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(54) **Insole comprising an electronic chip**

(57) The present invention relates to an insole comprising an electronic chip. To impart improved wearing comfort to the wearer of a shoe equipped with the generic

insole, it is provided according to the invention that a module encompassing the chip is removably embedded in the insole.

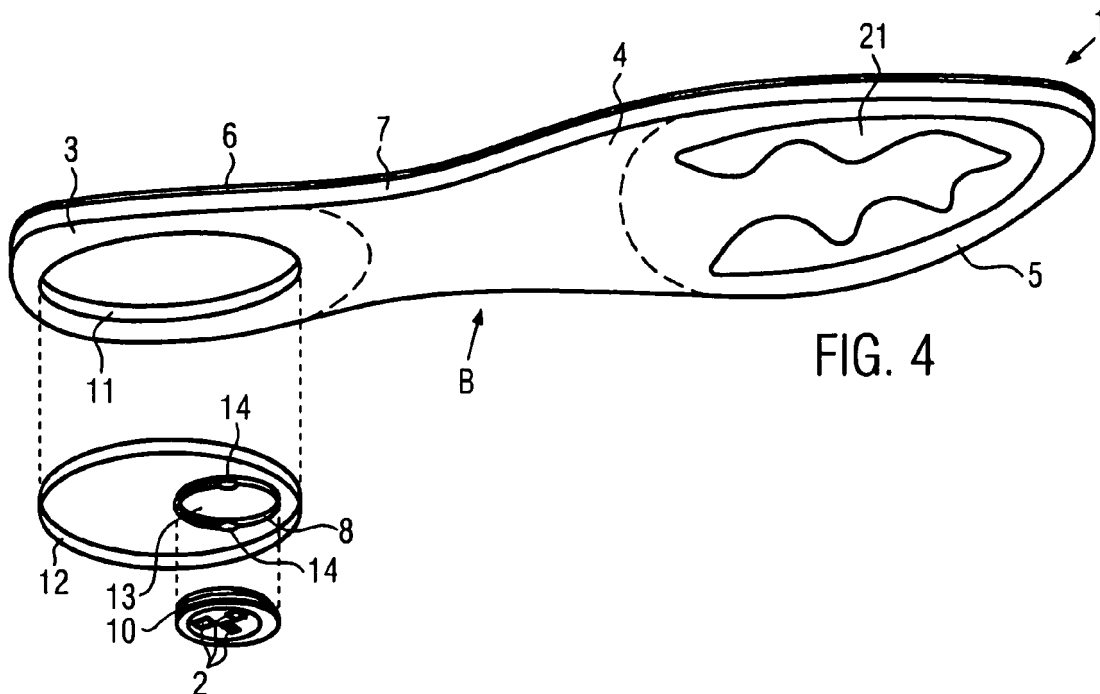


FIG. 4

Description

[0001] The present invention relates to an insole comprising an electronic chip, wherein a module encompassing the chip is removably arranged in the insole.

[0002] An insole with a top-sided or bottom-sided receptacle for the module is e.g. known from US 2007/0260421 A1. Insoles of such a type are e.g. used in the running shoe sector to collect performance data of the wearer of the running shoes. The receptacle of the insole in US 2007/0260421 A1 is open towards one side of the insole (Figs. 5C, 6C).

[0003] The known insoles are only suited to a limited degree for sports shoes for lawn sports, particularly football shoes, because on account of the type the shoes have cleats, knobs, or the like, and also a relatively thin sole so that there is only little space for accommodating the module. So far it has also not been possible to make the electronic components sufficiently flexible, so that during prolonged use of the insole according to the invention the module integrated into the insole does not create a pressure sensation through the insole. Moreover, there is the risk that the module inadvertently falls out of the receiving chamber.

[0004] It is therefore the object of the present invention to improve an insole of the aforementioned type so as to impart improved wearing comfort to the wearer of a shoe equipped with the insole and to prevent the module from falling out.

[0005] To achieve the object underlying the invention, the invention provides an insole comprising an electronic chip, wherein a module encompassing the chip is removably embedded in the insole. "Embedded" means in the sense of the invention that the insole extends at least in sections on all sides of the module (top side, bottom side and edge sides between top side and bottom side). The module is thereby enclosed in the insole and secured in form-fit fashion against falling out. As a result, even with the comparatively thin sole it can be prevented that the module presses onto the wearer's foot. Any inadvertent falling out of the module is thereby prevented. To exchange electronic components or a battery, the module can be removed from and reinserted in the insole.

