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(54) Insole for sports shoes

(57) An insole (1, 101) for sports shoes, comprising a shell (3) and a sole (4, 104) made of plastic material.

The insole has, in a lower region, means adapted to allow the controlled transverse tilting of the insole (1, 101) with respect to the sole (4, 104).

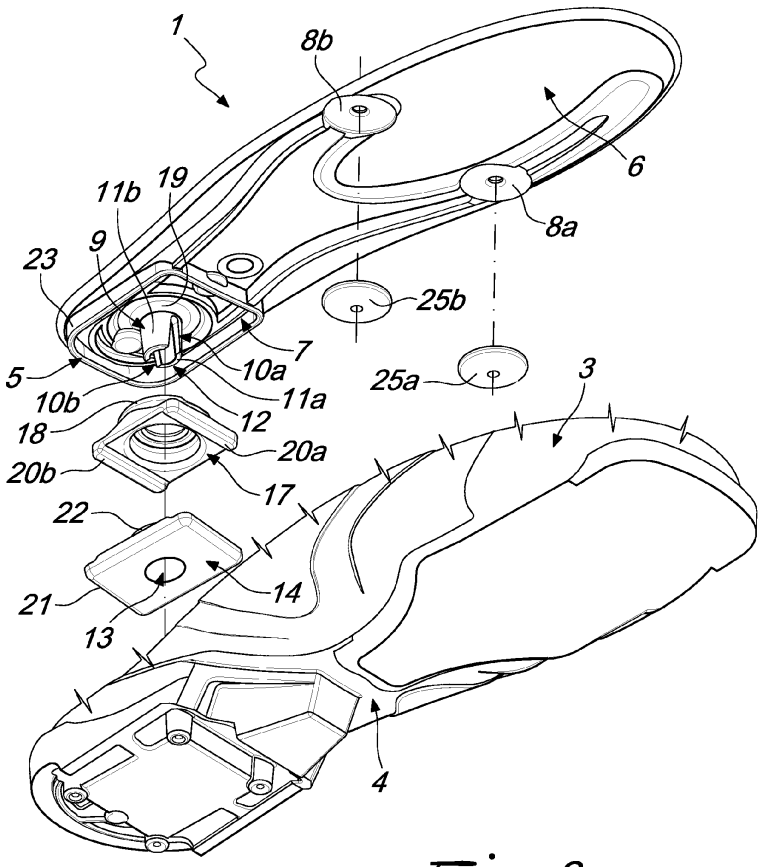

Fig. 2

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Description

[0001] The present invention relates to an insole for sports shoes of the type comprising a shell and a sole made of plastic material, such as for example a ski boot, a Telemark boot, a roller skate or an ice skate or a trekking boot.

[0002] Today these shoes are usually constituted by a shell made of plastic material to which an upper is articulated and which is provided with a sole which, in the case of ski boots, is of the standardized type, provided with a toe unit and a heel unit which have standardized dimensions.

[0003] The use of plastic material makes it possible to have a shoe that is rigid enough for the foot, arranged inside it with the interposition of a soft innerboot, to be able to transmit in an optimum manner the forces to the sports implement, such as the ski or the rollers or an ice skating blade.

[0004] In case of the ski boot, the greater the rigidity of the shoe, the better the edge grip of the skis on the snow-covered surface or on ice.

[0005] However, the inherent rigidity of the shoe is associated with some drawbacks, since incorrect placement and adaptation inside them can cause severe musculoskeletal problems, in addition to making the movement imparted for example to the ski or to the rollers or to the ice skating blade imprecise.

[0006] Any interposition of plantar inserts within the shoe does not make it possible to solve these problems, since such plantar inserts in any case interfere with posture, consequently having repercussions on the integrity of the entire musculoskeletal system and causing therefore the onset of inflammations of the knee, pelvis, spinal column, etc.

[0007] This problem is aggravated by the fact that it has been observed statistically that every person does not have perfectly identical feet whereas shoes are usually perfectly symmetrical.

[0008] The mechanisms that regulate postural activity are independent of our will and use sensorimotor systems at various levels, which maintain a permanent antigravity contraction of several muscle groups which also control the joints.

[0009] In order to understand the implication thereof, we should imagine that the end of a muscle is tied to each foot and such muscle, without discontinuity, is tied to another muscle, until a chain is formed; the feet are the starting points and the endpoints of all muscle chains.

[0010] The force of gravity that accompanies us is applied to the ground through the feet; this compression is perceived as a pressure by particular nervous sensors known as mechanoreceptors, which are corpuscles that inform the central nervous system and determine how the muscle chains must be tensioned.

[0011] Mechanoreceptors are distributed more or less all over the body: under the skin, in joints, ligaments, tendons and muscles, and signal to our central nervous system pressures, vibrations, torsions, frictions and the relative position of one part of the body with respect to the other.

[0012] Only in the feet, they also have the function of indicating the orientation of the body with respect to the force of gravity.

[0013] Mechanoreceptors are different in terms of shape and specialization; some of them have the appearance of tiny grapes, the compression of which during walking activates an electrochemical signal toward the brain; they measure from a few thousandths of a millimeter to a few millimeters and are far more numerous in the feet and hands than elsewhere; they are also connected via nerves to the central nervous system.

[0014] Sight and hearing complete the set of sentries that inform us about our position in space.

[0015] When we walk, we shift the weight of our body first onto one foot and then onto the other; this shift is perceived by the mechanoreceptors in the described manner; at every instant, everything that occurs between the foot and the ground and between joints, muscles and ligaments is reported to the central nervous system, which arranges the appropriate muscle contractions in order to perform the intended movement and keep us in balance.

