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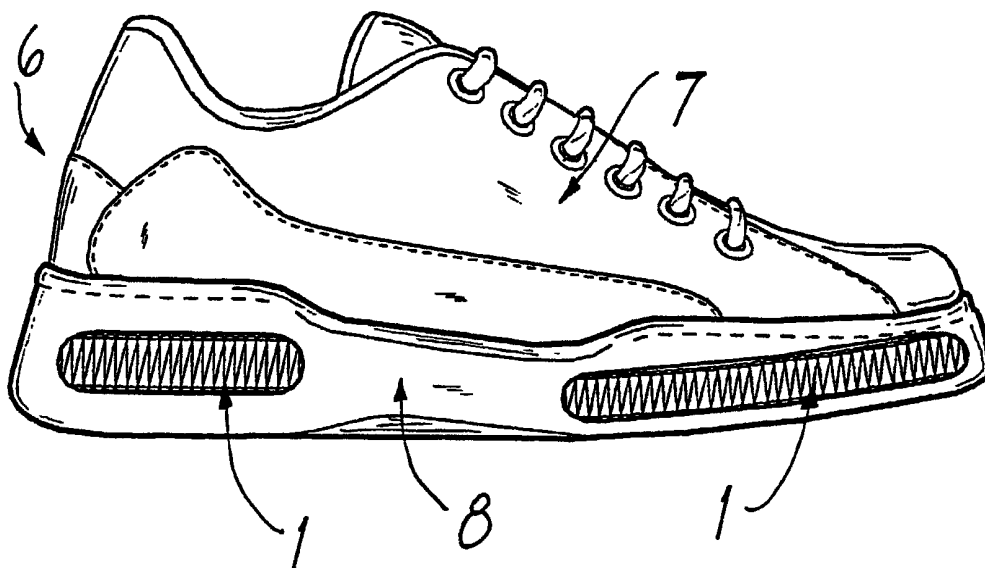
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(54) Title: VIBRATION ABSORBING DEVICE, PARTICULARLY FOR SHOES OR SPORTS IMPLEMENTS



(57) Abstract: A vibration absorbing device (1), particularly for use in shoes (6) or sports implements, is constituted by a mesh which has a vertical warp and two faces, has no filling, is elastically deformable and is embedded or coated with at least one layer of plastic material which is adapted to change its deformability.

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VIBRATION ABSORBING DEVICE, PARTICULARLY FOR SHOES OR SPORTS IMPLEMENTS

Technical field

The present invention relates to a device for absorbing vibrations,
5 particularly for use in footwear, such as for example shoes, climbing boots, ski boots or trekking boots, or in sports implements, including for example skates, skis and tennis racquets.

Background art

Conventional devices for absorbing vibrations are currently
10 commercially available and are mainly applied in sports shoes for tennis, basketball or running.

In particular, vibration absorbing devices are widely used for reducing the shocks caused by the impact of the shoe against the ground during sports activity.

15 These conventional devices are generally constituted by one or more cavities or cells formed for example inside the sole of the shoe, usually in the heel region, which contain air or optionally viscous fluid substances, commonly known as gels, constituted by silicone foam or by other synthetic substances.

20 Other conventional devices, also used in the sole of sports shoes, are constituted by thin layers of elastically compressible material or by honeycomb cells which contain air or gel.

EP no. 878142 discloses an insole for sports shoes which comprises an insole made of soft elastic material and of an undulated layer which is
25 arranged inside said insole at least in the heel region.

The amplitude and wavelength of the undulated layer can be variable both along the longitudinal axis, from the front edge to the rear edge, and between the median region and the lateral ends of said heel region, thus entailing a range of different stability and damping solutions.

30 In the field of sports implements, vibration damping is achieved for

example by adopting, in tennis racquets, internally hollow frames or handles with layers of soft or elastically compressible material associated therewith.

In the shoe manufacturing field, solutions are currently known which are adapted to reduce the transmission of stresses to the foot caused by vibrations transmitted by the skiing surface, by the supporting surface, or due to skating and others: these solutions consist in providing specific fixed inserts which are made of a single material of varying softness which is arranged for example in a plurality of parts of the boot or shoe or skate or sports implement according to chosen dimensions.

It is evident that the use of these devices is designed to optimize the performance of the shoes and sports implements to which they are applied, and their cushioning characteristic is added to the inherent characteristic of the shoe or implement, whose performance must be optimized per se.

All the cited conventional devices, however, have the drawback that they must be manufactured and optimized exclusively for a specific use, i.e., studied and designed for a given shoe or sports implement.

The use of these conventional devices accordingly has the drawback of requiring a diversified, and therefore expensive, design and manufacturing commitment in the development of each implement or shoe.

Disclosure of the Invention

The aim of the present invention is to solve the mentioned problems, eliminating the drawbacks of the cited prior art, by providing a vibration absorbing device whose basic structure is substantially constant as its applications vary, thus being able to provide simply and rapidly vibration absorbing devices which can be used in different types of shoe or sport implement.

Within the scope of this aim, an object is to provide a device which can be manufactured by using conventional methods, allowing to vary the characteristics of the product simply and rapidly.

Another object is to provide a device which is reliable and safe in use

and can be manufactured at low costs by means of conventional machines and equipment.

This aim and these and other objects which will become better apparent hereinafter are achieved by a vibration absorbing device characterized in
5 that it is constituted by a mesh which has a vertical warp with two faces, contains no filling, is elastically deformable and is embedded or coated with at least one layer of plastic material which is adapted to modify its deformability.

Brief description of the drawings

10 Further characteristics and advantages of the invention will become better apparent from the following detailed description of a particular embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a plan view of a first type of mesh;

15 Figure 2 is a plan view of a second type of mesh;

Figure 3 is a side view of the warp of a mesh;

Figure 4 and 5 are sectional views, taken along a transverse plane, of a thread of the mesh, shown respectively without and with coating;

20 Figure 6 is a side view of a shoe which uses the device according to the invention;

Figures 7 and 8 are plan views of, respectively, a first absorbing device and a second absorbing device which are applied to a shoe and have been illustrated for the sake of clarity although they are embedded in the sole;

25 Figure 9 is a side view of a skate which uses the device according to the invention;

Figure 10 is a front view of a detail of the skate;

Figures 11, 12 and 13 are front sectional views of three types of device applied to three different skis.

30 Figure 14 is a side view of a shoe provided with the device according to the invention.

Figure 15 is a bottom view of an inner sole provided with the device according to the invention;

Figure 16 is a bottom view of a further inner sole provided with the device according to the invention;

5 Figure 17 is a side view of a shoe provided with the device according to the invention;

Figure 18 is a bottom view of a shoe provided with the device according to the invention;

10 Figure 19 is a side view of a ski boot provided with the device according to the invention;

Figure 20 is a side view of an inner sole, for a ski boot, provided with the device according to the invention;

Figure 21 is a bottom view of the inner sole of the preceding figure.