[0006] Preferred developments of the invention are the subject matters of the sub-claims.

[0007] It may be helpful when the module is arranged in a receiving chamber of the insole, with the receiving chamber comprising an access opening of variable shape and/or size. The module can be removed from the receiving chamber via the access opening and can be reinserted in the receiving chamber. For inserting and removing the module into and from the receiving chamber the access opening can be deformed and/or increased in size and for reliably holding the module in the receiving chamber it can be deformed and/or reduced in size. The receiving chamber is preferably shaped in the form of a pocket and comprises an undercut to protect the module in form-fit fashion against falling out. In one

embodiment the receiving chamber is reclosable. In another embodiment the receiving chamber comprises an elastically deformable access opening, whereby the module can be removed from and reinserted into the receiving chamber by widening the elastically deformable access opening.

[0008] It may be of advantage when the insole comprises a stiffening element which forms the receiving chamber at least in sections. The stiffening element has the effect that the weight of a person wearing the shoe equipped with the insole can be distributed over the module and over the stiffening element at the same time, so that the module itself presses onto the wearer's foot to a lesser degree. Especially during prolonged use of the insole according to the invention, e.g. for the duration of a football match, the improved wearing comfort of the insole can be distinctly noticed. The stiffening element is an element which stiffens the insole in sections. In order not to limit the flexibility of the insole, the stiffening element is preferably made harder and/or stiffer than the adjoining or surrounding portion of the insole, but is nevertheless flexible. To have a situation where the weight of a wearer of the shoe equipped with the insole is predominantly carried by the stiffening element, it is advantageous when substantially in a direction perpendicular to the load direction (or in the extension plane) of the insole the stiffening element has at least two times, preferably at least three times, four times or five times the dimension of the module and/or in the load direction (or in a direction perpendicular to the extension plane) of the insole at least the dimension of the module. It may be helpful when the module is fully surrounded by the stiffening element at least in a direction perpendicular to the load direction (or in the extension plane) of the insole. Preferably, the module is covered in the load direction (or in a direction perpendicular to the extension direction) of the insole at least at one side, preferably at both sides, by the stiffening element and/or is embedded in the stiffening element. It may also be of advantage when the stiffening element is substantially pad-shaped. Furthermore, it may be of advantage when the stiffening element is arranged substantially in the center relative to the length and/or width and/or thickness of the stiffening element, with the length (along the insole) and the width (in a direction transverse to the insole) of the stiffening element being measured vertically to the load direction (or in the extension plane) of the insole and the thickness in the load direction (or vertically to the extension plane) of the insole.

[0009] It may also turn out to be advantageous when the stiffening element stiffens a heel portion and/or an arch portion and/or a ball portion of the insole. Specifically in the heel portion, the weight of a wearer of the shoe equipped with the insole can very well be transferred to the shoe.

[0010] In one embodiment the receiving chamber is formed by the stiffening element and by an adjoining or surrounding portion of the insole, preferably a layer of

the insole, preferably a foamed layer of the insole. It may turn out to be helpful when the module is arranged between the stiffening element and an adjoining or surrounding portion of the insole and preferably directly or indirectly contacts the stiffening element and/or the adjoining or surrounding portion of the insole.

[0011] It may turn out to be advantageous when the stiffening element is formed of a more rigid material than the adjoining or surrounding portion of the insole. For instance, the stiffening element is made from silicone. The adjoining or surrounding portion of the insole can e.g. consist of a softer plastic material, preferably of a foamed plastic. Preferably, both the stiffening element and the adjoining or surrounding portion of the insole are flexible. This increases the wearing comfort of the insole, and the freedom of movement of the wearer of the shoe equipped with the insole is maintained.

[0012] It may turn out to be useful when the stiffening element is inserted into a recess of the insole, preferably such that the stiffening element substantially closes and/or fills, preferably completely closes and/or fills, the recess, with a surface of the stiffening element ending preferably substantially flush with an adjoining or surrounding surface of the insole. The stiffening element can here be held secured against displacement and/or rotation in the recess. Preferably, the surface of the stiffening element and the adjoining or surrounding surface of the insole are substantially in one plane. This prevents objectionable edges that press onto the wearer's foot and might possibly reduce the wearing comfort of the insole. The formulation "substantially flush" shall optionally also include a small gap between the surface of the stiffening element and the adjoining or surrounding surface of the insole. This gap may have a variable width and/or disappear completely when the insole is deformed. The gap may be created in that the stiffening element and the adjoining or surrounding portion of the insole have different degrees of rigidity. The stiffening element is preferably insertable from the bottom side of the insole in the receptacle and/or the bottom side of the stiffening element defines the bottom side of the insole together with the adjoining or surrounding surface.

