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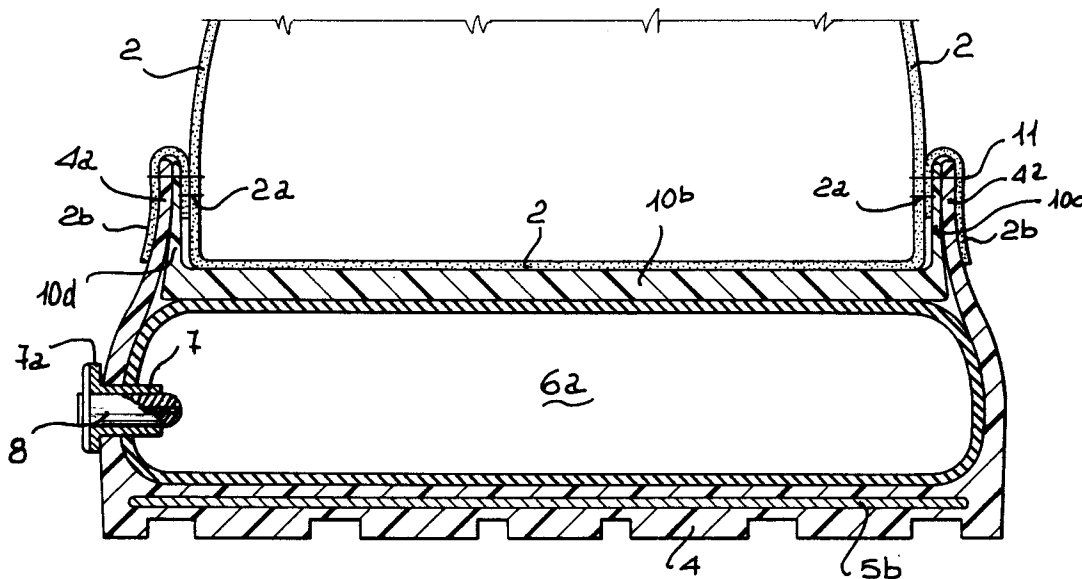
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54 Shoe with sole including hollow space inflatable through removable bladder.

57 Shoe formed by an upper (2) and a flat sole (4) of the type comprising an air chamber (6) made up of compartments, capable of being inflated by means of valves (8), the flat sole (4) of which is provided with a raised perimetrical edge (4a) to which are made integral such air chamber (6), a rigid

countersole (10) and upper (2) by means of stitching, gluing or the like, there being also included in such flat sole (4) a rigid layer (5), such combination providing a flexible cavity capable of allowing flat and parallel movement of the arch support of the shoe in relation to the outer sole.

Fig. 3



EP 0 576 734 A1

The object of this invention is a shoe provided with an interposed cavity which can be inflated with compressed air to regulate the flexibility of the sole.

It is known that in all the daily activities performed by people major importance is attached to comfort during walking, which is greatly influenced by the type of shoe worn by the user; in particular such comfort in walking is determined by the degree of characteristic flexibility of the sole of the shoe, which flexibility should differ for different needs such as, for example, the practice of sporting activities which necessitates rigid soles to restore the necessary force of reaction, for example when jumping, or the normal gait of an elderly person who needs greater softness to cushion the rebound sustained by the foot with each step on the ground.

There are also known certain developments intended to provide a solution to this problem and based either on the use of different materials capable of imparting higher or lower rigidity to the sole, or on the use of insoles with air chambers of various designs.

Such air insoles known in themselves, for example by Patent EP 0 293 034 in the name of the same applicant, do however pose major disadvantages on being applied to a shoe, either because of the difficulty of insertion therein during a normal industrial processing cycle, or because of the basic impracticability of achieving correct regulation of the pressure in the air chamber without rendering uncomfortable the said insole, which is either too deflated, and therefore superfluous, or too inflated, resulting in the foot being supported on hard surfaces which soon cause aching feet and an awkward gait.

There is therefore posed the technical problem of developing a shoe which is provided with a sole of inflatable type in order to regulate the flexibility of such sole so as to modify the features of the shoe and make it suitable both for normal walking and for the practice of sporting activities.