[0016] Our brain is made aware of the slightest pressure, its intensity, speed and duration thanks to the signals of the mechanoreceptors.

[0017] An essential condition for being able to exhibit first-choice muscular activity is that the signals that reach the brain must be strong and clear, otherwise the movements are not of good quality (kinetic harmony versus kinetic disharmony).

[0018] The nervous system is unintentionally fooled by this information; the symmetry of shoes and the difference in our feet cause the nervous system to interpret for years the difference in pressure applied by the shoes as a true weight displacement even if we are not moving and alerts the muscle chains for a movement action that is not occurring.

[0019] The nervous system responds automatically to the stimuli that it receives and does not comment on them.

[0020] One shoe can thus compress the foot more than the other one in terms of length, width, at the big toe, on the metatarsal region: these sensory differences, maintained for years, are sufficient to perpetuate unnecessary and "misleading" muscle tensions and, with the complicity of the movements that we perform, set our posture asymmetrically (a shorter leg, a lower hip, a higher shoulder, the head tilted).

[0021] All this, in particular shoes, such as spike shoes for athletics, with studs for soccer, or ski boots that are not adapted correctly, can create the above-mentioned severe musculoskeletal problems in addition to making the movement imprecise.

[0022] The user does not realize the differences because this situation can be missed by pain sensors for

years without causing any problem.

[0023] In athletes this disparity can influence the harmony of the gesture (and off-center attitude on the skis, for example) or can interfere with the finest expression (in tennis a few meters behind the base line to respond).

[0024] Among the problems that affect amateur and professional skiers most frequently, there is backache, caused mainly by the rigidity of the boot, which is necessary in order to transmit supporting actions effectively, while lateral rigidity is an essential criterion, because it conditions edge grip; moreover, this rigidity must prevent the heel from rising and must cause the front part of the foot to adhere to the sole.

[0025] Since in the practice of skiing one is biomechanically in an upright position, the feet tend to splay outward, the knees, by bending, assume an X-like shape and the motor apparatus system is scarcely protected against dangerous stresses.

[0026] Finally, in skiing there is a considerable dispersion of the forces imparted by the foot to the ski and therefore to the snow-covered surface, which makes sports practice also tiring.

[0027] CH 688 637 is also known which describes a ski boot which comprises a shell made of plastic material which comprises a sole that has a flat surface for resting on the ski, a plantar insert being arranged inside the shell and inside a soft inner shoe; the plantar insert has, on its lower surface, protrusions or plates which are located in the regions of the heel and of the first and fifth metatarsal bones.

[0028] However, this solution does not solve the technical problems noted earlier, since it is dependent exclusively on the intention to discharge the weight of the user in three distinct resting points, while the structure remains nonetheless rigid as a whole.

[0029] The aim of the present invention is therefore to solve the noted technical problems, eliminating the drawbacks of the cited background art and, by devising an insole for sports shoes that is capable of allowing the user to adapt the shoe in the various situations of use to his most correct posture both on the frontal plane and on the sagittal or lateral plane, complying with the tibiofemoral angle that is most physiological for said athlete.

[0030] Within this aim, an object of the invention is to provide an insole for sports shoes that allows an adaptation of the posture of the user already in the static phase prior to sports action, in order to find his best center of gravity.

[0031] Another object of the invention is to obtain an insole for sports shoes that improves laterally the return of the user onto the blades.

[0032] Another object is to obtain an insole for sports shoes that is structurally simple, has low manufacturing costs and can be provided by means of common known systems.

[0033] This aim and these objects, as well as others that will become more apparent hereinafter, are achieved by an insole for sports shoes, comprising a shell and a sole made of plastic material, **characterized in that** it has, in a lower region, means adapted to allow the controlled transverse tilting of said insole with respect to said sole.

[0034] Advantageously, there are elastically deformable means which are interposed between said insole and said sole and are adapted to control the extent of said tilting.

[0035] Further characteristics and advantages of the invention will become more apparent from the detailed description of a particular but not exclusive embodiment, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a side view of a ski boot;
Figure 2 is an exploded bottom perspective view of the insole and of the sole of the shoe;
Figure 3 is a sectional view, taken along the line III-III of Figure 1;
Figure 4 is a sectional view, taken along the line IV-IV of Figure 1;
Figure 5 is a sectional view, taken along a central sectional plane which is longitudinal with respect to the insole once it is placed at the sole;
Figure 6 is a view, similar to Figure 2, of a further embodiment;
Figure 7 is a view, similar to Figure 4, of the solution according to Figure 6, in which the pad 114 has been removed partially on the right side of the figure;
Figure 8 is a view, similar to Figure 3, of the solution according to Figure 6.

[0036] In the exemplary embodiments that follow, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0037] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0038] With reference to the figures, an insole 1 is particularly usable for sports shoes for example of the type constituted by a ski boot 2, a skate or a trekking boot, comprising a shell 3 and a sole 4 made of plastic material.

[0039] The insole 1 is provided in a lower region, at the heel region 5 and at the metatarsal region 6, respectively with a first seat 7 and with a pair of second seats 8a, 8b for elastically deformable means which are adapted to allow the controlled transverse tilting of said insole with respect to such sole.

[0040] A hollow pivot 9 protrudes at the first seat 7 provided in the heel region 5 approximately centrally thereto and is provided with a frustum-like shape in which the vertex is directed away from the lower surface of the insole 1 and has, at a diametrical plane that substantially coincides with the longitudinal axis of the insole 1, a pair of openings 10a, 10b which are adapted to define a pair

of elastically deformable wings 11a, 11b.