[0013] It may turn out to be useful when the receiving chamber comprises a closure which is preferably formed by the stiffening element, wherein preferably the closure selectively substantially completely and/or sealingly closes or releases at least in sections an access opening to the receiving chamber, wherein the closure is particularly preferably a flexible flap. The flexible flap may be cut free out of the material of the insole, preferably out of the material of the stiffening element. The closure is preferably reversibly closable, i.e. it can be opened or closed as often as desired, e.g. for inserting or removing the module. The access opening to the receiving chamber is preferably just so large that the module can be inserted in and/or removed from the receiving chamber. In one embodiment the access opening is formed in the stiffening element. For instance, the module is insertable in

and/or removable from the receiving chamber through the stiffening element.

[0014] It may turn out to be advantageous when the module substantially, preferably completely, closes and/or fills the receiving chamber. The module can thereby be fixed secured against displacement in the receiving chamber. Preferably, the module can be arranged in only one position in the receiving chamber. As a result, the module can also be fixed to be non-rotatable in the receiving chamber. It may be useful when a surface of the module ends substantially flush with an adjoining or surrounding surface of the stiffening element. Preferably, this is a surface of the stiffening element which is oriented substantially in a direction perpendicular to the load direction (or in the extension plane) of the insole and/or an adjoining or surrounding portion of the insole, particularly a neighboring layer of the insole.

[0015] It may also turn out to be expedient when the module is insertable in and/or removable from the receiving chamber from the bottom side of the insole. The bottom side of the insole preferably faces the shoe bottom, so that the module cannot fall out of the receiving chamber inadvertently during use or non-use of the insole.

[0016] It may turn out to be advantageous when the chip and/or a printed circuit board and/or an energy storage means and/or an energy generation means is/are arranged in a housing of the module which is preferably reclosable or closed in watertight fashion, with the chip preferably protruding at least in sections into a recess in a housing wall. The housing is closable preferably reversibly in watertight fashion, i.e. it can be opened or closed as often as desired, e.g. for exchanging a battery. A flat button cell is preferably used as the battery. In the housing the electronic components are well protected from liquid, particularly sweat, rainwater, or the like, which considerably increases the service life of the electronic components.

[0017] It may turn out to be useful when the stiffening element is substantially flat and has a circular or oval contour in its extension plane. Preferably, a main axis of the stiffening element (with oval contour) extends substantially centrally through the heel portion and/or the arch portion and/or the ball portion of the insole. The extension plane is preferably the plane in which the stiffening element has the greatest planar extension. The top sides and bottom sides of the stiffening element are preferably aligned in parallel with each other and are congruent. Owing to this configuration of the stiffening element the weight of a wearer of the shoe equipped with the insole can be distributed very well and transferred onto the shoe or shoe bottom.

[0018] It may turn out to be advantageous when the module is substantially flat and has a substantially egg-shaped contour in its extension plane, with the module being preferably insertable in the receiving chamber such that a thinner end of the module is oriented towards the ball portion of the insole and/or a thicker end of the module is oriented towards the heel portion of the insole. The

extension plane is preferably the plane in which the module has the greatest planar extension (cf. Fig. 5). Thanks to this configuration of the module an incorrect insertion of the module in the receiving chamber is avoided.

[0019] It may turn out to be useful when the module is flattened in substantially wedge-shaped fashion towards at least one side. This means that the module is thinner in a direction transverse to its plane of extension. In an advantageous embodiment the module tapers both in and vertically to the extension plane towards an end which is preferably aligned with the ball portion of the insole. This can further improve the press-through characteristics of the module in a targeted way particularly at a pressure side or in the most strongly loaded area of the insole.

[0020] It may turn out to be convenient when the insole comprises an elevation on the top side, with a recess for the stiffening element being formed on the bottom side of the insole in a corresponding position relative to the elevation. Due to this elevation the thickness of the insole can be locally increased for accommodating the stiffening element and the module. This increases the stability and service life of the insole.