The shoe should furthermore ensure maximum comfort and waterproofness under any conditions and should be capable of easy, repeatable and low-cost production.

Such problems are solved according to this invention by a shoe formed by an upper and by a flat sole of the type comprising an air chamber made up of compartments, capable of being inflated by means of valves, in which the flat sole is provided with a raised perimetrical edge to which are made integral such air chamber, a rigid countersole and the upper by means of stitching, gluing or the like, there being also included in such flat sole a rigid layer, such combination providing a flexible cavity capable of allowing flat and parallel

relative movement of the arch support of the shoe in relation to the outer sole.

In a preferred form of implementation of the shoe according to the invention, such compartmented air chamber is made integral with the sole in a reversible manner, and furthermore such raised edge of the outer sole is provided with at least one through hole at right angles to the surface of the said edge.

Provision is also made for such rigid layer integral with the outer sole to be preferably included within the thickness of the said sole, albeit divided into two parts, comprising a front part and a rear part, articulated to one another by means of a transverse-axis hinge.

In the shoe according to the invention such rigid countersole is in turn divided into two parts, comprising a front part and a rear part, articulated to one another lengthwise by means of a transverse hinge, such front and rear parts being delimited peripherally by a raised edge capable of being made integral with the matching raised edge of the outer sole.

Further features of the shoe according to the invention will become apparent from the following description with reference to the accompanying drawings, which show:

In figure 1 : an axonometric view of a shoe according to the invention;

In figure 2 : an exploded view of the shoe in figure 1;

In figure 3 : a sectional view of the shoe according to plotting plane II-II in figure 1, and

In figure 4 : a plan view of the air cavity according to the invention.

As shown in the figure, shoe 1 according to the invention consists of an upper part commonly known as an upper 2, the lower part of which is formed according to the right or left shape of the foot.

To such upper 2 is made integral, for example by stitching 2a or the like, a perimetrical strip 2b made of the same material as used for upper 2, capable of being turned from top to bottom, and vice versa, around such line of stitching 2a, as will become more clearly apparent from the following.

The part of the shoe forming the sole is in turn formed of several parts made integral with one another; more particularly it consists of an outer sole 4 which has a surrounding vertical band 4a provided with holes 4b on a horizontal axis; in such outer sole 4 is furthermore included, using a method known in itself, a thin layer 5 of rigid material capable of imparting greater rigidity to the said sole.

Such layer 5 is divided into two parts, a front part 5a and a rear part 5b, which are articulated to one another by means of a transverse hinge con-

sisting of a thin strip of flexible material. To outer sole 4 is made integral an air chamber 6 suitably shaped (figs. 2 and 4) which, as shown in the figures, is preferably divided into three spaces capable of being inflated separately and corresponding respectively to heel area 6a, arch support area 6b, 6c and toe area 6d.

Each of these spaces is then connected, by means of a perforated cylindrical chamber 7, to one-way valves 8 through which it is possible to pump into each space the volume of air needed to obtain the desired rigidity; in order to allow improved distribution of air in such spaces they are isolated from one another as illustrated in figure 4, and more precisely heel 6a is independent, two spaces 6b of the arch support are connected to one another and a third space 6c of the arch support is connected to spaces 6d of the toe, such gluing being carried out by means of connecting channels 109.

Such spaces 6a and 6d are furthermore separated transversally from spaces 6b and 6c by thin-transverse, continuous, solid strips 9 made of the same material, acting as a transverse-axis hinge around which such spaces are articulated to enable them to adapt to the different movements of the foot when walking. Likewise, spaces 6b and 6c of the arch support are divided by like strips 9a of material arranged longitudinally.

Such air chamber 6 is made integral with outer sole 4 by means of perforated cylinders 7 restraining valves 8, which are forced into holes 4b of edge band 4a until each circular edge flange 7a protrudes from holes 4b, causing the locking of air chamber 6 to sole 4.

As is apparent from figure 3, in the still available thickness of band 4a is inserted a countersole 10 which is divided into two parts, front 10a and rear 10b, by means of a strip 10c of thin material forming a horizontal/transverse-axis hinge which allows articulation of the front part relative to the rear part in the manner already described for air chamber 6.