Ways of carrying out the Invention

15 With reference to the figures, the reference numeral 1 designates a vibration absorbing device which has a mesh 2 constituted by a woven fabric with a vertical warp and two faces.

Said faces are made of two strips of mesh, designated by the reference numerals 3a and 3b, which are spaced one another.

20 A plurality of filler threads, generally designated by the reference numeral 4, lie between said strips 3a and 3b and are straight and joined in said strips of mesh 3a and 3b.

A spacer mesh, as disclosed in EP no. 529,671, for the provision of a laminated textile material, can be used as mesh 2.

25 Mesh 2 has no filling and is elastically deformable.

Mesh 2 can be made of many materials, such as for example natural fibers (wool, cotton, etc.); synthetic fibers (polyester, acrylic or other fibers, including the one known by the trade-name Nylon); metallic fibers (steel, titanium, copper, nickel, etc.); engineering fibers (carbon, aramid fibers or
30 others, including for example those known by the trade-names Kevlar,

Nomex and Dyneema); said materials can also be used individually or in combination (for example carbon/titanium) by varying the pattern and thickness of the mesh in order to achieve the best performance for the specific application.

5 Figures 1 and 2 illustrate two different patterns for the weft of said mesh 2: in the first pattern, the plan shape of the loops is oval and pointed at the ends or lanceolate; in the second pattern, the loops have a honeycomb shape.

 The vibration absorbing device 1 is obtained starting from said mesh 2,
10 by embedding it or coating one or more threads by means of at least one layer, designated by the reference numeral 5, of plastics.

 Said layer is adapted to modify the overall deformability of said mesh 2 according to the characteristics that the absorbing device 1 is required to have, so that the mesh 2 acts substantially as an elastically deformable
15 support which gives the appropriate shape to said device 1.

 The materials that can be used to fill the interspaces of said mesh 2 or for coating said threads 4 and/or said strips of mesh 3a and 3b can advantageously consist of appropriate foamed or non-foamed plastic materials, thus determining the characteristics of said device 1.

20 It is possible to use polyurethane materials or polyurethane foams, urethane foams, polyisocyanide foams, polystyrene materials or foams, polyethylene foams, polyvinyl chloride materials or foams, polyolefin materials or foams, epoxy resins and foams, urea-formaldehyde foams, latex or foamed latex, foamed rubber, silicone foams, fluoropolymer foams, ethyl
25 vinyl acetate or foamed ethyl vinyl acetate, gel or foamed gel, synthetic foams, polyolefin materials, polystyrene materials, polymethylacrylate materials, polyamide materials, phenolic or creolin resins, urea resins, melaminic resins, polyimide materials.

 The materials and the dimensional structure of the mesh and of the
30 coating may of course be combined, so long as they are compatible, thus

obtaining a different performance according to the specific application.

Figures 6, 7 and 8 illustrate a shoe, designated by the reference numeral 6, which is constituted by an upper 7 rigidly coupled to an underlying sole 8, in which two devices 1 have been inserted in the heel region and in the
5 metatarsal and toe region.

The shoe may be provided with openings or transparent portions allowing a view of the device.

Figures 9 and 10 illustrate a skate, designated by the reference numeral 9, which is constituted by a soft innerboot 10 which is associated with a rigid
10 shell 11.

Said shell 11 is connected in a downward region, with two interposed devices 1 arranged respectively in the heel region and in the metatarsal region, to a rigid frame 12 whose transverse cross-section is shaped like an inverted U and to which four in-line wheels, designated by the reference
15 numeral 13, are pivoted.

Figures 11, 12 and 13 illustrate three different skis, designated by the reference numerals 14a, 14b and 14c respectively, all of which comprise an internal seat 15a, 15b and 15c which is closed in an upward region and laterally by an external covering, technically known as cap, which is
20 designated by the reference numerals 16a, 16b and 16c.

In a downward region, the inner seat 15a, 15b and 15c is formed by a base 17 which is advantageously flat for sliding on snow and is laterally associated with the outer covering and/or with a pair of preferably metallic laminae designated by the reference numerals 18a and 18b.

25 The inner seat 15a, 15b, 15c of said skis 14a, 14b and 14c can advantageously include in part or all of its volume (see Figure 11) said device 1, in which there is a mesh 2 of appropriate dimensions which is embedded or covered by an adapted material, for example polyurethane.

Said skis 14a, 14b and 14c can be produced simply by inserting said
30 mesh 2 in the structure of said ski, subsequently embedding said mesh with

an injection of appropriate material.

The uses of the device are as follows: with reference to Figure 6, it can be used for example in the sole of a shoe as a shock absorber, i.e., to absorb the shocks produced by the impact of the foot against the ground; or it can be used, advantageously by using a different filling material, as an element
5 for separating the shell and the frame of a skate, in order to reduce the stresses transmitted to the foot and produced by the bumps in the ground.

By using a different material for the filler layer, said device can be used in other ways, and in other applications, such as for example for skiing, ski
10 boots, tennis racquets, etcetera.

Figure 14 illustrates a shoe 106 provided with a vibration absorbing device 101 which occupies almost the entire length of the sole 108 of the shoe and is embedded thereto.

Figure 15 illustrate an innersole 210 provided with two devices 201 at
15 the tip and heel regions thereto.

Figure 16 illustrate an innersole 310 entirely made by the combination of three different types of devices 301a, 301b, 301c, according to the invention. Namely, device 301a has an intermediate resiliency, while device 301b is less stiff and device 301c is stiffer. Figure 15 and 16 illustrate only
20 two examples of the many possible configurations and combination of devices. In such manner, several types of inner soles can be provided and the user may change the innersole in his/her shoes according to the use and to his or her needs and preferences.

Figure 17 illustrates a shoe 406 provided with a vibration absorbing
25 device 401, constituted by a tridimensional mesh, arranged at the innersole of the shoe, between the sole 408 and the upper 407.

While Figure 17 illustrates a one piece device, Figure 18 illustrates a similar arrangement where, however, the vibration absorbing device 501 is constituted by three pieces of mesh 501a, 501b and 501c with different
30 properties. In both embodiments, illustrated in Figures 17 and 18, the device

can be either associated with the inside or embedded thereto.

Figures 19-21 illustrate a skiboot 606 having an insole 607 provided with a front absorbing device 601a and a rear absorbing device 601b. It is however apparent that the number and arrangement of the devices in the insole way vary according to the desired properties to be achieved.

It is also noted that in addition to acting as a shock and/or impact absorber, the device can also have a structural function by using appropriate patterns, dimensions and materials for the mesh in combination with one or more coating materials; it is thus possible to obtain different static or dynamic structural behaviors according to the combination used.

The mesh constituting the absorbing device may be associated with other structures and materials, known in the field, such as gels, air, Outlast™, etc.

It has thus been found that the invention has achieved the intended aim and objects, a vibration absorbing device having been devised which is simple and cheap to manufacture, has a basic structure which is substantially constant for varying applications, and can thus provide, simply and rapidly, vibration absorbing devices which can be used in various kinds of shoe or sports implement.