[0021] It may turn out to be useful when the stiffening element is adhesively connected to an adjoining or surrounding portion of the insole. The module is preferably fixed in form-fit or force-fit fashion in the receiving chamber. It is thereby possible to inseparably connect the stiffening element to the adjoining or surrounding portion of the insole while the module continues to be removable from the insole.

[0022] It may turn out to be advantageous when the chip is formed as an active or passive transponder chip and can be in wireless communication with a receiver, which is preferably integrated into a wrist watch. The acquired performance data can thereby be processed in real time. Preferably, the module comprises a data memory to be able to bridge communication interruptions with the receiver and to transmit data packets intermittently to the receiver.

[0023] It may turn out to be advantageous when the insole is configured as an insole for sports shoes, preferably as an insole for lawn sports shoes, preferably as an insole for football shoes. When the insole is used in football shoes, the advantages of the insole according to the invention are particularly noticed.

Brief description of the drawings

[0024]

Fig. 1 is a view on the top side of a left insole according to the invention.

Fig. 2 is a view on the bottom side of the insole according to the invention of Fig. 1.

Fig. 3 is a perspective view of the top side of the

insole according to the invention of Fig. 1.

Fig. 4 is a perspective exploded view on the bottom side of the insole according to the invention of Fig. 1, with the stiffening element and the module being shown separated from a body of the insole.

Fig. 5 is a perspective exploded view of the module of the insole according to the invention.

Fig. 6 is a view on the top side of the module of the insole according to the invention.

Fig. 7 shows a section VII-VII of the module of Fig. 6.

Detailed description of the preferred embodiments

[0025] The preferred embodiment of the invention will now be described in detail with reference to Figs. 1 to 7.

[0026] Fig. 1 is a view on the top side A of an insole 1 according to the invention. The insole 1 according to the invention is specifically configured as an insole 1 for football shoes and is therefore of a particularly small overall height. For the sake of clarity the figure only shows the left insole 1, and only the structure and function of the left insole 1 are described. The right insole has a mirror-inverted structure with respect to the left insole 1. The module 10 comprising the chip 2 can be selectively arranged in the receiving chamber 8 of the left or of the right insole 1. When two identical modules are available, it is also possible to equip both insoles 1 with a corresponding module 10.

[0027] A body of the insole 1 or individual components or layers 6, 7 thereof is/are preferably made by injection (molding), foaming, casting, laminating, punching, or the like, preferably from plastics, preferably from a flexible elastomer, particularly ethylenevinylacetate (EVA), silicone and/or polyurethane (PU), or the like. For instance, the lower layer 6 is a foamed polyurethane layer with an average thickness of about 7 mm in the heel portion 3, about 5 mm in the arch portion 4 and about 3 mm in the ball portion 5, the thickness of the layer 5 preferably continuously decreasing over the length of the insole 1. The lower layer 6 forms a monolithic basic structure of the insole 1 and extends continuously or coherently over the heel portion 3, the arch portion 4 and the ball portion 5, i.e. over the whole length and base area of the insole 1 (cf. Fig. 2). The upper layer 7 forms the cover layer of the insole 1 and also extends continuously or coherently over the heel portion 3, the arch portion 4 and the ball portion 5, i.e. over the whole length and base area of the insole 1 (cf. Fig. 1). Here, the cover layer has a thickness of about 0.5 mm and consists of a preferably textile-reinforced plastic material, e.g. ethylenevinylacetate (EVA). The layers 6, 7 are laminated and preferably adhesively connected. On the top side A the insole 1 comprises an elevation 20, with a recess 11 for the stiffening element 12 being formed on the bottom side B of the

insole 1 in a corresponding position with respect to the elevation 20. The elevation 20 can clearly be seen in Fig. 3. The recess 11 defines an oval or ellipse having a main axis extending substantially centrally through the insole 1 and the heel portion 3, respectively. The recess 11 extends from the bottom side B of the insole 1 at a depth of about 5 mm into the lower layer 6. The recess 11 on the bottom side B of the insole 1 can clearly be seen in Fig. 2 and Fig. 4.