Countersole 10 is then completed by a surrounding vertical edge 10c the height of which is such as to arrive substantially at the level of the upper free end of edge 4a of outer sole 4 (fig. 3). Once upper 2 is assembled to the outer sole, completed in the manner described above, band 2b is turned down to overlap edge 4a, whereupon the shoe is made ready for final stitching 11.

Such final stitching not only makes upper 2 integral with outer sole 4, but also fixes in relation to the latter the assembly formed by air chamber 6 and countersole 10, thus making it possible for such assembly to function as a proper shock absorber having two fixed points: at the top, the final stitching, and at the bottom the outer sole and

therefore the ground, the regulation of the stiffness of such shock absorber being achieved by the higher or lower internal pressure of the air chamber.

It should moreover be emphasized that the insertion of countersole 10 makes it possible to obtain uniform distribution of the pressure of the air chamber on the plan of upper 2, and therefore on the wearer's feet, which pressure would in the absence of the countersole be concentrated in much smaller surface areas which would be equivalent, in regard to the feet, to the presence of foreign bodies such as pebbles or the like inside the shoe.

Many alternatives may be introduced in the practical implementation of the constructional details without thereby departing from the scope of protection of this invention as described in the following claims; in particular many alternatives may be adopted to render sole 4 integral with upper 2 as an alternative to the method described with reference to the example in the figure, depending on the type of model and of the materials used to manufacture the shoe.

Claims

1. Shoe formed by an upper (2) and a flat sole (4) of the type comprising an air chamber (6) made up of compartments, capable of being inflated by means of valves (8), characterized in that flat sole (4) is provided with a raised perimetrical edge (4a) to which are made integral such air chamber (6), a rigid countersole (10) and upper (2) by means of stitching, gluing or the like, there being also included in such flat sole (4) a rigid layer (5), such combination providing a flexible cavity capable of allowing flat and parallel movement of the arch support of the shoe in relation to the outer sole.
2. Shoe according to claim 1 characterized in that such compartmented air chamber (6) is made integral with sole (4) in a reversible manner.
3. Shoe according to claim 1 characterized in that such raised edge (4a) of outer sole (4) is provided with at least one through hole (4a) at right angles to the surface of the said edge.
4. Shoe according to claim 1 characterized in that such holes are preferably three in number.
5. Shoe according to claim 1 characterized in that such rigid layer (5) integral with outer sole (4) is preferably included within the thickness of the said sole.

6. Shoe according to claim 1 characterized in that such rigid layer (5) is divided into two parts comprising a front part (5a) and a rear part (5b) which are articulated to one another by means of a transverse-axis hinge. 5
7. Shoe according to claim 1 characterized in that such rigid countersole (10) consists of two parts comprising a front part (10a) and a rear part (10b) which are articulated to one another lengthwise by means of a transverse hinge (10c), such front and rear parts being delimited peripherally by a raised edge (10d) capable of being made integral with the matching raised edge (4a) of the outer sole. 10
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8. Shoe according to claim 1 characterized in that to such upper (2) is made integral a strip (2b) capable of being turned over around its line of adherence to the said upper. 20
9. Shoe according to claim 1 characterized in that such strip (2b) is made integral with upper (2) by means of stitching (2a) on one of its edges, the other edge being free so as to be turned over the edge (4a) of sole (4). 25