The device according to the invention is susceptible of numerous modifications and variations, within the scope of the appended claims.

The materials used, as well as the dimensions that constitute the individual components of the invention, may of course be more pertinent according to specific requirements.

The disclosures in Italian Patent Application No. TV2000A000004 from which this application claims priority are incorporated herein by reference.

CLAIMS

1. A vibration absorbing device, characterized in that it comprises a mesh which has a vertical warp and two faces, has no filling, is elastically deformable and is embedded or coated with at least one layer of plastic material which is adapted to change its deformability.

2. The device according to claim 1, characterized in that it is obtained, starting from said mesh comprising two spaced strips of mesh between which a plurality of filler threads are arranged, by coating or embedding one or more of said filler threads by means of at least one layer of plastics which is adapted to modify the overall deformability of said mesh.

3. The device according to claim 2, characterized in that the material that can be used to fill the interspaces of said mesh, or to coat said filler threads and/or said strips of mesh, consists of foamed or non-foamed plastic materials which are adapted to determine the rigidity, stability and cushioning characteristics of said device.

4. The device according to one or more of the preceding claims, characterized in that said mesh has a weft which has honeycomb loops.

5. The device according to one or more of the preceding claims, characterized in that said strips of mesh have a weft in which the loop are oval and pointed at their ends so as to be slightly lanceolate.

6. The device according to one or more of the preceding claims, characterized in that said at least one layer of plastics is constituted by materials, or foams, chosen among polyurethane, urethane, polyisocyanide, polystyrene, polyethylene, polyvinyl chloride, polyolefin, epoxy resins, urea-formaldehyde, latex or foamed latex, foamed rubbers, silicone foams, fluoropolymer foams, ethyl vinyl acetate or foamed ethyl vinyl acetate, gel or foamed gel, synthetic foams, polyolefin, polymethylacrylate, polyamide, phenolic or creolin resins, urea resins, melaminic resins, polyimide materials, latex.

7. The device according to one or more of the preceding claims,

characterized in that said mesh is made of natural materials.

8. The device according to one or more of the preceding claims, characterized in that said mesh is made of synthetic materials.

9. Shoe, characterized in that it comprises a device as claimed in claim 1,
5 embedded in the sole.

10. Skate, characterized in that it comprises a device, as claimed in claim 1, interposed between a shell and an underlying rigid frame of the skate.

11. Ski, characterized in that it comprises a device, as claimed in claim 1, which constitutes a partial or complete filling for a seat formed inside the
10 ski, said internal seat being formed in an upward region and laterally by an outer covering and being closed in a lower region by a base which is laterally associated with the outer covering and/or with a pair of metallic blades.

12. Ski, characterized in that it comprises a device, as claimed in claim 1,
15 arranged inside one or more adapted seats formed inside said ski .

13. A tennis racquet, characterized in that it comprises a device, as claimed in claim 1, arranged inside one or more adapted seats formed inside said tennis racquet.

14. Ski boot, characterized in that it comprises a device, as claimed in
20 claim 1, arranged inside one or more adapted seats formed inside the sole of said ski boot.

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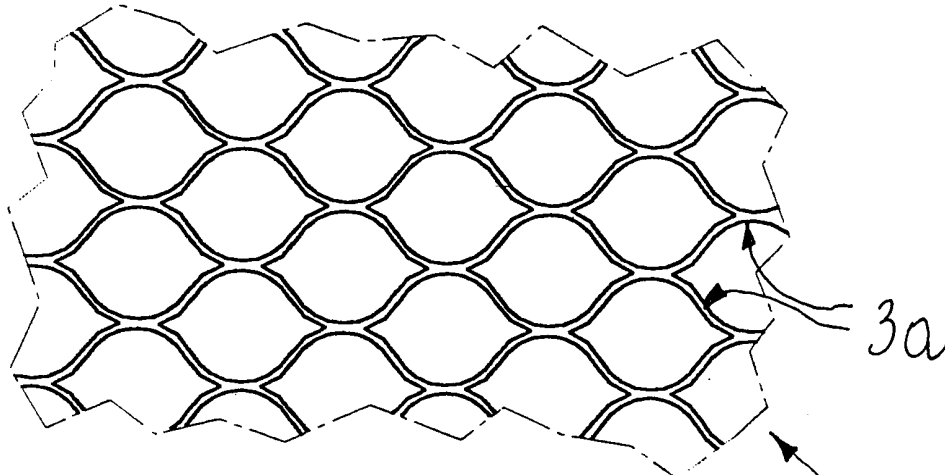


