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(54) Title: SOLE WITH VENTILATION, ESPECIALLY FOR FLEXIBLE TRENDY WALKING SHOES

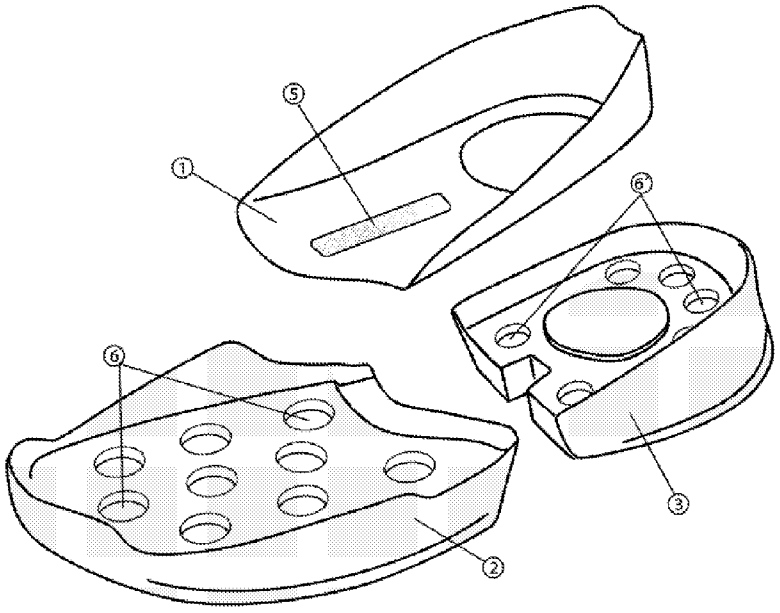

Fig. 3

(57) Abstract: The sole has a flexible tread part (2) with a flexible heel part (3) inseparably joined together through a fixed connecting part (1), overlapping from above at least the perimeter of the heel part (3) and provided with a vertically oriented hem at the outer edges of the sole. The connecting part (1) is provided with perforations (4) in its central zone and has area of perforations (4) covered by a membrane (5) from above. The membrane (5) is preferably a textile water-resistant breathable polymer nanofibre membrane. The area of perforations (4) with the membrane (5) can also be formed in advance as a separate part, subsequently inserted into the corresponding hole in the connecting part (1). Advantageously, the area of perforations (4) can be formed in a given shape directly on the membrane (5) by 3D printing technology. Preferably the tread part (2) and / or the heel part (3) of the sole is provided with an above¬ opened set of lightening cavities (6, 6').

[Continued on next page]

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SOLE WITH VENTILATION, ESPECIALLY FOR FLEXIBLE TRENDY WALKING SHOES

Field of Technology

The invention relates to a sole with ventilation, intended especially for flexible walking shoes.

The sole can be used in conjunction with various types of uppers in the footwear industry.

State of the Art

In the field of footwear production, many new solutions have been emerging, especially recently. In addition to traditional natural or synthetic leathers, footwear with a textile upper also has an irreplaceable place on the market. The shoes are, especially in the temperate climate zone, gradually perceived more and more often as a protection of the foot against the direct effect of the terrain, while the role of the upper is basically to ensure sufficient holding of the outsole on the foot. The requirements for the properties of the upper therefore change considerably compared to the classic concept of footwear - the criteria of easy to put on shoes and affordable prices come to the fore.

Under the influence of these trends, footwear manufacturers have recently come up with a number of previously unusual solutions, which are basically reminiscent of the combination of an outsole and a sock. Inspired by this, the upper part of the shoe is often made of knitted fabric, which, like the socks, is slightly elastic and allows its user to put the shoes on quickly, without zippers or other closures.

However, within conventional footwear solutions of this type, the upper itself often does not have sufficient shape stability on the foot during walking, especially in the lower part adjacent to the foot. Therefore, keeping the outsole in its original position during walking gets often difficult, all the more so with a massive outsole or when moving faster.