[0028] The receiving chamber 5 is formed at least in part by a stiffening element 12 which stiffens the insole 1 e.g. in the heel portion 3. The stiffening element 12 is made from a more rigid material than the adjoining or surrounding portion of the insole 1, which is here formed by the lower layer 6. The stiffening element 12 consists in this instance of a transparent or translucent silicone material. Other materials are also conceivable. The stiffening element 12, the lower layer 6 and the upper layer 7 of the insole 1 are flexible, so that the insole 1 can follow a deformation of a shoe equipped with the insole 1. The stiffening element 12 is inserted from the bottom side B of the insole 1 into the recess 11 such that it substantially closes and fills the recess 11, with a bottom side of the stiffening element 12 ending substantially flush with the bottom side of the lower layer 6 so as to jointly define the bottom side B of the insole 1. Only the top side of the stiffening element 12 that is facing the lower layer 6 is here preferably glued to the lower layer 6, but not the circumferential side of the stiffening element 12. Due to deformation and bending of the insole 1 a gap of variable size can thereby be created between the surface of the stiffening element 12 and the surrounding surface of the insole 1 because the stiffening element 12 and the lower layer show different degrees of flexural rigidity.

[0029] In the front half of the stiffening element 12 facing the ball portion 5, the receiving chamber 8 is formed for receiving the module 10. The contour of the receiving chamber 8 in the extension plane of the stiffening element 12 is substantially egg-shaped, the middle axis of the receiving chamber 8 preferably coinciding with the main axis of the oval recess 1 and extending substantially centrally through the insole 1 and the heel portion 3, respectively. The receiving chamber 8 extends from the top side of the stiffening element 12, which faces the lower layer 6, at a depth of about 4 mm into the stiffening element 12. On the bottom side of the stiffening element 12 a flexible flap is cut free from the material of the stiffening element 12. This flexible flap forms a closure 13 of the receiving chamber 8 which is formed by the stiffening element 12 and which selectively substantially sealingly closes an access opening towards the receiving chamber 8 or releases said access opening at least in sections. The slit that separates the flexible flap from the surrounding material of the stiffening element 12 extends arcuately preferably exactly on the rear edge of the receiving chamber 8 which faces away from the ball portion 5 of the insole 1. Rounded portions 14 are preferably provided on the slit ends for preventing any tearing of the material.

Due to the flexibility of the material of the stiffening element 12 the shape and the size of the access opening of the receiving chamber 8 are variable.

[0030] According to the invention the insole 1 comprises an electronic chip 2, wherein the module 10 encompassing the chip 2 is removably embedded in the insole 1. Fig. 5 shows a perspective exploded view of the module 10, Fig. 6 is a view on the top side of the module 10, and Fig. 7 shows a section VII-VII of the module 10 from Fig. 6. An electronic chip 2 in the sense of the invention may be any electronic component, particularly a device of an electronic circuit and/or a microprocessor and/or an active or passive transponder which may e.g. be in wireless communication with a receiver (e.g. in a wrist watch). The module 10 comprises a printed circuit board 18, on which various chips 2 are arranged, and an energy storage means 9 in a watertightly closable housing 15, 16. The housing 15, 16 has a base 15 for receiving the printed circuit board 18 and a reversibly closable lid 16 on the inside of which a button type battery 9 can be held. For each chip 2 the housing 15, 16 comprises a recess 17 into which the chip 2 protrudes at least in sections. The recesses 17 are formed on the corresponding position of the chips 2 in a housing wall or in a housing bottom, so that the overall height of the module 10 can be additionally reduced by a few tenths of a millimeter owing to the reception of the chips 2 in the recesses 17. The module 10 is substantially flat and, in its extension plane, it has an egg-shaped contour so that it can be inserted in the receiving chamber 8 only in such a manner that the thinner end 19 of the module 10 is oriented towards the ball portion 5 of the insole 1 and the thicker end of the module 10 is oriented towards the heel portion 5 of the insole 1, with the module substantially filling the receiving chamber 8. The module 10 is here flattened in a substantially wedge-shaped manner towards the thinner end 19 and is thus thinner not only in, but also in a direction transverse to, its extension plane.

[0031] A separate stiffening element 21, which is preferably substantially U-shaped, can be arranged for stiffening the ball portion 5 e.g. in such a manner that two legs of the stiffening element 21 open towards the heel portion 3.

[0032] The preferred mounting and use of the insole 1 according to the invention is described hereinafter with reference to the figures.

[0033] First of all, the module 10 is assembled in the way shown in Figs. 5, 6 and 7. The printed circuit board 18 which is equipped with chips 2 is here used in the base 15 of the housing 15 such that the chips 2 are oriented towards the bottom of the base 15 and protrude in sections into the corresponding recesses 17, as shown in Fig. 7. Subsequently, the button type battery 9 is inserted into the lid 16, and the lid 16 is mounted to close the housing 15, 16 in a watertight manner. The button type battery 9 is here arranged on the rear side of the printed circuit board 18 facing away from the chips 2 so as to electrically contact the printed circuit board 18.