Fig. 1

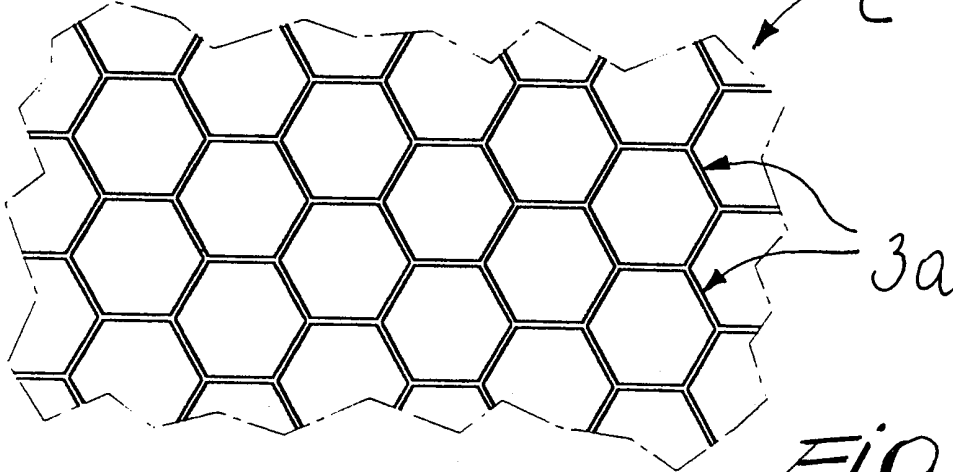


Fig. 2

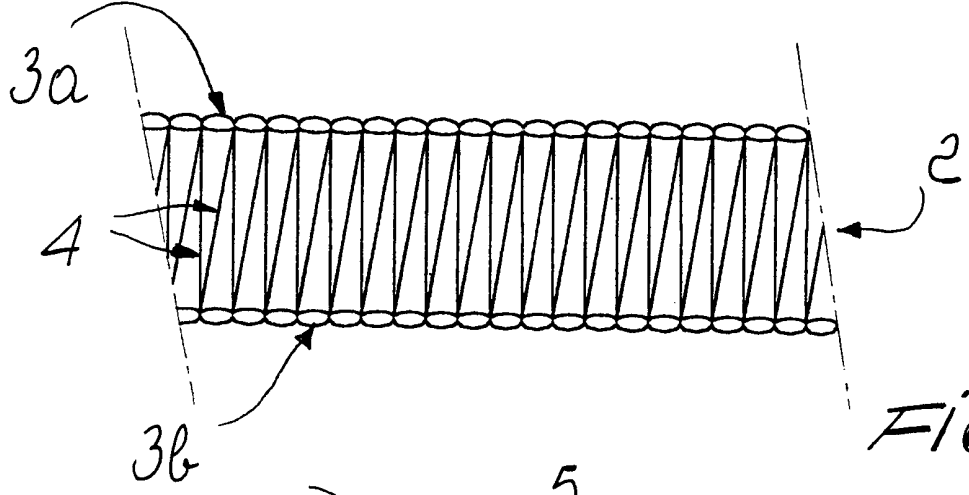


Fig. 3



Fig. 4

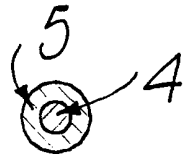
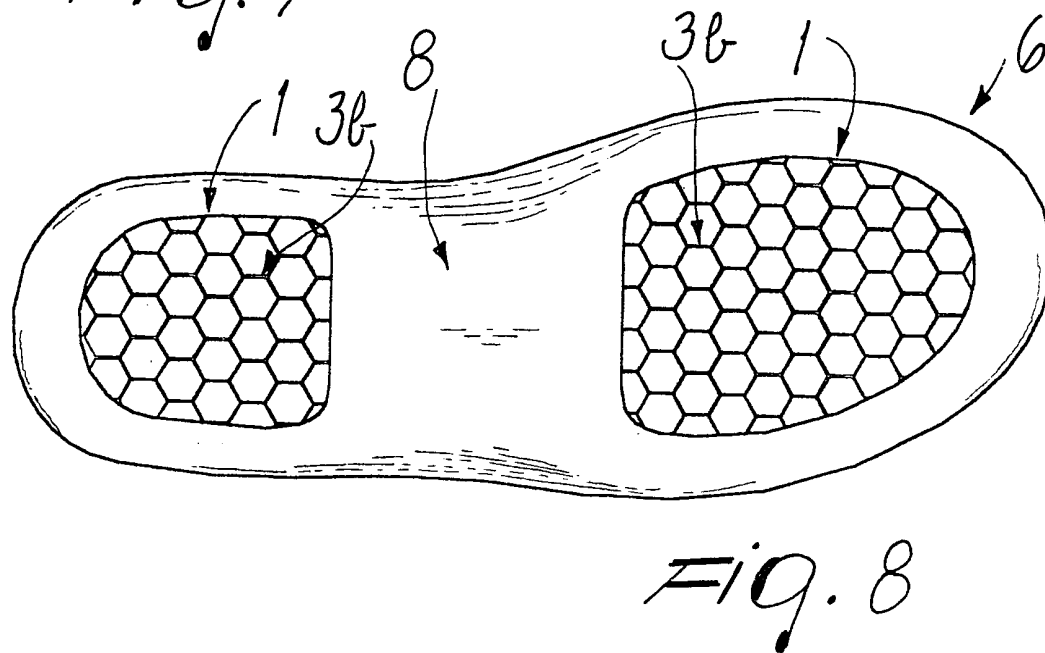
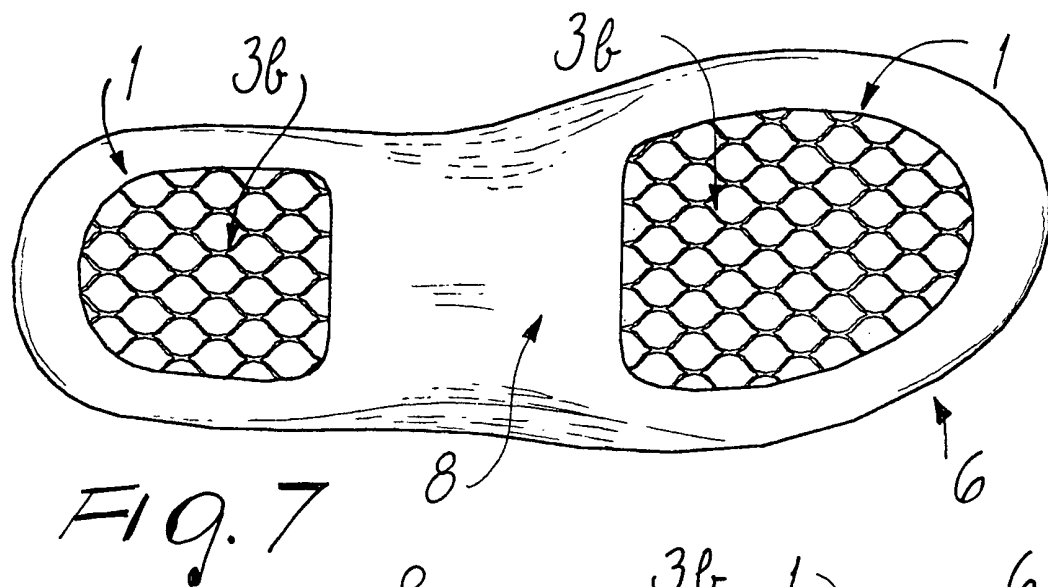