The stabilization of the position of such footwear on the foot during its usage, even in more demanding conditions, thus largely depends on the properties and behaviour of the outsole. The inhomogeneity of physical and mechanical properties of the outsole and upper compared to traditional leather footwear is striking all the more because the outsoles of these types of footwear have a somewhat more powerful construction, in which the middle part must ensure the overall shape stability, so that the outsole bends in its front part, i.e., in the transition area

between the toes and the instep. The outsole should also define and maintain the position of the foot against shifting out of the outsole outline. Regarding that, a stable heel position is extremely important, as the properties of the outsole in the heel part tend to be crucial in terms of wearing comfort.

The outsoles for footwear with a flexible upper are usually made in one piece and are relatively massive in order to achieve the required shape stability of the middle part. Stabilization of the foot position is ensured by raised edge parts of the outsole, the outlines of which are visible from the outside and project against the contrasting upper as design elements.

The requirements placed on the individual parts of the outsole - the front tread part, the middle reinforcing part and the heel area - are so different that the combination of the whole complex of the requirements is very difficult within the production of a solid outsole from one compact piece of material.

In order to combine all the above-mentioned requirements for shoes with a non-traditional shape flexible upper, to achieve a reliable fixation of such shoes on the user's foot while ensuring comfort and at the same time favourable economic terms, an outsole design was created for non-traditional walking shoes according to CZ 308747 patent. The outsole has a flexible tread part and the flexible heel part inseparably connected to each other by means of a connecting part with a Shore A hardness of 70 to 85 ° so that the connecting part overlaps the heel part at least in its peripheral outline and is provided with a vertically oriented hem at the outer edges of the outsole. The advantage of the solution is the fact that the tread part together with the heel part sufficiently ensures the basic function of the sole, consisting in the protection of the foot from direct contact with the terrain.

These parts possess properties needed for shock absorption - from the point of view of the anatomy of the foot and the physiology of the foot movement, this is extremely important, especially for the heel part, which supports the heel joints and the heel. The connecting part acts as a support and stabilization of the middle part of the foot so that the bending of the outsole occurs in ergonomic harmony with the bending of the foot, i.e., in its front tread part, with a reinforced shank. At the same time, the higher rigidity and small thickness of the connecting part allow a total weight reduction of the sole.

A certain shortcoming of the outsole solution according to the patent is the design of ventilation of the connecting part. It assumes that the following parts of the upper, more precisely the insole, complement the overall comfort of ventilation by incorporating a specific membrane to

prevent water penetration through the perforation of the connecting part in adverse external conditions.

Background of the Invention

The above-mentioned disadvantages and drawbacks of the solutions of the so far known shoe outsoles, particularly of the soles intended for footwear with a shape-flexible upper, are being largely eliminated by the outsole with ventilation, in particular for flexible trendy walking footwear, according to the invention. The nature of the invention lies in the fact that the sole, having its flexible tread inseparably joined to the flexible heel part by a fixed connecting part, which overlaps at least the peripheral outline of the heel part and is provided with a vertically oriented hem at the outer edges of the sole, where the connecting part, joining the tread part and the heel part, has perforation formed in its central zone from above covered by a membrane. The membrane is preferably a textile water resistant breathable polymer nanofibre membrane.

The sole with ventilation, particularly for flexible walking shoes, according to the invention preferably has a perforation area with a membrane formed as a separate part which is inserted into an opening in the connecting part. The perforation area can advantageously be formed on the membrane by 3D printing technology.

Both the tread and the heel part of the sole with ventilation according to the invention may preferably have a set of lightening cavities opened from above.

The sole with ventilation, designed especially for flexible walking shoes, with the concept according to the invention, due to its construction sufficiently ensures the basic function of the sole, consisting in the protection of the foot from direct contact with the terrain. This means that it provides the properties needed to absorb shocks, both in the tread part, which is also sufficiently flexible, and especially in the heel part, which supports the heel joints and the heel.

The connecting part, made of a cheaper rigid, shape-stable material, considerably increases the overall stability - it reduces the risk of ankle sprain, and that without using the shank, which is necessary for ordinary footwear. This reduces the total price of the shoes at the same time.