[0041] The pivot 9 has such a length as to protrude, with its end 12, beyond the first seat 7.

[0042] The end 12 of the pivot 9 is inserted at a complementarily shaped and axially provided third seat 13 of a pad 14, which is made of elastically deformable material and is such as to allow the transverse tilting of the insole 1 under the weight of the user.

[0043] The pad 14 is accommodated at an adapted fourth seat 15, which is provided at the heel region 5 of the sole 4.

[0044] The pad 14 is arranged within the fourth seat 15 so that it cannot move under the force of the pin 9, the end 12 thereof being spaced from the bottom 16 of the fourth seat 15.

[0045] An insert 17 is arranged coaxially with the pivot 9 which is also made of elastically deformable material, preferably with a lower elastic constant than the pad 14.

[0046] The insert 17 has an essentially cylindrical shape and is interposed between the lower surface of the insole and the pad 14; the insert 17 has a first end 18 which has a preferably circular plan shape and can be positioned at a fifth seat 19 which is provided coaxially to the pivot 9 at the first seat 7.

[0047] The first end 18 is perforated axially for allowing the passage of the pivot 9 also at the third seat 13 provided in the pad 14.

[0048] The insert 17 is provided in a lower portion, on two opposite sides which are preferably arranged transversely to the heel region 5, with a pair of feet 20a, 20b, which are adapted to rest at the perimetric edge 21 of the underlying pad 14.

[0049] Such pad advantageously has an axial protrusion 22 that affects partially the opening provided in the insert 17.

[0050] Figure 4 is a sectional view, taken along a plane that is transverse to the heel region 5, of the insert 17, which exhibits an essentially cup-like shape and whose first end 18 again interacts with the first seat 7; the insert 17 has, at the sides not affected by the pair of feet 20a, 20b, a C-shaped transverse cross-section in which the perimetric end edge 17a faces the perimetric edge 21 of the underlying pad 14.

[0051] In relation to the different elasticity of the pad 14 and of the insert 17, it is specified that their differences have three purposes, namely the improvement of the damping of vertical forces in all the areas of the foot in which thermoplastic material is placed, reduction of vibrations which would reduce muscle reactivity and optimization of elastic returns.

[0052] In addition to this there is the fact that distinct elements, composed of inelastic and elastic parts, tend to imitate the physiological composition of our feet and therefore such a system avoids inconsistencies in the forces that ultimately are the basis for more or less invalidating traumas affecting the musculoskeletal system.

[0053] For limiting the transverse tilting of the insole 1, so that the oscillation is free but not perceivable by the user, there are adapted means below said insole 1 such as an annular ridge 23 that protrudes below the insole 1 sellers to define the edge for the first seat 7.

[0054] The annular ridge 23 has such an extension as to keep it, in the condition of non-use of the shoe, at a desired distance from an underlying flat surface 24 that is present at the facing internal surface of the sole 4 that is adjacent to the bottom 16.

[0055] A pair of disks 25a, 25b can be arranged at the second seats 8a, 8b, which preferably have a circular shape in plan view and also are made of the same material of which the pad 14 is made.

[0056] The disks 25a, 25b can be placed at complementarily shaped sixth seats 26 which are obtained at the vertex of adapted supports 27 that protrude from the bottom of the sole 4.

[0057] The supports 27 may be optionally omitted.

[0058] The illustrated solution utilizes laterally the flexing of the wings 11a, 11b of the pivot 9 and of the pad 14 and of the insert 17, which are capable of storing elastic potential energy and of returning it, thus loading energetically the insole and ensuring an elastic return for the user.

[0059] Figures 6 to 8 illustrate a variation in which the end 112 of the pivot 109, which is axially hollow, is inserted in a complementarily shaped third annular seat 113, which is provided axially to a pad 114 that is made of elastically deformable material and is such as to allow the transverse tilting of the insole 101 under the weight of the user.

[0060] The pad 114 is T-shaped so as to form a first base 114a, which is directed towards the sole 104, and a first axial stem 114b, which is adjacent to the third annular seat 113 and can be inserted within the pivot 109.

[0061] The height of the first stem 114b and the depth of the third seat 113 are such that in inactive conditions the end 112 of the pivot 109 does not interact with the bottom of the third seat 113 and the end of the first stem 114b does not interact with the bottom of an overlying fifth seat 119 which is provided coaxially and externally with respect to the pivot 109 at the first seat 107.

[0062] The pad 114 is accommodated at an adapted fourth seat 115 which is provided at the region 105 of the heel of the sole 104.

[0063] The first base 114a of the pad 114 is arranged within the fourth seat 115 so that it cannot move under the force of the pivot 109.

[0064] An insert 117, made of elastically deformable material, preferably with a lower elastic constant than the pad 114, can be associated coaxially and externally with respect to the pivot 109.

[0065] The insert 117 is essentially T-shaped, with a second flat base 117a which is directed toward the underlying pad 114, and a second stem 117b, which is perforated so as to accommodate the pivot 109 inside it.

[0066] The hole that affects said second stem 117b continues to affect the entire thickness of the second base 117a.

[0067] The second stem 117b has a first end 118 which has a preferably circular plan shape and can be positioned at the fifth seat 119.

[0068] The insole 101 is provided in a lower region, at the metatarsal region 106, with second axially perforated seats 108a, 108b, in each of which it is possible to arrange rotatably the third stem 108c of a disk 125a, 125b.