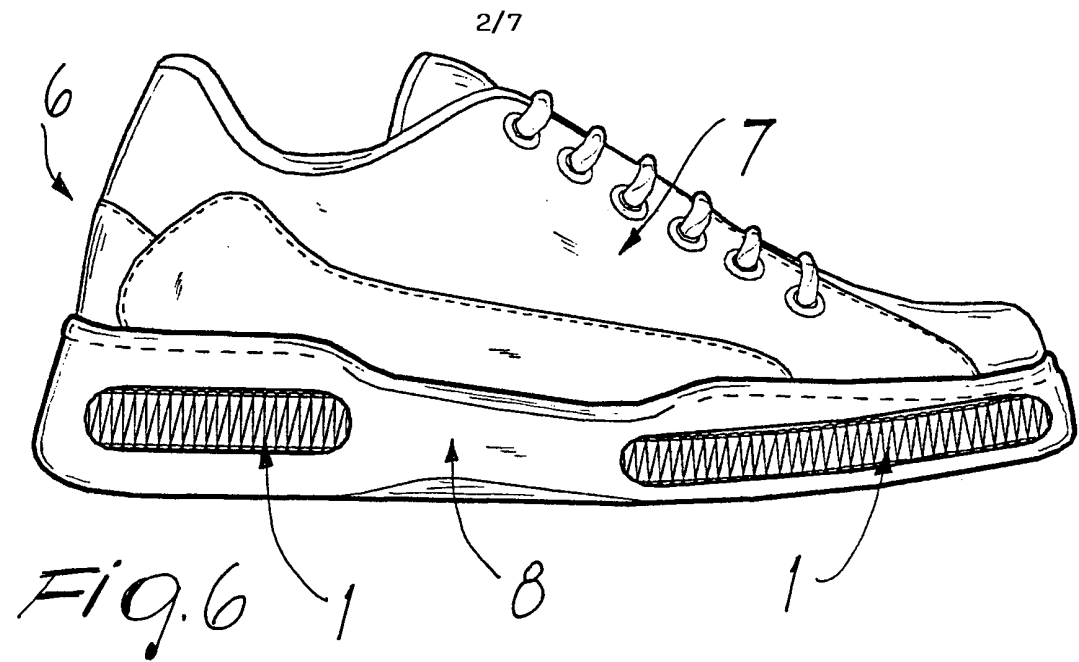
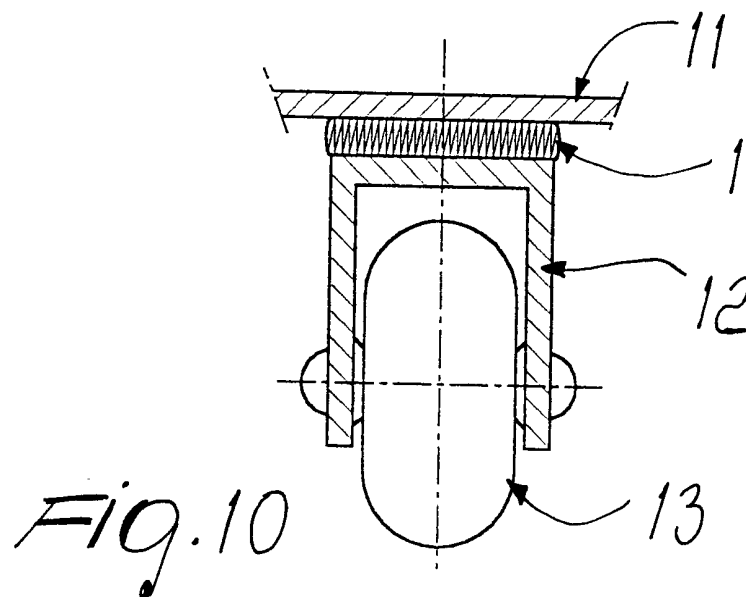
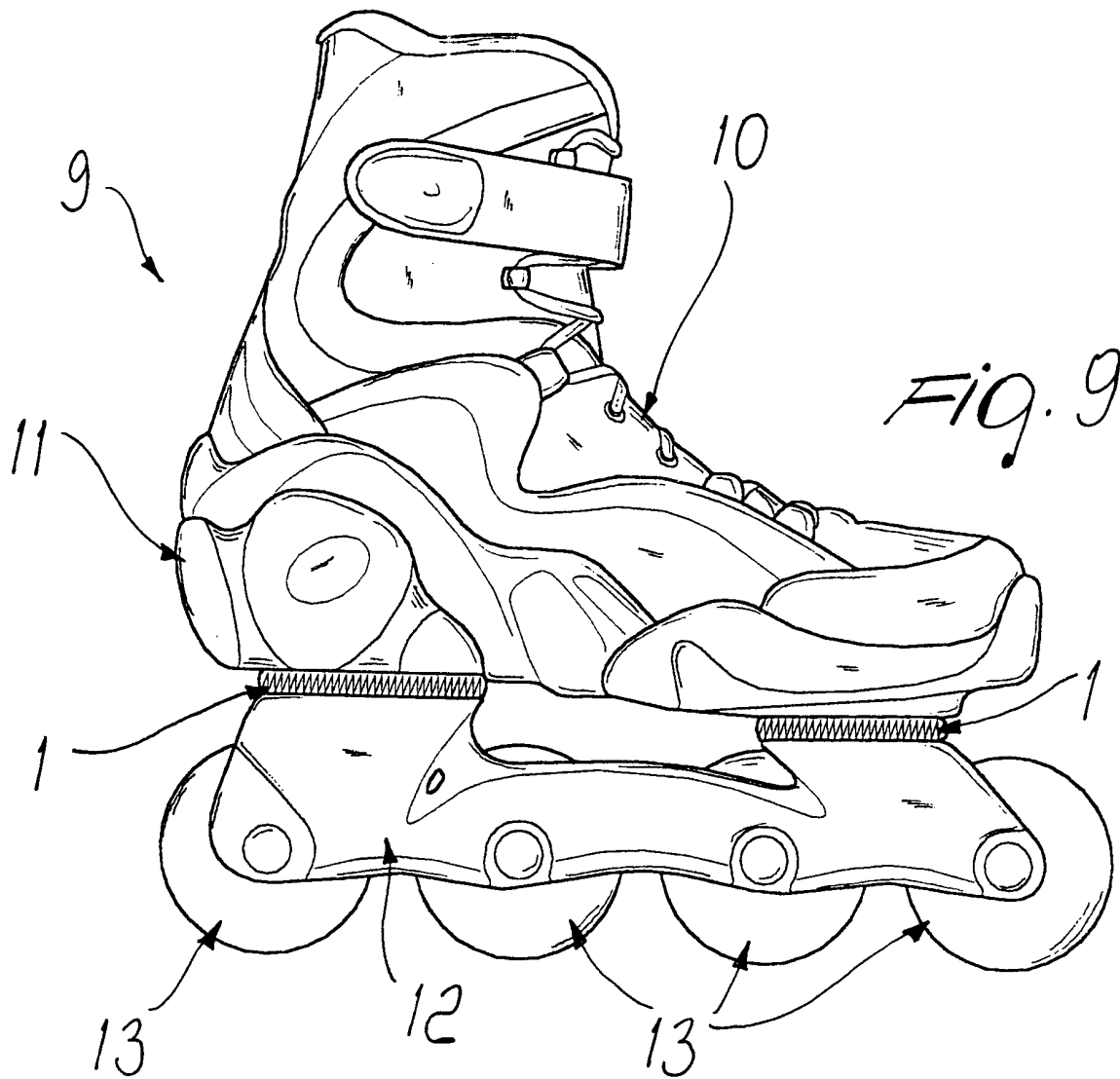
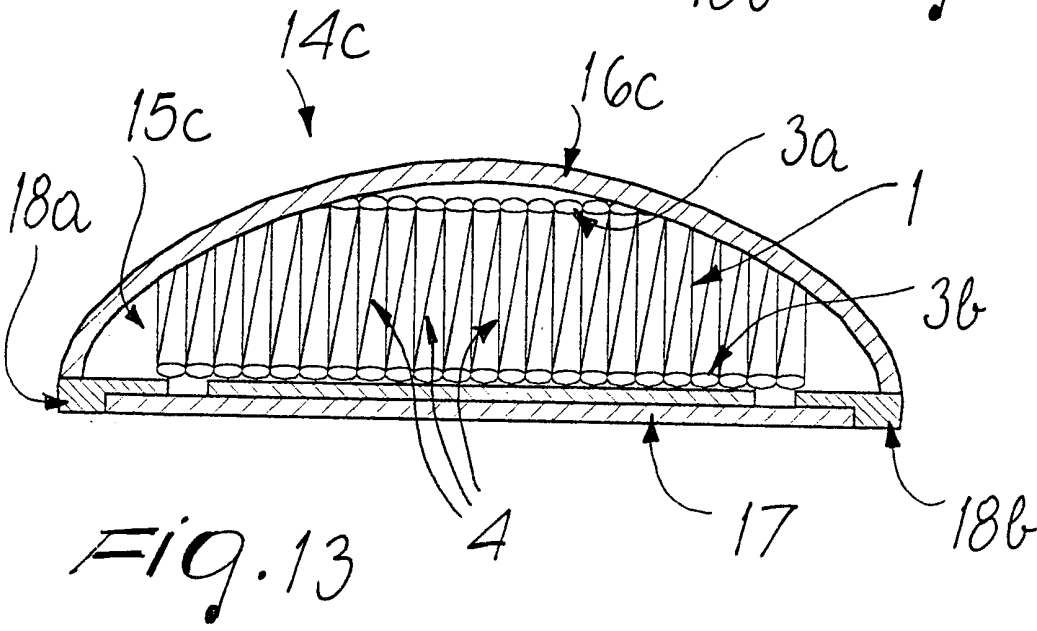
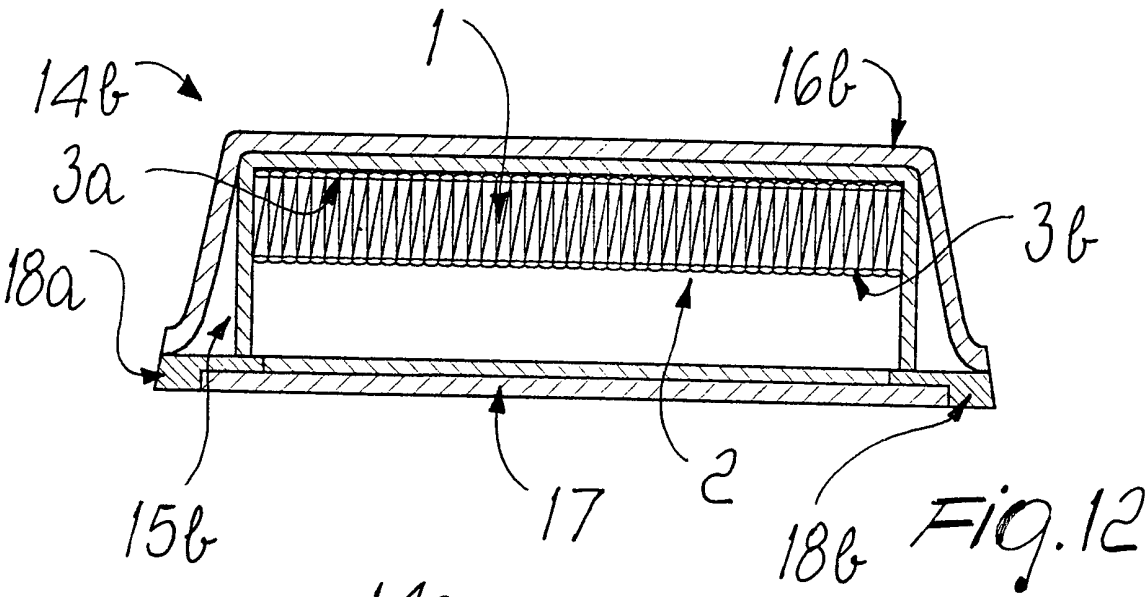
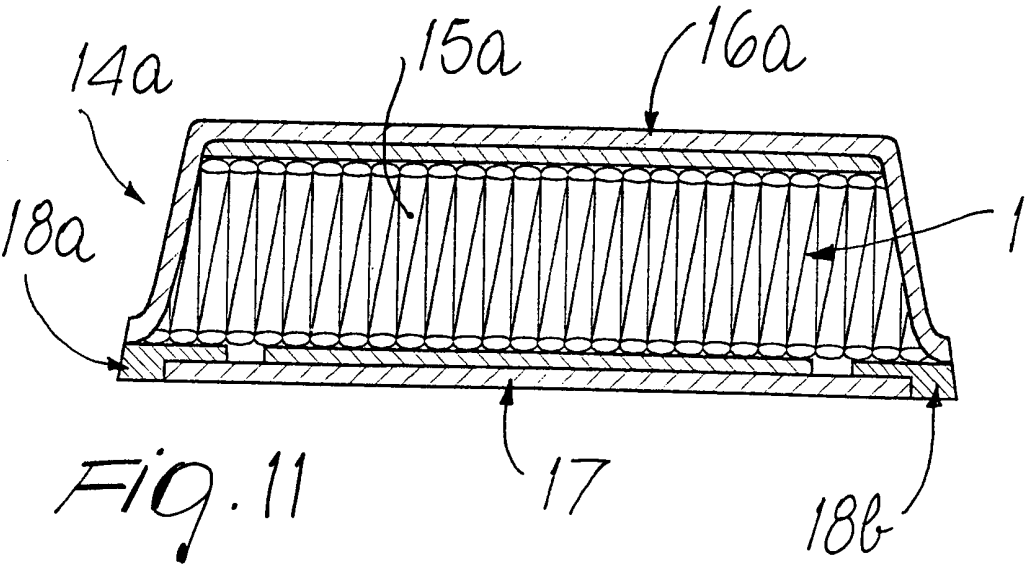