[0034] The module can now be embedded in the way illustrated in Fig. 4 from the bottom side B of the insole 1 into the insole 1. To this end the closure of the receiving chamber 8 has to be opened. This is accomplished in that the flexible flap 13 is e.g. gripped with the fingers and pulled away from the lower layer 6, so that access is given to the receiving chamber 8. Subsequently, the module 10 is arranged in the receiving chamber with the thin end 19 ahead and the flexible flap 13 is closed, so that the module 10 completely fills the receiving chamber and is fixed in form-fit and force-fit contact in the receiving chamber between the stiffening element 12 and the lower layer 6.

[0035] The insole 1 can now be inserted through a foot opening into a football shoe. For the wireless transmission of the acquired data the receiver is preferably switched to reception mode.

[0036] If necessary, the module 10 can be removed from the bottom side B of the insole 1 out of the receiving chamber 8 and can be reinserted in the above-described way. The lid 16 can also be removed again and can again be mounted in watertight fashion, for instance, to exchange the battery.

[0037] The present invention is not restricted to the preferred embodiment. Advantageous developments of the invention follow from any desired combinations of the features disclosed in the description, the claims and the drawings.

Claims

1. Insole (1) comprising an electronic chip (2), wherein a module (10) encompassing the chip (2) is removably embedded in the insole (1).
2. Insole (1) according to claim 1, **characterized in that** the module (10) is arranged in a receiving chamber (8) of the insole (1), the receiving chamber (6) comprising an access opening of variable shape and/or size.
3. Insole (1) according to at least one of the preceding claims, **characterized in that** the insole (1) comprises a stiffening element (12) which forms the receiving chamber (8) at least in sections.
4. Insole (1) according to at least one of the preceding claims, **characterized in that** the stiffening element (12) stiffens a heel portion (3) of the insole (1).
5. Insole (1) according to at least one of the preceding claims, **characterized in that** the module (10) is arranged between the stiffening element (12) and an adjoining or surrounding portion of the insole (1) and preferably directly or indirectly contacts the stiffening element (12) and/or the adjoining or surrounding portion of the insole (1).
6. Insole (1) according to at least one of the preceding claims, **characterized in that** the stiffening element (12) is formed of a more rigid material than the adjoining or surrounding portion of the insole (1).
7. Insole (1) according to at least one of the preceding claims, **characterized in that** the stiffening element (12) is inserted in a recess (11) of the insole (1), preferably such that the stiffening element (12) substantially closes and/or fills, preferably completely closes and/or fills, the recess (11), with a surface of the stiffening element (12) ending preferably substantially flush with an adjoining or surrounding surface of the insole (1).
8. Insole (1) according to at least one of the preceding claims, **characterized in that** the receiving chamber (8) comprises a closure (13) which is preferably formed by the stiffening element (12), the closure (13) being preferably a flexible flap which is cut free out of the material of the stiffening element (12).
9. Insole (1) according to at least one of the preceding claims, **characterized in that** the module (10) substantially closes and/or fills, preferably completely closes and/or fills, the receiving chamber (8).
10. Insole (1) according to at least one of the preceding claims, **characterized in that** the module (10) is insertable into and/or removable from the receiving chamber from the bottom side (B) of the insole (1).
11. Insole (1) according to at least one of the preceding claims, **characterized in that** the chip (2) is arranged in a housing (15, 16) of the module (10) which is preferably reclosable in a watertight manner, the chip (2) protruding preferably at least in sections into a recess (17) in the housing wall.
12. Insole (1) according to at least one of the preceding claims, **characterized in that** the stiffening element (12) is substantially flat and has an oval contour in its plane of extension.
13. Insole (1) according to at least one of the preceding claims, **characterized in that** the module (10) is substantially flat and has a substantially egg-shaped contour in its plane of extension, the module (10) being preferably insertable in the receiving chamber (8) such that a thinner end (19) of the module (10) is oriented towards the ball portion (5) of the insole (1) and/or a thicker end of the module (10) is oriented towards the heel portion (5) of the insole (1).
14. Insole (1) according to at least one of the preceding claims, **characterized in that** the module (10) is flattened in substantially wedge-shaped fashion towards at least one side.