[0069] Each one of the disks 125a, 125b is shaped so as to form a pair of studs 128a, 128b, also made of the same material or of a different material with respect to the one of which the pad 114 is made.

[0070] The disks 125a, 125b can be arranged at complementarily shaped sixth seats 126 obtained at the bottom of the sole 4.

[0071] The height of the two studs 128a, 128b is different, so that upon a rotation of the disks 125a, 125b it is possible to achieve, as indicated in Figure 8, a different distance of the insole 101 from the sole 104.

[0072] In practice it has been found that the invention has achieved the aim and objects described above, an insole having been obtained which is capable of tilting under the effect of the weight force, allowing the athlete to adapt the boot in the various situations of use to his most correct posture both on the frontal plane and on the sagittal or lateral plane, complying with the tibiofemoral angle that is most physiological for the athlete.

[0073] The invention furthermore allows an adaptation of the posture of the athlete already in the static phase, prior to athletic action, in order to find his best center of gravity; this can be achieved with an adjustment system that acts both on the heel and on the forefoot.

[0074] The return on the blades of the athlete (return to "position") is thus improved laterally by means of a rigid-elastic system that allows the athlete to utilize the elastic energy produced by his own movement.

[0075] The described solution allows the base of the foot to oscillate laterally (not freely so that it is not perceived) under the effect of the weight force of the athlete, adapting the relationship between the sole and the lower limb to the athlete and increasing the return to the balanced position by utilizing such elastic energy.

[0076] 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.

[0077] The various means for performing certain different functions need not certainly coexist only in the illustrated embodiment but can be present per se in many embodiments, even if they are not illustrated.

[0078] The characteristics indicated as advantageous, convenient or the like may also be omitted or be replaced with equivalents.

[0079] The disclosures in Italian Patent Application No. TV2011A000003 from which this application claims priority are incorporated herein by reference.

[0080] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An insole (1, 101) for sports shoes, comprising a shell (3) and a sole (4, 104) made of plastic material, **characterized in that** it has, in a lower region, means adapted to allow the controlled transverse tilting of said insole (1, 101) with respect to said sole (4, 104).

2. The insole according to claim 1, **characterized in that** said means adapted to allow the controlled transverse tilting of said insole comprise elastically deformable means (14, 114, 17, 117, 25a, 25b, 125a, 125b), which are interposed between said insole (1, 101) and said sole (4, 104) and are adapted to control the extent of said tilting.

3. The insole according to claims 1 and 2, **characterized in that** it has, in a lower region, at the heel region (5) and at the metatarsal region (6, 106), respectively a first seat (7, 107) and a pair of second seats (8a, 8b, 108a, 108b) for elastically deformable means (14, 114, 17, 117, 25a, 25b, 125a, 125b), which are adapted to allow the controlled transverse tilting of said insole (1, 101) with respect to said sole (4, 104).

4. The insole according to claims 1 and 3, **characterized in that** a hollow pivot (9, 109) protrudes at said first seat (7, 107), approximately centrally thereto, and is frustum-shaped with the vertex directed away from the lower surface of said insole (1, 101) and has, at a diametrical plane that substantially coincides with the longitudinal axis of said insole (1, 101), a pair of openings (10a, 10b) which are adapted to define a pair of elastically deformable wings (11a, 11b).

5. The insole according to claims 1 and 4, **characterized in that** said pivot (9, 109) has such a length as to protrude, with its end (12, 112), beyond said first seat (7, 107), said end (12, 112) of said pivot (9, 109) being inserted at a complementarily shaped third seat (13, 113) provided axially to a pad (14, 114), which is made of elastically deformable material and is such as to allow the transverse tilting of said insole (1, 101) under the weight of the user.

6. The insole according to claims 1 and 5, **characterized in that** said pad (14, 114) is accommodated at an adapted fourth seat (15, 115), which is provided at said heel region (5, 105), said pad (14, 114) being

arranged within said fourth seat (15, 115) so as to be unable to move under the force of said pivot (9, 109), the end (12) of said pivot being spaced from the bottom (16) of said fourth seat (15, 115).

7. The insole according to claims 1 and 6, **characterized in that** an insert (17, 107) is arranged coaxially with said pivot (9, 109) and is also made of elastically deformable material, preferably with a lower elastic constant than said pad (14).

8. The insole according to claims 1 and 7, **characterized in that** said insert (17) is essentially cylindrical and is interposed between the lower surface of said insole (1) and said pad (14), said insert (17) having a first end (18) which has a circular plan shape and can be arranged at a fifth seat (19) which is provided coaxially with said pivot (9) at said first seat (7), said first end (18) being perforated axially in order to allow the passage of said pivot (9) also at said third seat (13) provided in said pad (14).

9. The insole according to claims 1 and 8, **characterized in that** said insert (17) has, in a lower region, on two opposite sides arranged transversely to said heel region (5), a pair of feet (20a, 20b), which are adapted to rest at the perimetric edge (21) of said underlying pad (14), which has an axial protrusion (22) that affects partially the opening provided in said insert (17).

10. The insole according to claims 1 and 9, **characterized in that** said insert (17) has, at the sides that are not affected by said pair of feet (20a, 20b), a C-shaped transverse cross-section with the perimetric end edge (17a) facing the perimetric edge (21) of said underlying pad (14).