Fig. 5



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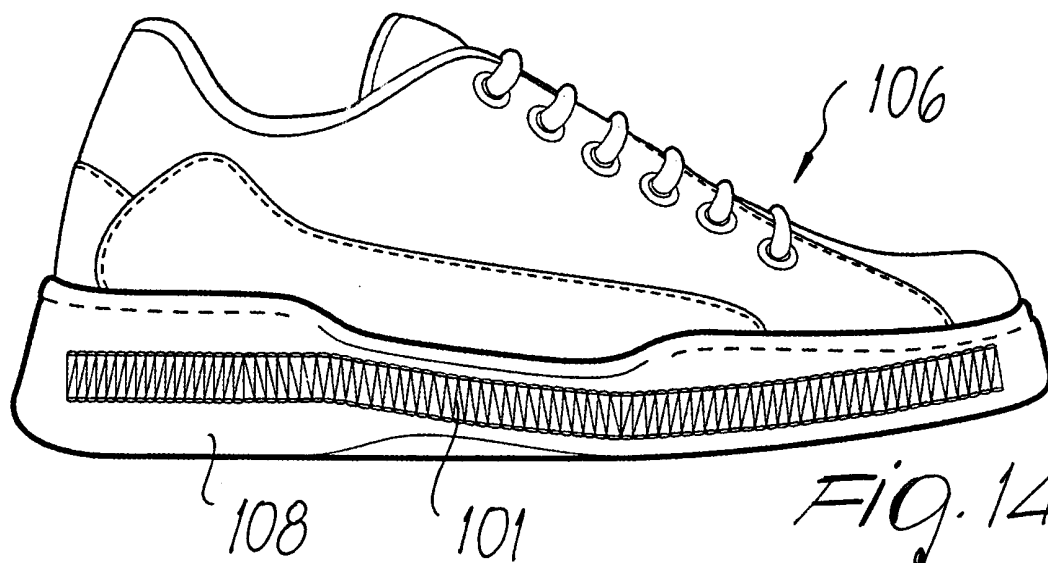