15. Insole (1) according to at least one of the preceding claims, **characterized in that** the insole (1) comprises an elevation (20) on the top side (A), a recess (11) for the stiffening element (12) being formed on the bottom side (B) of the insole (1) in a corresponding position with respect to the elevation (20).

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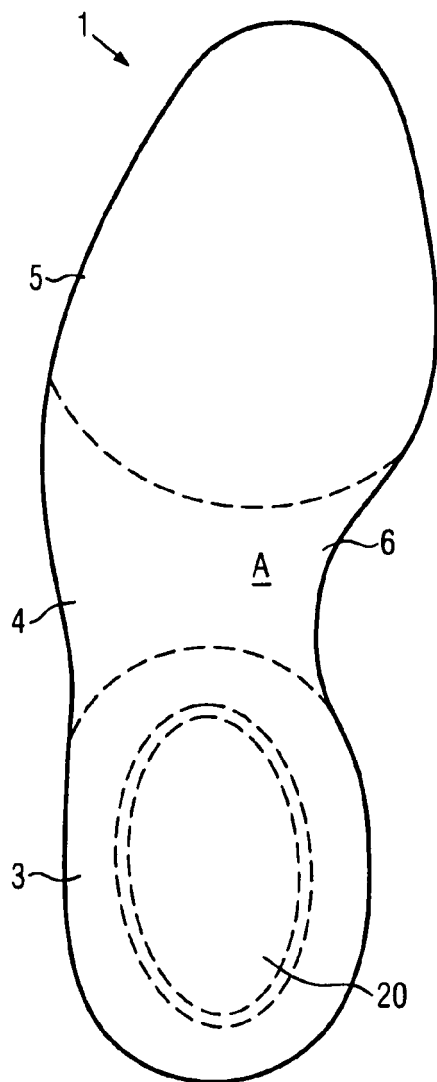