11. The insole according to one or more of the preceding claims, **characterized in that** said pad (14, 114) and said insert (17, 117) have different elasticity characteristics, in order to improve the damping of vertical forces in all the areas of the foot where thermoplastic material is placed, achieve reduction of the vibrations that would reduce muscle reactivity and optimization of elastic returns, each one of said pad (14, 114) and said insert (17, 117) being constituted by a single element or a plurality of elements composed of inelastic and/or elastic parts.

12. The insole according to claims 1 and 10, **characterized in that** it comprises, below said insole (1), means, such as an annular ridge (23) which protrudes below said insole (1) so as to define the edge for said first seat (7), said annular ridge (23) being adapted to limit the transverse tilting of said insole (1) so that the oscillation is free but not perceivable by the user.

13. The insole according to claims 1 and 12, **characterized in that** said annular ridge (23) has such an extension as to keep it, in the condition in which the shoe is not used, at a desired distance from an underlying flat surface (24) provided at the facing internal surface of said sole (4) which is adjacent to the bottom (16).

14. The insole according to claims 1 and 13, **characterized in that** two disks (25a, 25b) can be arranged at said second seats (8a, 8b), which have a circular plan shape, and are also made of the same material of which said pad (14) is made, said disks (25a, 25b) being arrangeable or not at complementarily shaped sixth seats (26) which are obtained at the vertex of adapted supports (27) which protrude from the bottom of said sole (4).

15. The insole according to claims 1 and 6, **characterized in that** said pad (114) is T-shaped, so as to form a first base (114a), which is directed toward said sole (104), and a first axial stem (114b), which is adjacent to said third annular seat (113) and can be inserted in the pivot (109), the height of said first stem (114b) and the depth of said third seat (113) being such that in the inactive condition said end (112) of said pivot (109) does not interact with the bottom of said third seat (113) and the end of said first stem (114b) does not interact with the bottom of an overlying fifth seat (119) which is provided coaxially and externally to said pivot (109) at said first seat (107).

16. The insole according to claims 1 and 11, **characterized in that** an insert (117) can be associated coaxially and externally to said pivot (109) and is essentially T-shaped, with a flat second base (117 a), which is directed toward said underlying pad (114), and a second stem (117b), which is perforated in order to accommodate inside it said pivot (109), the hole that affects said second stem (117b) continuing so as to affect the entire thickness of said second base (117a), said second stem (117b) having a first end (118), which has a preferably circular plan shape and can be arranged at said fifth seat (119).

17. The insole according to claims 1 and 16, **characterized in that** it has in a lower region, at the metatarsal region (106), second axially perforated seats (108a, 108b), into each of which the third stem (108c) of a disk (125a, 125b) can be positioned rotatably, each one of said disks (125a, 125b) being shaped so as to form a pair of studs (128a, 128b), also made of the same material as said pad (114) or of a different material, said disks (125a, 125b) being arrangeable at complementarily shaped sixth seats (126) obtained at the bottom of said sole (104), the height of said two studs (128a, 128b) being different, so that

a rotation of said disks (125a, 125b) can lead to a different distance of said insole (101) from said sole (104).