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Fig. 3

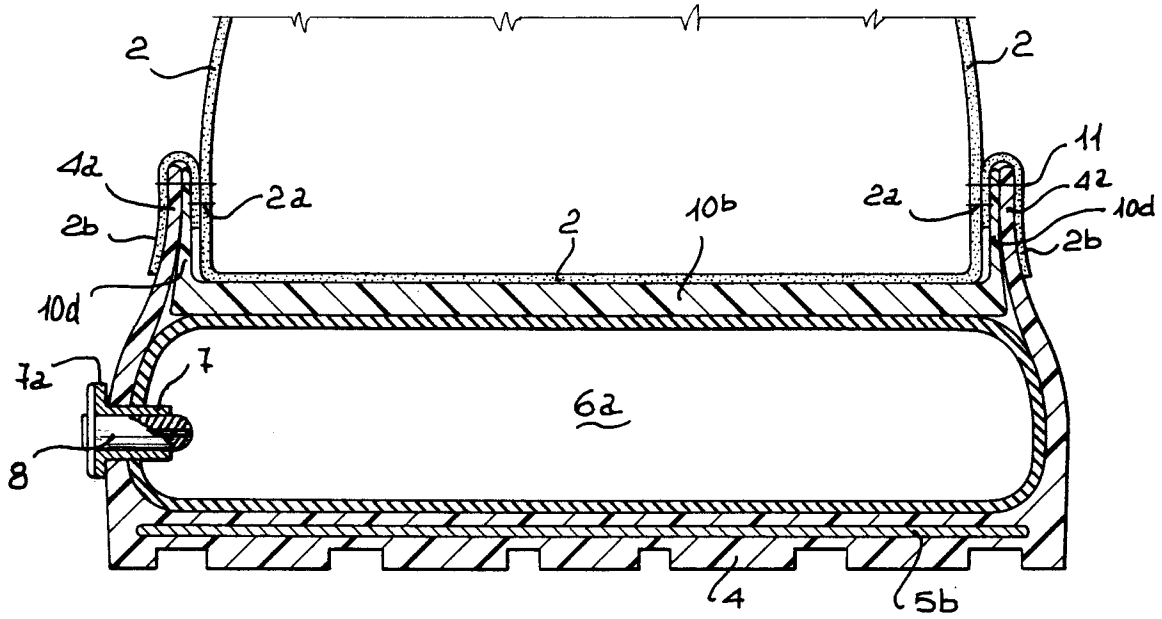
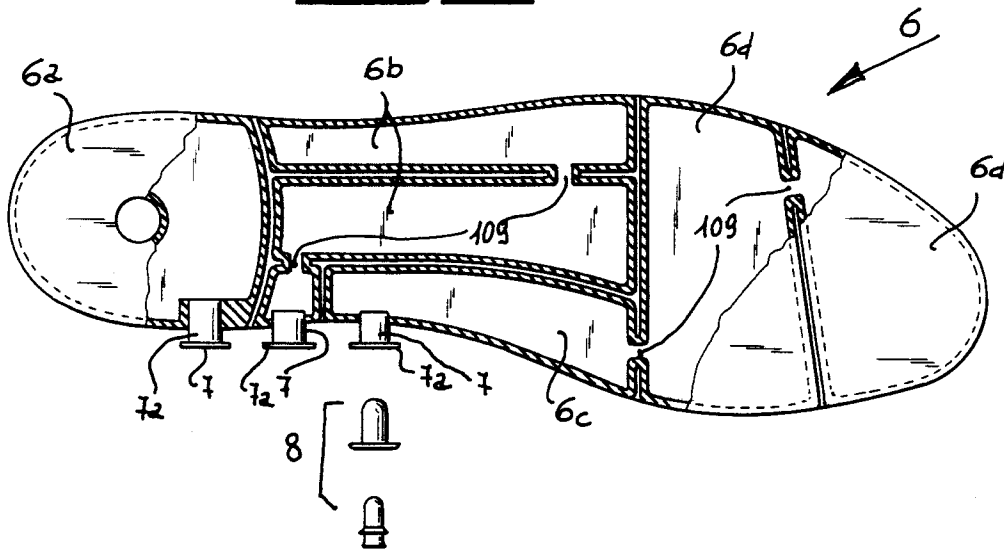


Fig. 4





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EUROPEAN SEARCH REPORT

Application Number

EP 92 20 1478

DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	US-A-4 462 171 (L. WHISPELL) * the whole document * ---	1
A	US-A-4 670 995 (ING-HUNG HUANG) * the whole document * ---	1
A	US-A-2 109 180 (M. MOHUN) * the whole document * ---	1
A	US-A-2 037 230 (N. HACK) * the whole document * -----	1
The present search report has been drawn up for all claims		
Place of search THE HAGUE		Date of completion of the search 22 DECEMBER 1992
		Examiner DECLERCK J.T.
CLASSIFICATION OF THE APPLICATION (Int. Cl.5) A43B13/20		
TECHNICAL FIELDS SEARCHED (Int. Cl.5) A43B		
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		

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