FIG. 1

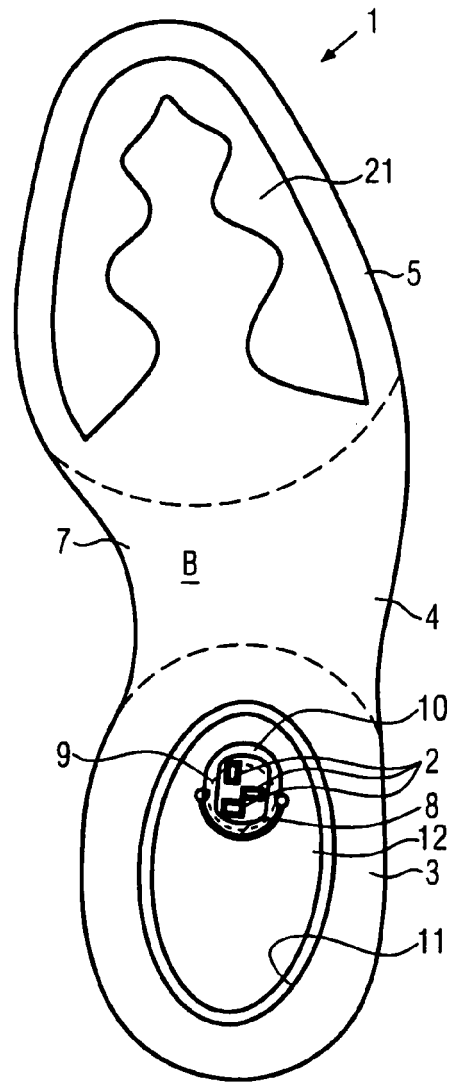
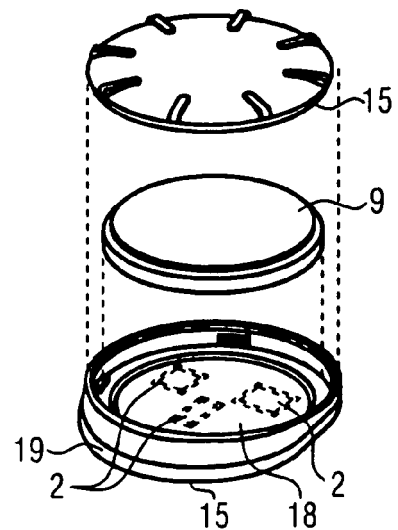
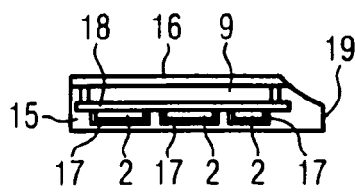
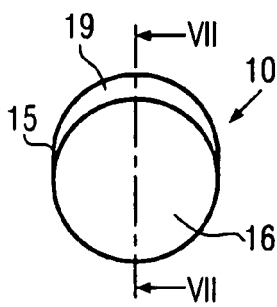
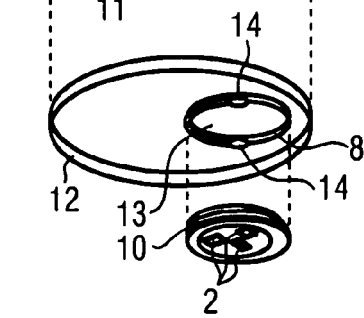
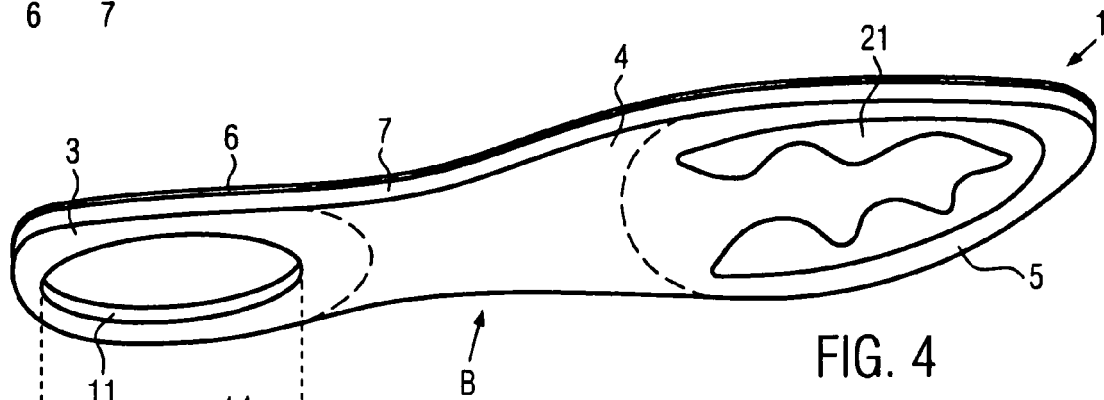
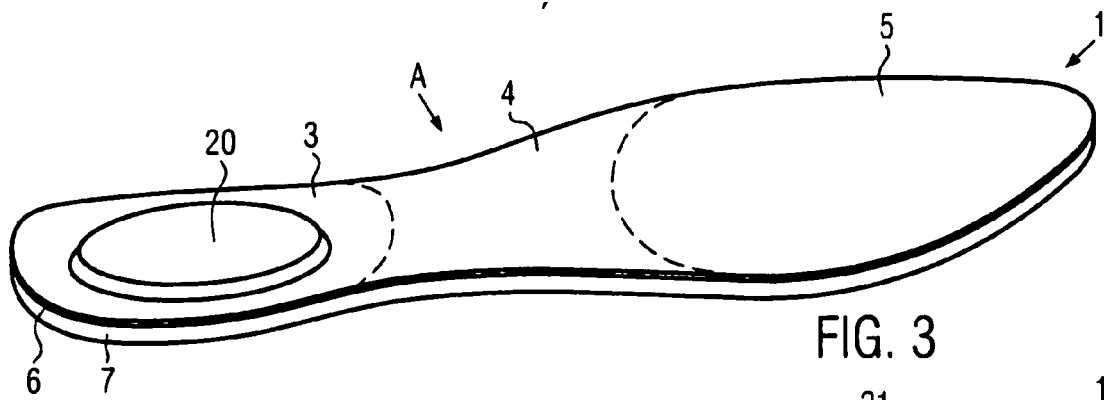


FIG. 2





EUROPEAN SEARCH REPORT

Application Number
EP 11 00 4536

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2007/260421 A1 (BERNER WILLIAM E JR [US] ET AL BERNER JR WILLIAM E [US] ET AL) 8 November 2007 (2007-11-08) * paragraphs [0034] - [0037], [0076], [0079], [0093], [0096] - [0097], [0099] - [0100], [0102], [0106]; figures 6A-12B *	1-15	INV. A43B17/00 A43B3/00
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The present search report has been drawn up for all claims			
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