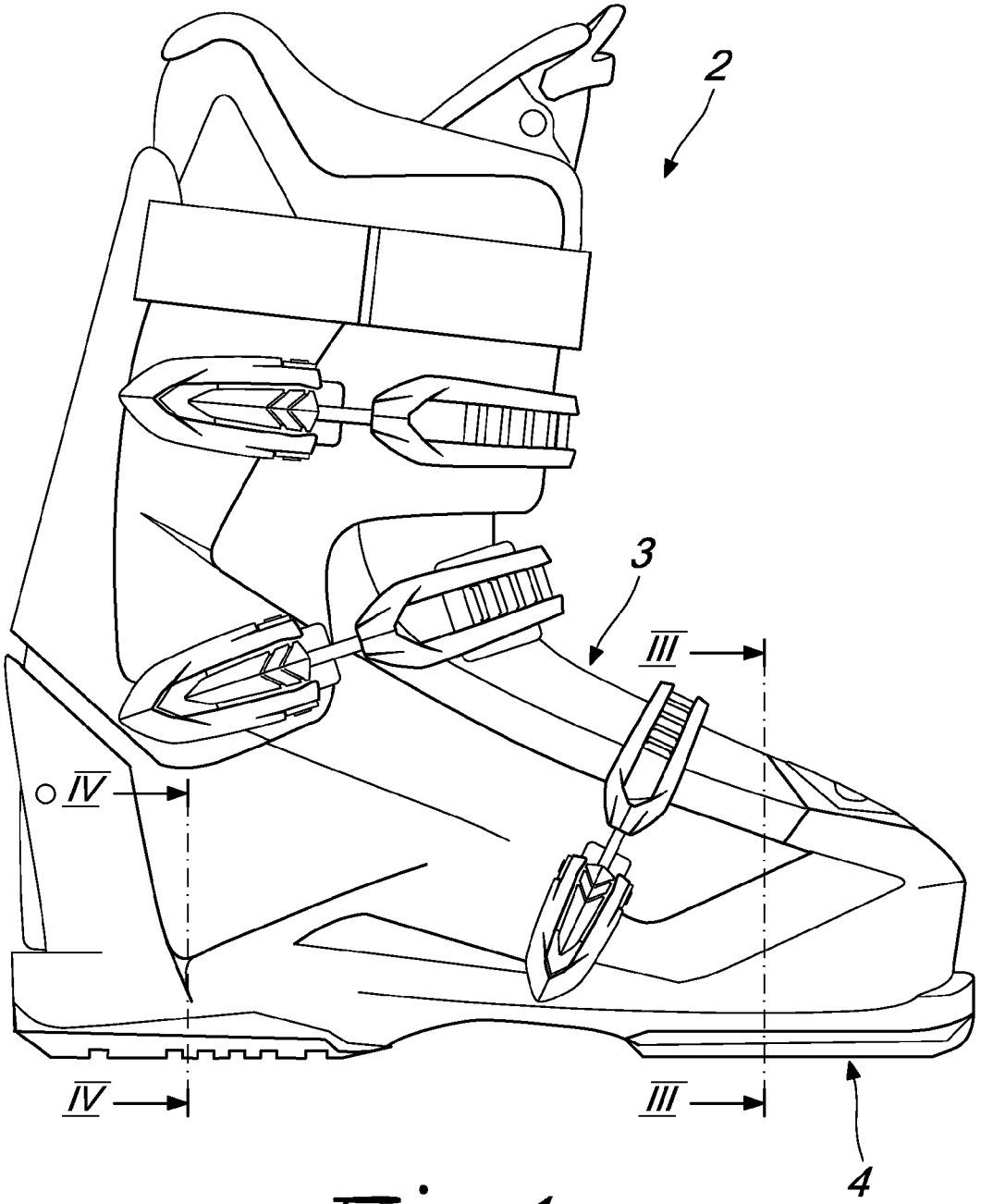

Fig. 1

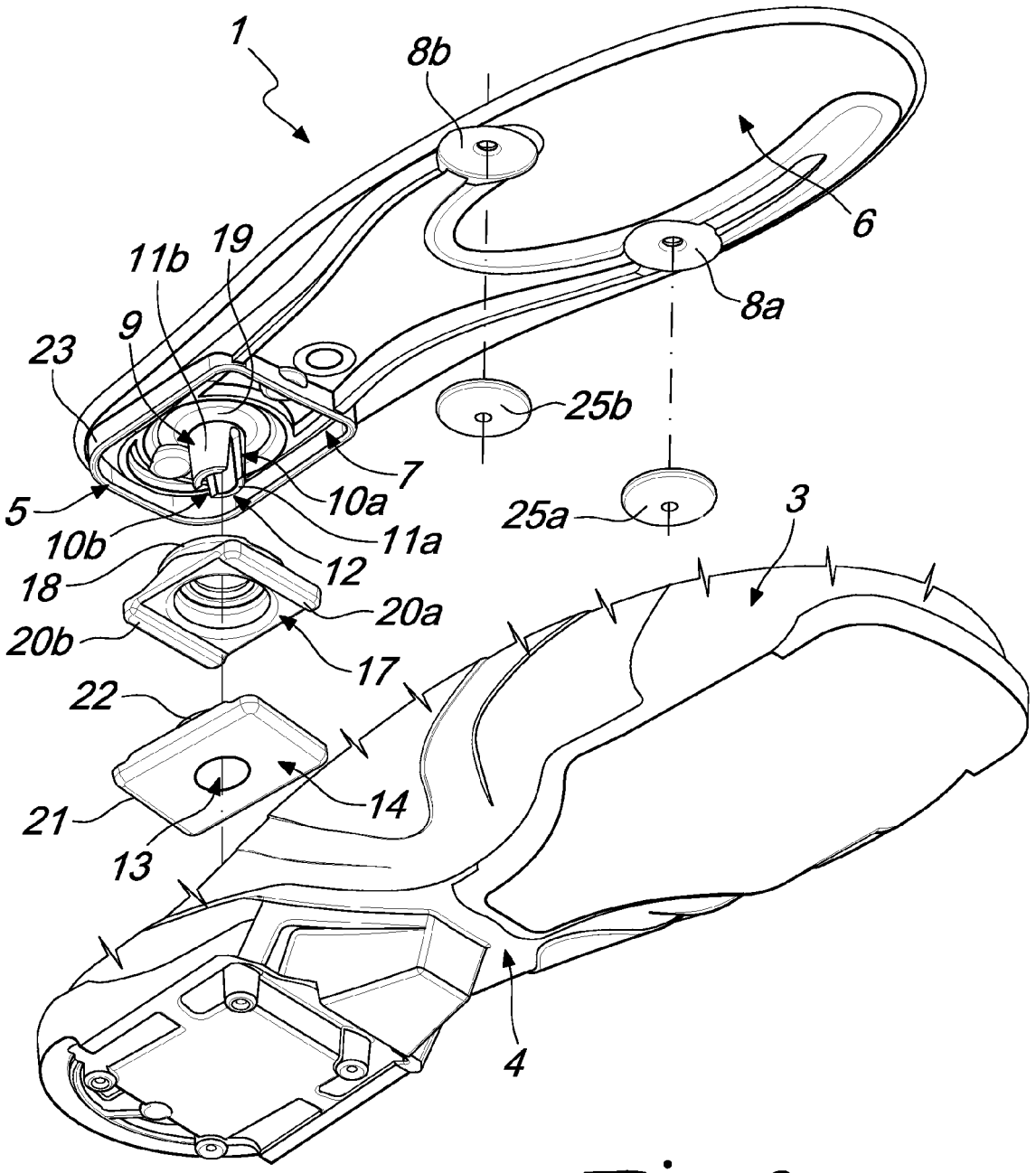
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Fig. 2