Fig. 14

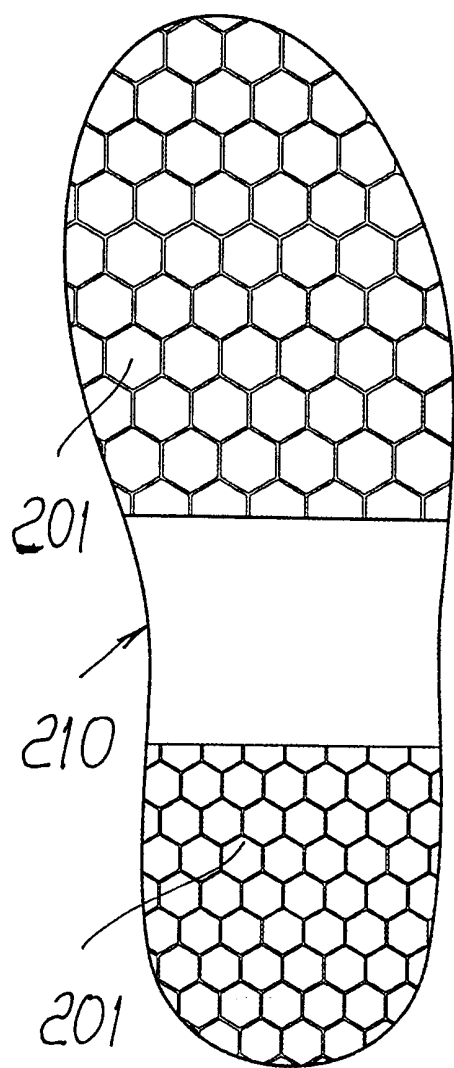


Fig. 15

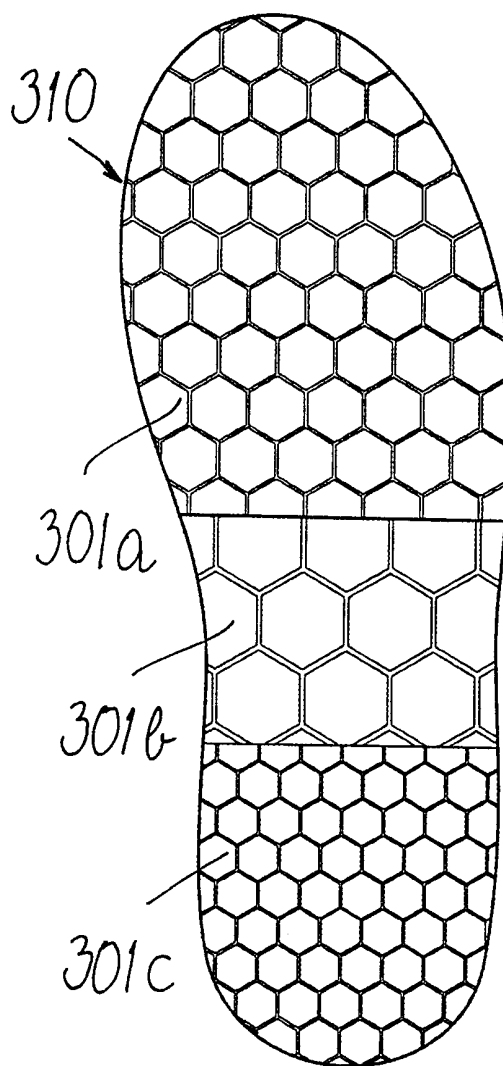
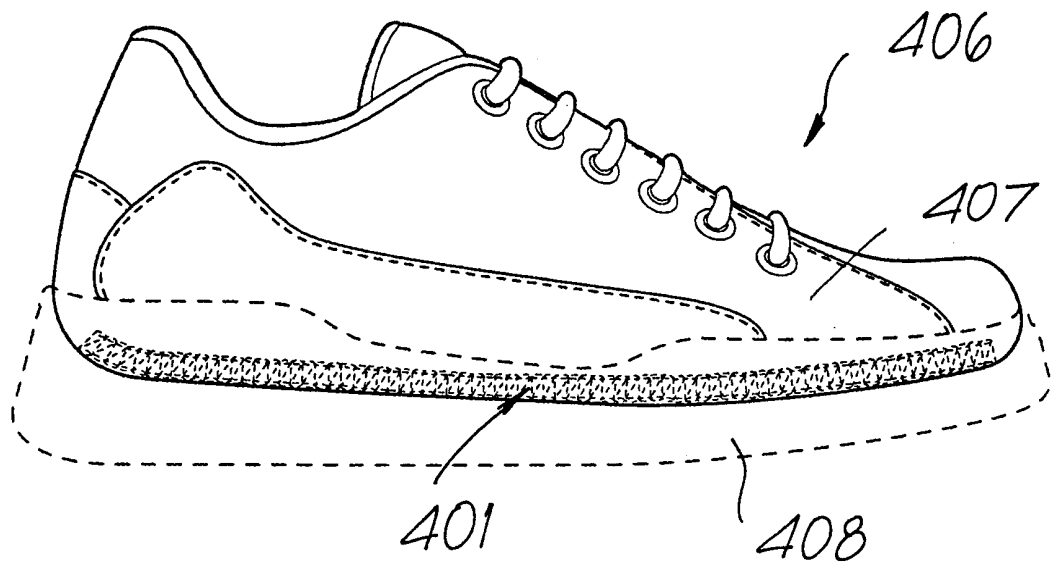
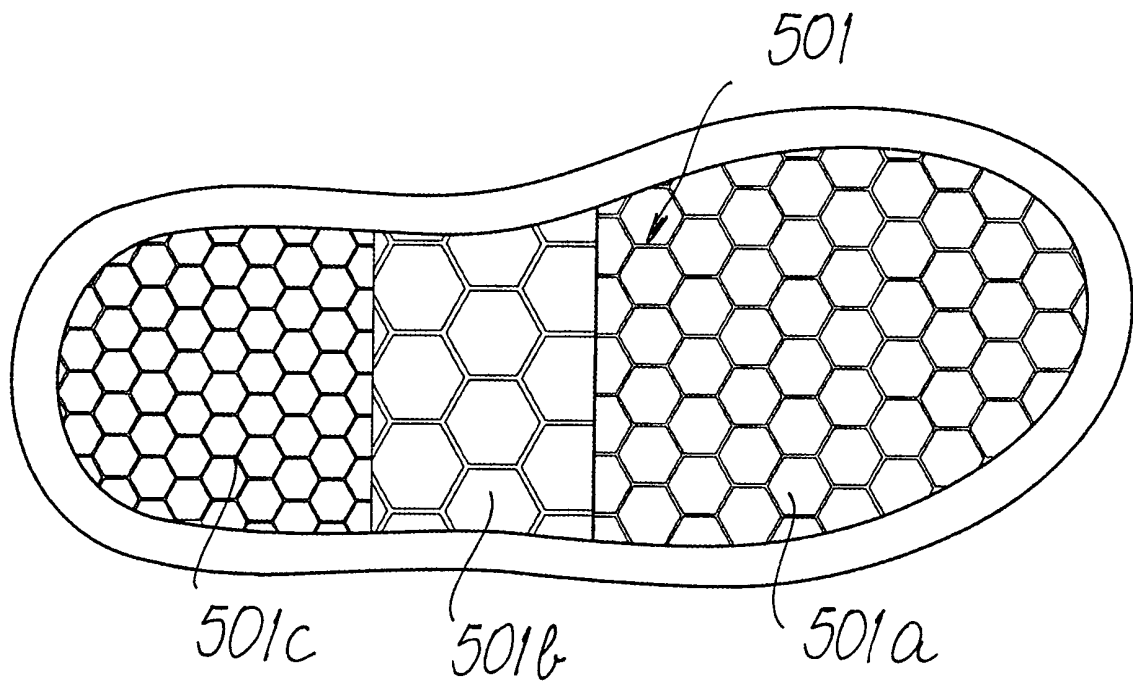