However, the main advantage of sole with ventilation according to the invention is the optimized solution of the connecting part, which, due to the membrane, also fulfils the function of safe air and water vapour circulation at a higher level. When assembling the shoes, a compact upper part with a built-in insole with special barrier properties is no longer necessary. The

penetration of water and moisture into the inside of the shoe is completely prevented by the construction of the sole, but the outsole allows water vapour to escape outwards.

Brief Description of Drawings

Exemplary specific embodiments of an sole with ventilation, particularly for flexible trendy walking shoes, are shown in the attached drawings, where they indicate:

- Fig. 1 - basic scheme of the sole construction with a membrane according to example 1 (a - preparation phase, b - preparation - bottom view, c - sole after membrane application);

- Fig. 2 - embodiment of the construction of the sole with a membrane, insertion of a pre-prepared unit providing ventilation - according to Example 2 (a - preparation phase, b - sole after application of the membrane, c - bottom view);

- Fig. 3 - lightweight design of the sole construction with a membrane according to example 3 (shown for clarity just before the assembly of the sole).

Detailed Embodiments of the Invention

E x a m p l e 1

As shown in Fig. 1, the sole has a connecting part 1, which connects the shape-independent flexible tread part 2 and the flexible heel part 3, both of which are made of polyurethane. The connecting part 1 made of acrylonitrile-butadiene-styrene is in its central section provided with perforations 4, the area of perforations 4 being overlapped by a membrane 5 which is made of polymeric nanofibres.

Within the sole, the connecting part 1 performs all its necessary functions - the connection of the tread part 2 with the heel part 3 and at the same time due to the perforations 4 in cooperation with the membrane 5 contributes to user comfort by allowing air circulation in the middle part of the foot outwards and inwards, thus providing effective protection against water penetration into the inside of the shoe.

E x a m p l e 2

The sole shown in Fig. 2 again has a shape-independent flexible tread part 2 and a flexible heel part 3 which are inseparably connected to each another by means of a connecting part 1, which is in its central section provided with perforations 4 and a membrane 5 placed from above.

However, the area of the perforations 4 is formed as a separate part by 3D printing technology on the membrane 5, and the unit thus obtained is subsequently inserted into a shape-matching hole in the connecting part 1.

The sole has the same functional advantages as the sole according to Example 1, the advantages being related to the production technology.

Example 3

The sole shown in Fig.3 again consists of three components as in the previous examples, i.e. it comprises a connecting part 1, which connects the shape-independent flexible tread part 2 and a flexible heel part 3 and is in the central zone provided with perforations 4 covered by a membrane 5 from above.

The sole again has the advantages mentioned in Example 1, related to ventilation, air circulation and removal of moisture from the foot, as well as protection against unwanted penetration of water from the outside environment. In addition, it contributes to user comfort thanks to its reduced weight.

Industrial Applicability

The solution of the sole with ventilation according to the invention is preferably intended especially for non-traditional - trendy walking shoes with a flexible type of upper, suitable even for unfavourable external conditions. The outsole can be used in conjunction with various types of uppers in the footwear industry.

List of reference Marks used in Drawings:

1 - connecting part

2 - tread part

3 - heel part

4 – perforation(s)

5 – membrane

6, 6´- lightening cavities

CLAIMS

1. The sole with ventilation, intended especially for flexible trendy walking shoes, where the flexible tread part of the outsole is inseparably connected to the flexible heel part by a fixed connecting part, overlapping at least the perimeter of the heel part from above and provided with a vertically oriented hem at the outer edges of the sole, c h a r a c t e r i z e d i n t h a t the connecting part (1), joining the tread part (2) and the heel part (3) and provided with perforations (4) in its central zone, has the area of perforations (4) covered by a membrane (5) from above.

2. The sole with ventilation, intended particularly for flexible trendy walking shoes, according to claim 1, c h a r a c t e r i z e d i n t h a t the membrane (5) is a textile water-resistant breathable membrane made of polymeric nanofibres.