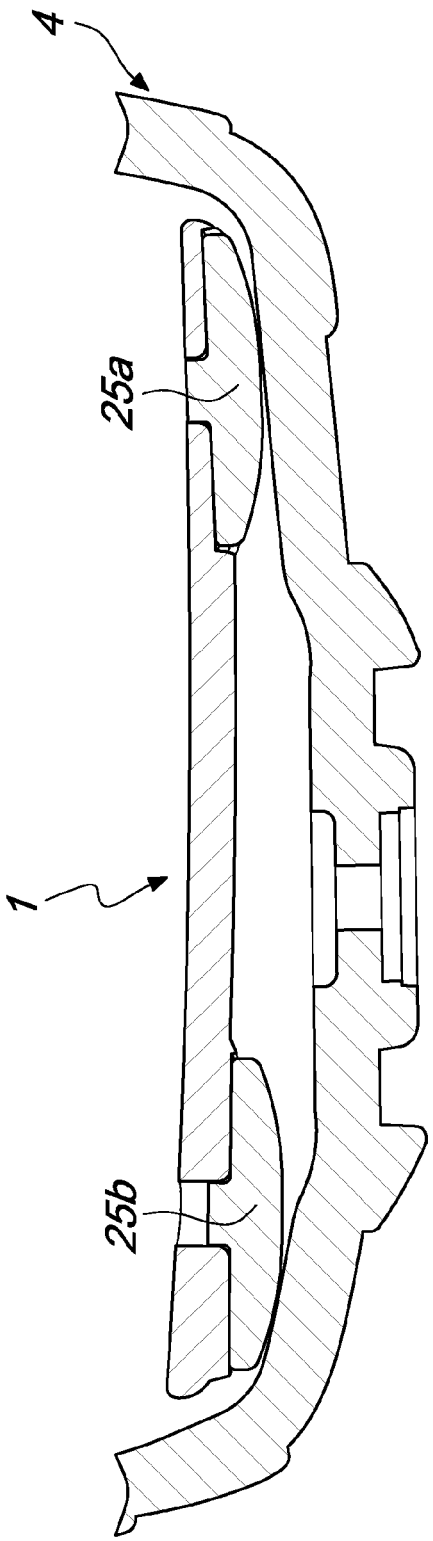

Fig. 3

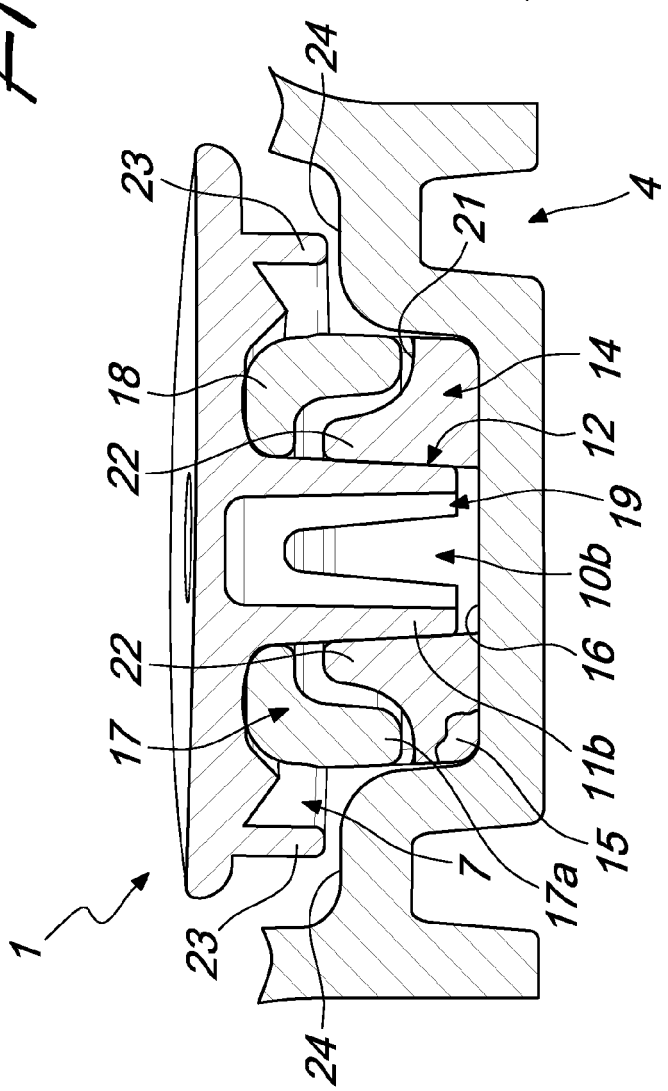

Fig. 4

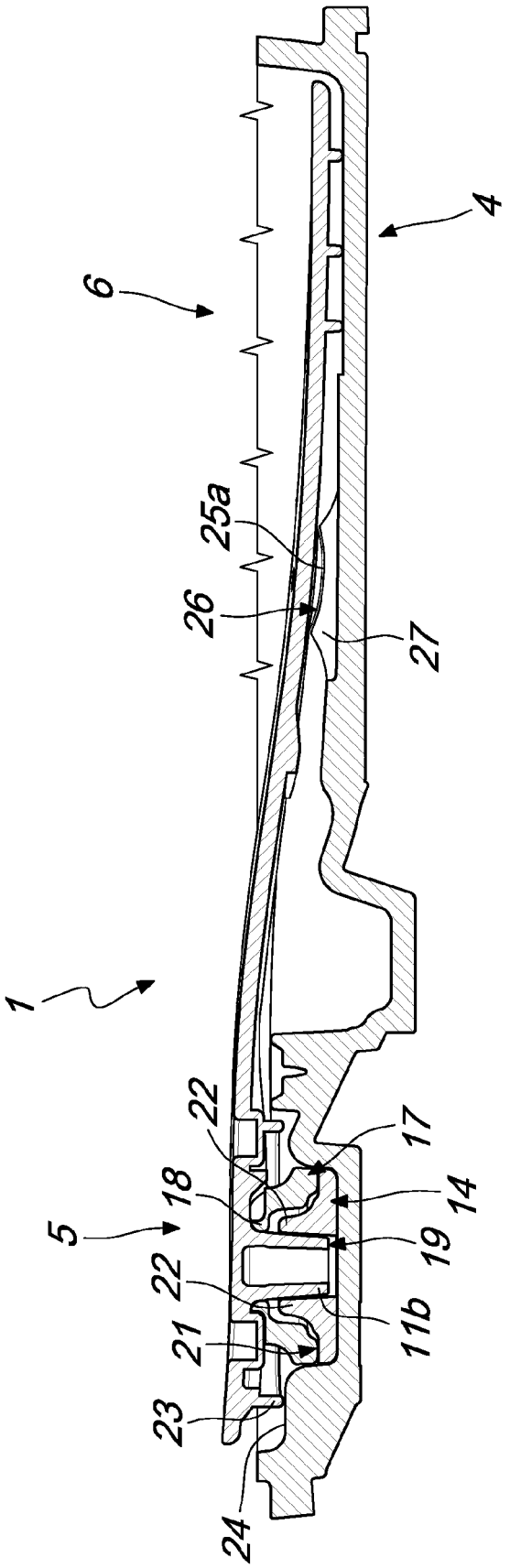