Fig. 16

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*Fig. 17**Fig. 18*

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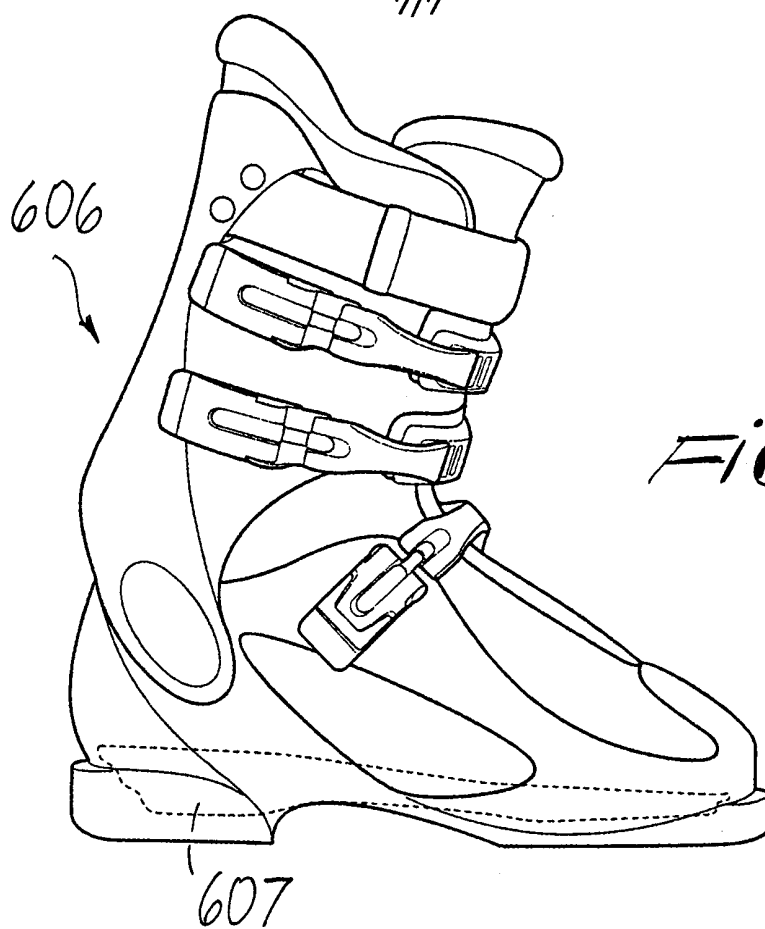


Fig. 19

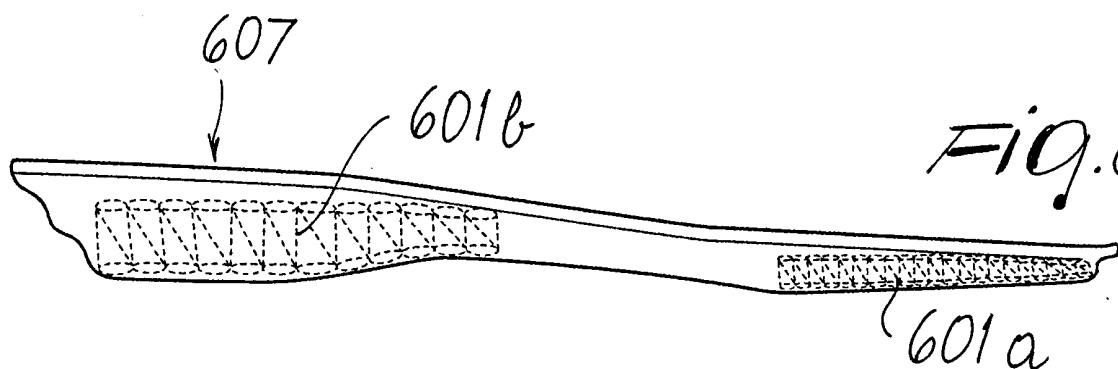


Fig. 20

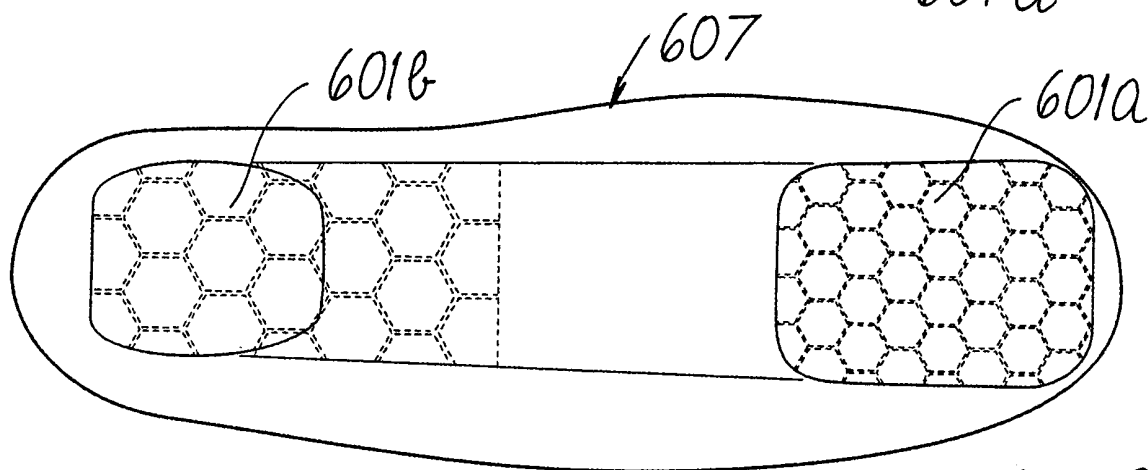


Fig. 21

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 01/00173

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 D04B21/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 D04B D03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	---	9-14
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Y	---	9,14
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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Date of the actual completion of the international search

15 June 2001

Date of mailing of the international search report

29/06/2001

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INTERNATIONAL SEARCH REPORT

International Application No

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