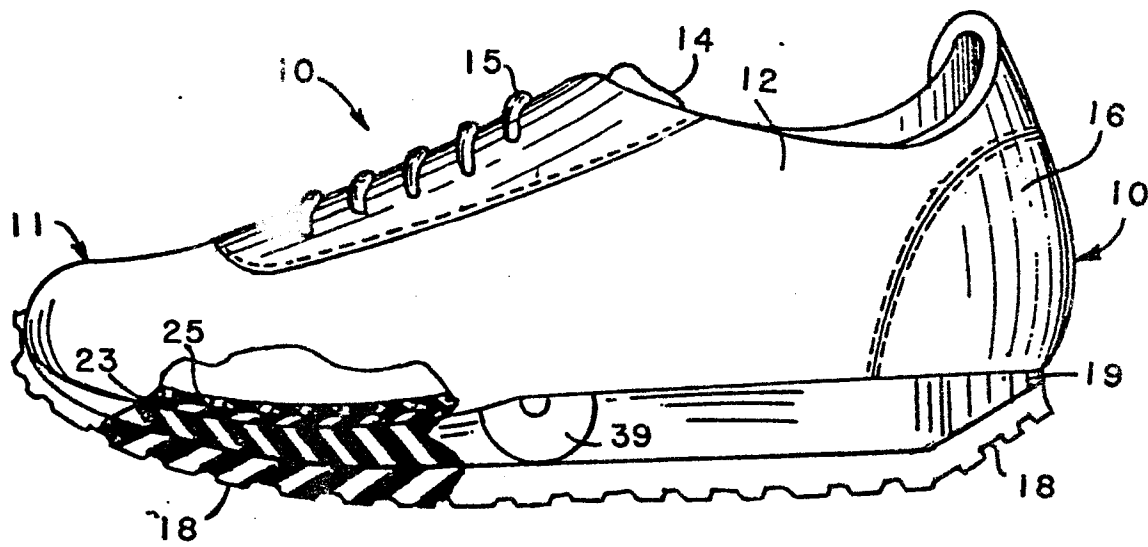


FIG. 1

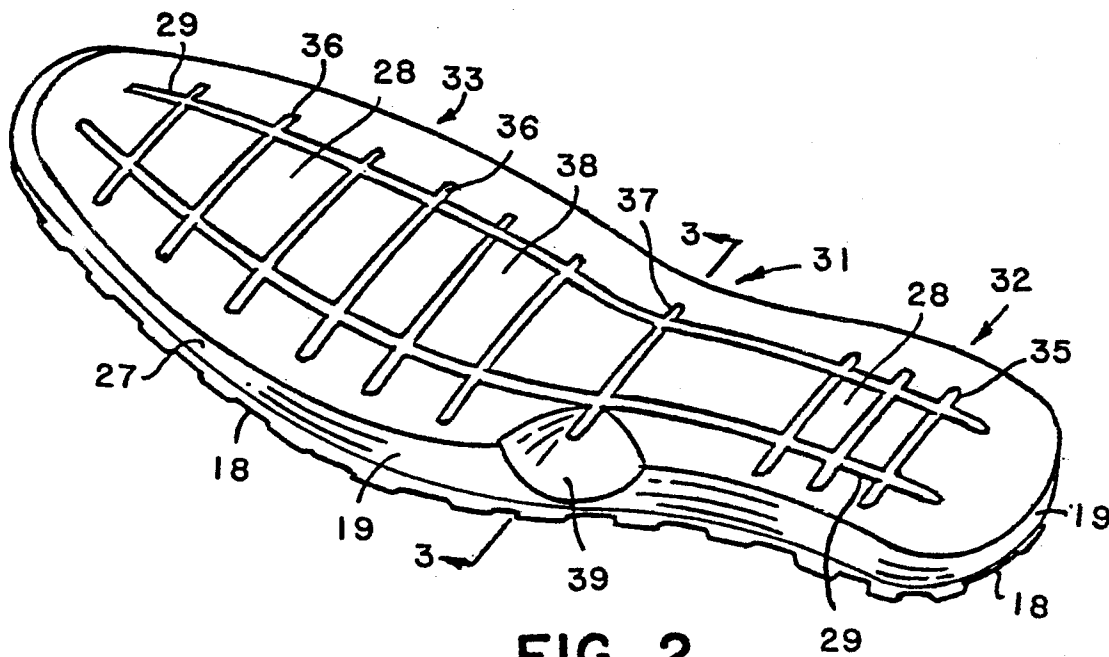


FIG. 2

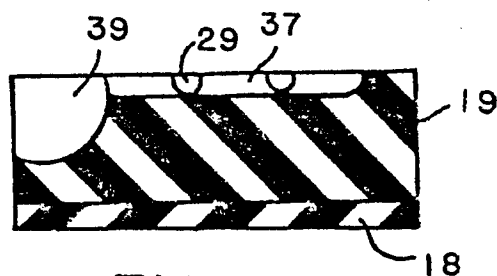


FIG. 3

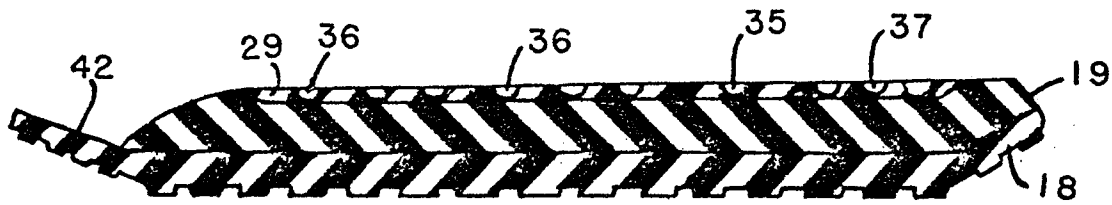


FIG. 4

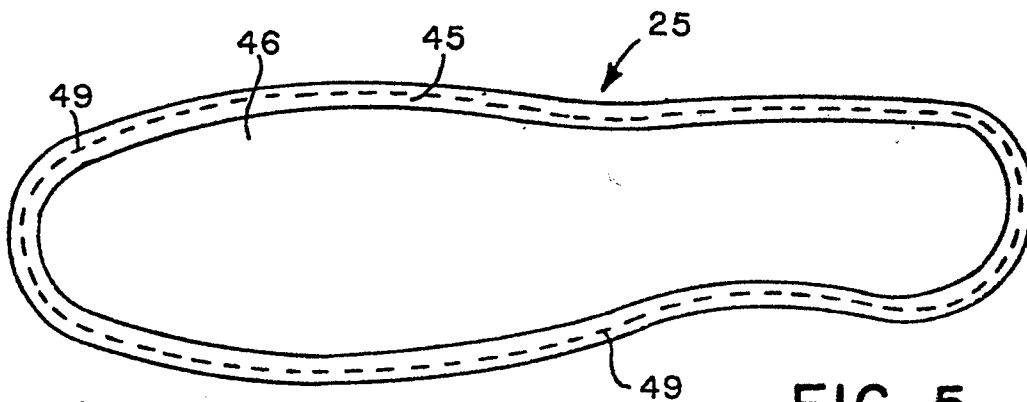


FIG. 5

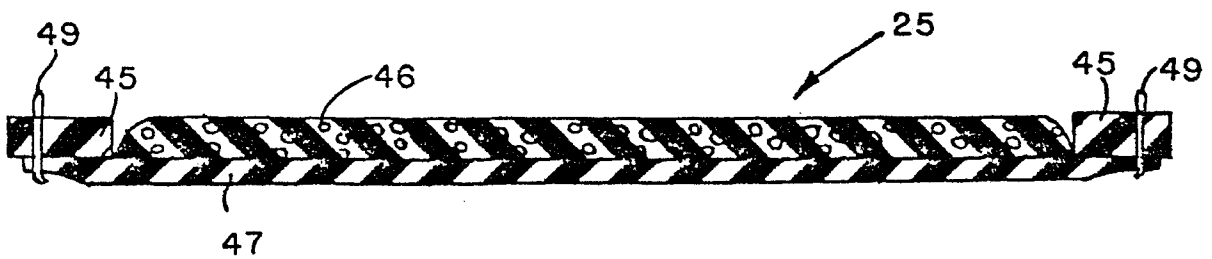


FIG. 6