3. The sole with ventilation, intended particularly for flexible trendy walking shoes, according to claim 1, c h a r a c t e r i z e d i n t h a t the area of perforations (4) with the membrane (5) is formed as a separate part, inserted into a hole in the connecting part (1).

4. The sole with ventilation, intended particularly for flexible trendy walking shoes, according to claims 1 and 3, c h a r a c t e r i z e d i n t h a t the area of perforations (4) is formed on the membrane (5) by 3D printing technology.

5. The sole with ventilation, intended particularly for flexible trendy walking shoes, according to claim 1, c h a r a c t e r i z e d i n t h a t the tread part (2) and / or the heel part (3) have a set of lightening cavities (6, 6´) opened above.

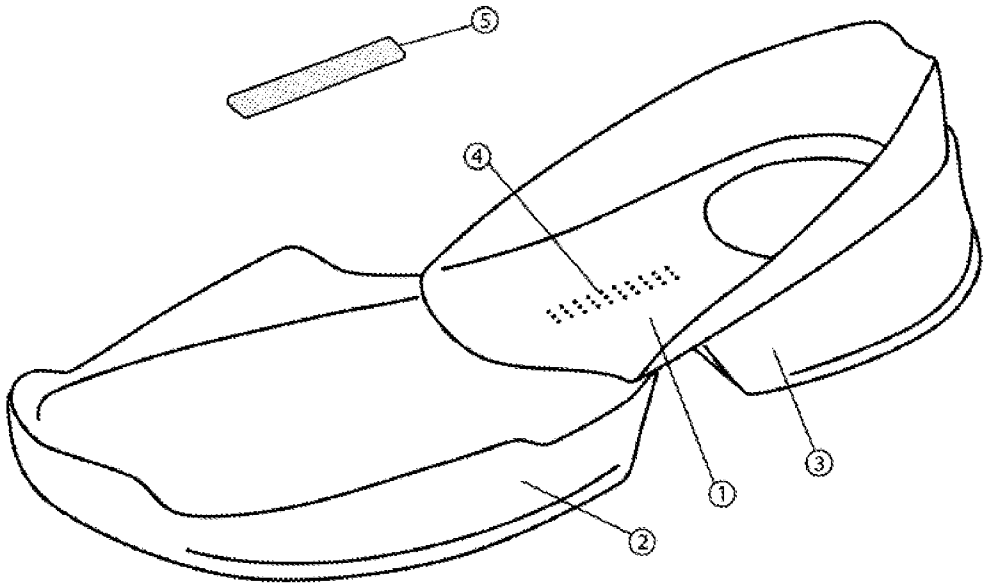

Fig. 1a

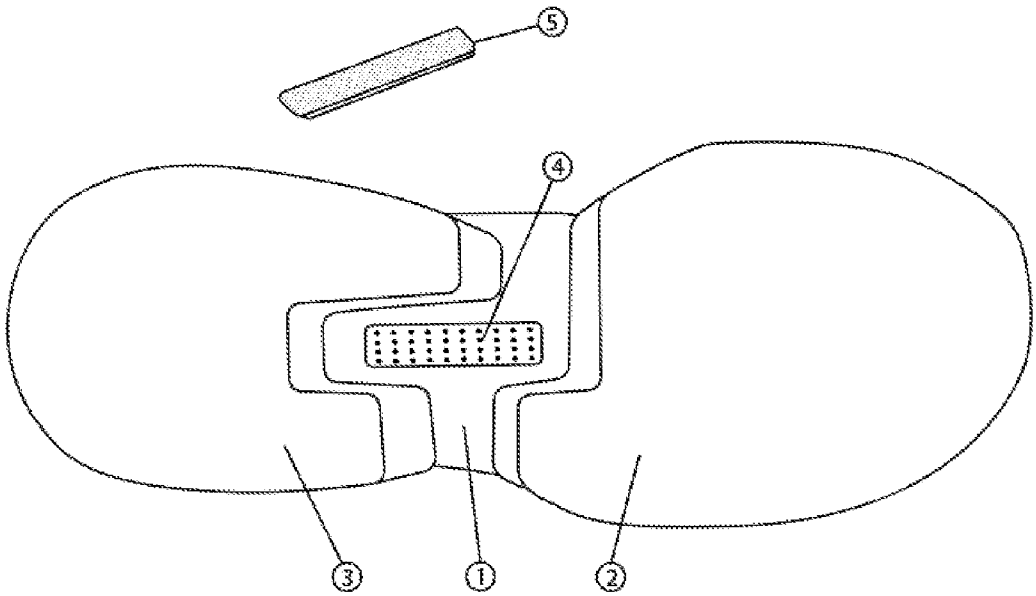

Fig. 1b

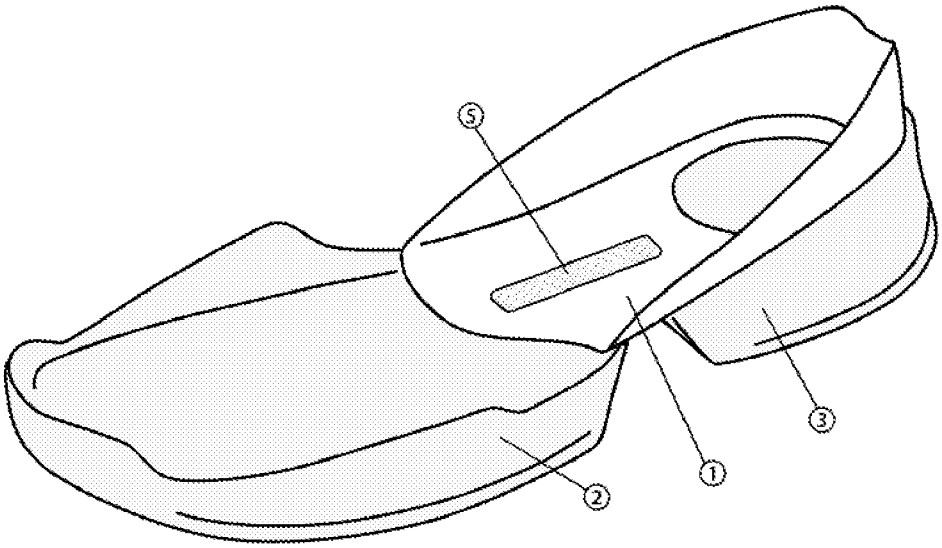

Fig. 1c

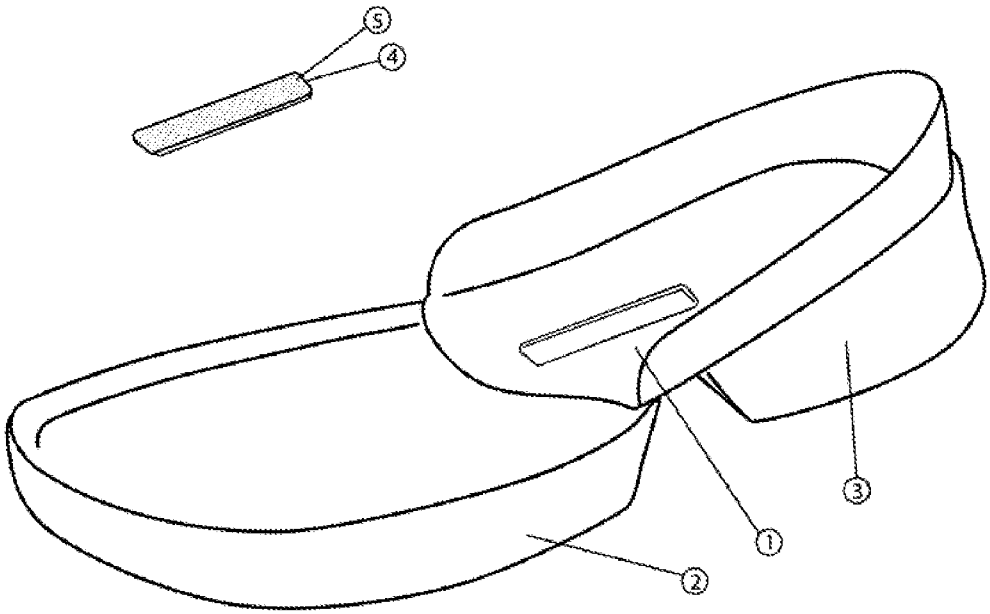

Fig. 2a

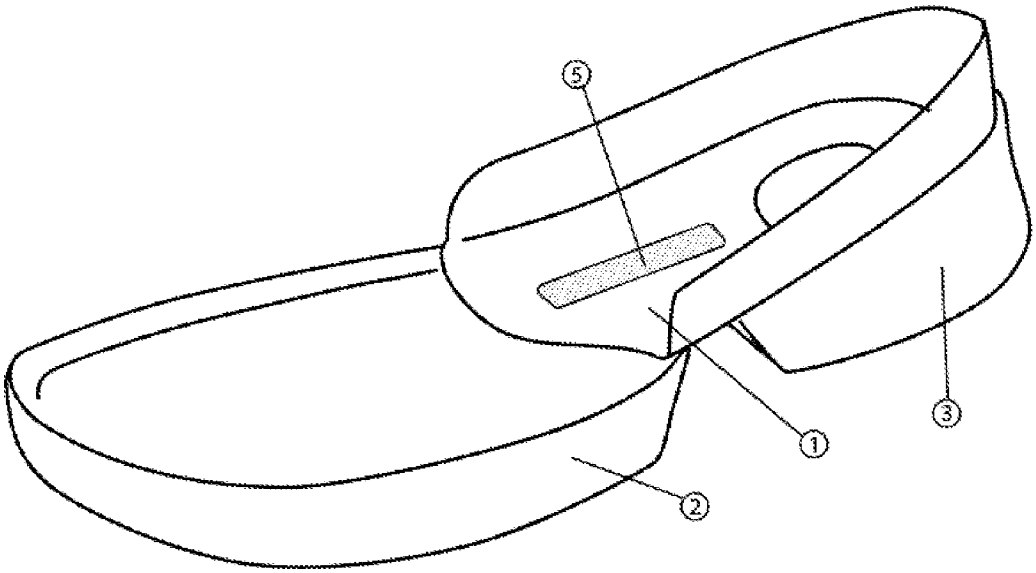

Fig. 2b

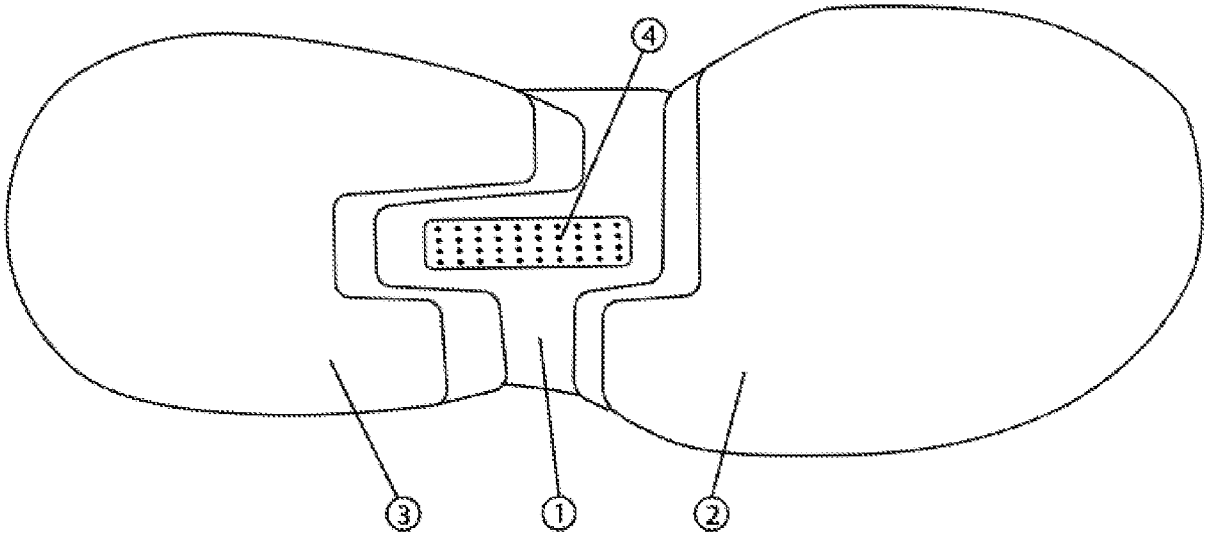

Fig. 2c

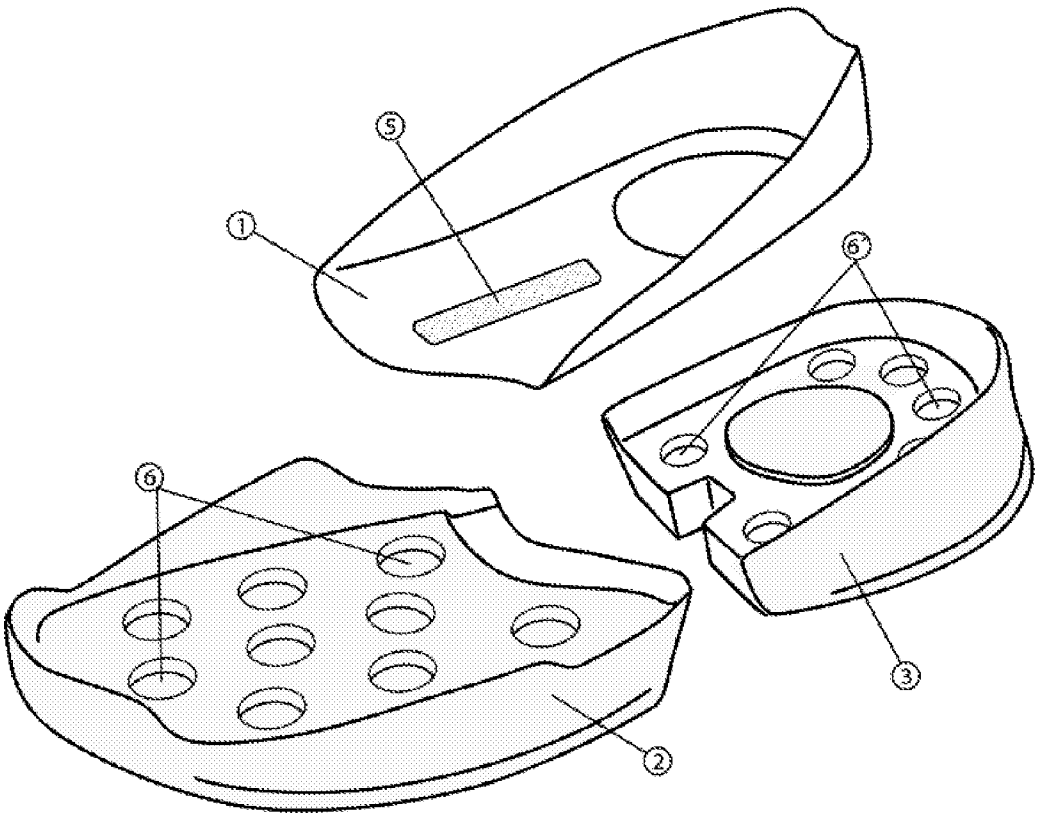

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2022/050033

A. CLASSIFICATION OF SUBJECT MATTER
INV. A43B7/08 A43B13/14 A43B13/16
ADD.

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)
A43B

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 practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/017036 A1 (BERGER CHRISTOPH [DE] ET AL) 14 February 2002 (2002-02-14) abstract paragraphs [0011] - [0060] figures 1A-12B claims 1-27	1-5
A	EP 1 114 591 A2 (FREDDY SPA [IT]) 11 July 2001 (2001-07-11) abstract paragraphs [0001] - [0018] figures 1-7 claims 1-21	1-5
A	US 2020/170825 A1 (AQUINO LOUIS [US] ET AL) 4 June 2020 (2020-06-04) abstract paragraph [0035] figure 10	1-5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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