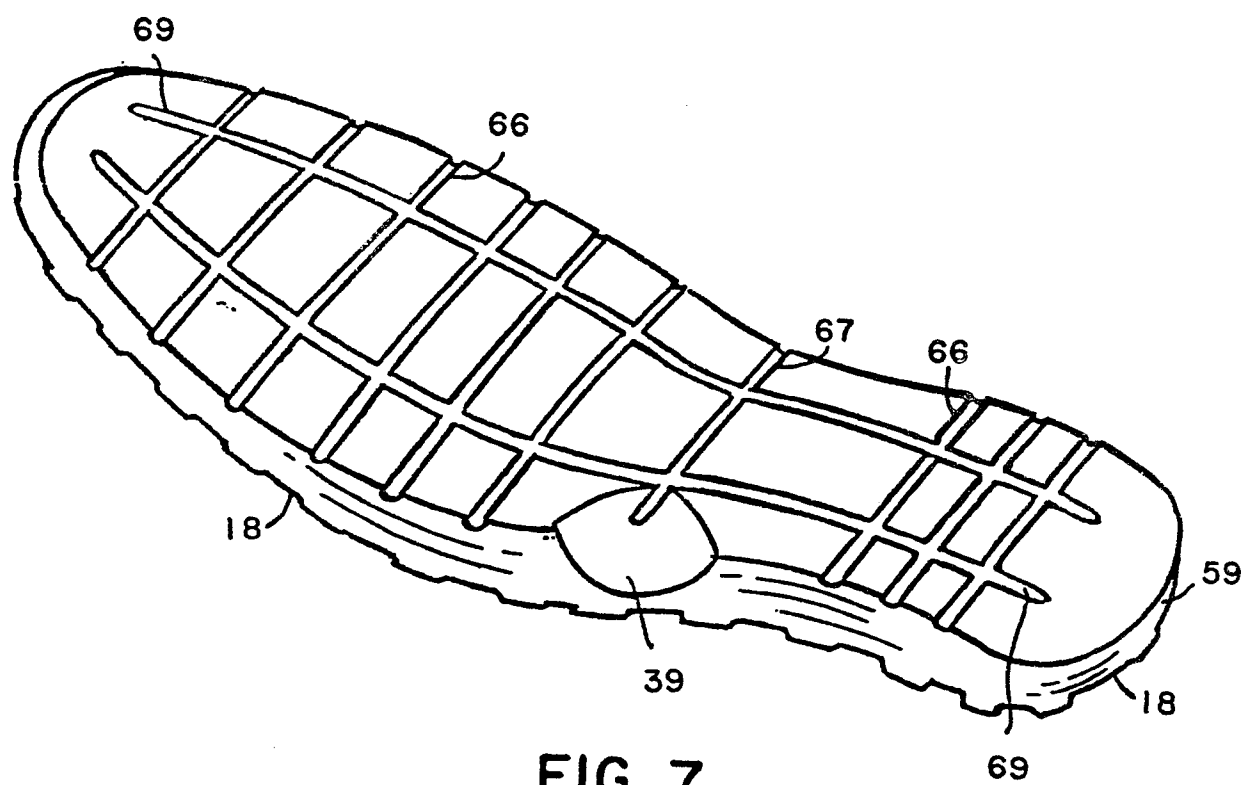


FIG. 7

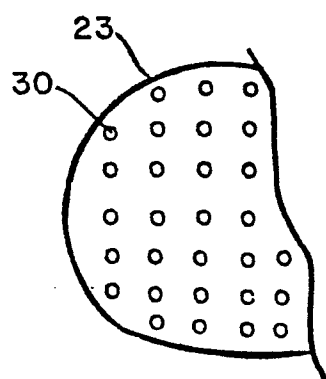


FIG. 8



European Patent
Office

EUROPEAN SEARCH REPORT

0135368

Application number

EP 84 30 5558

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-1 304 781 (N.V. VEREENIGDE NEDERLANDSCHE RUBBERFABRIEKEN) * Abstract nos. 1-5; figures 1-4 *	1-5	A 43 B 7/06
A	FR-A- 718 476 (E. MEUCCI) * Page 4, lines 18-43; figures 2,3 * -----	1-5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			A 43 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19-11-1984	Examiner MALIC K.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			