Fig. 5

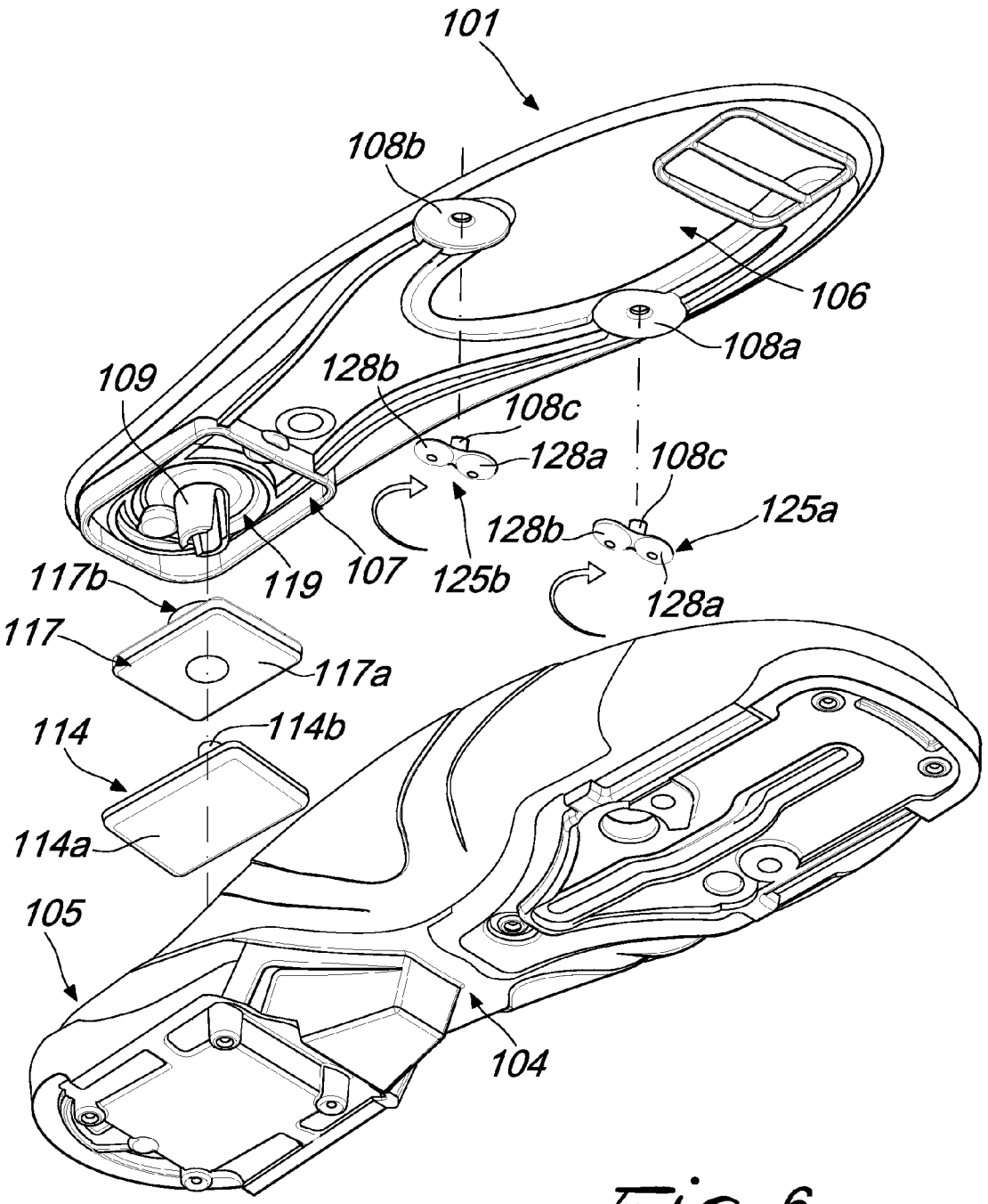
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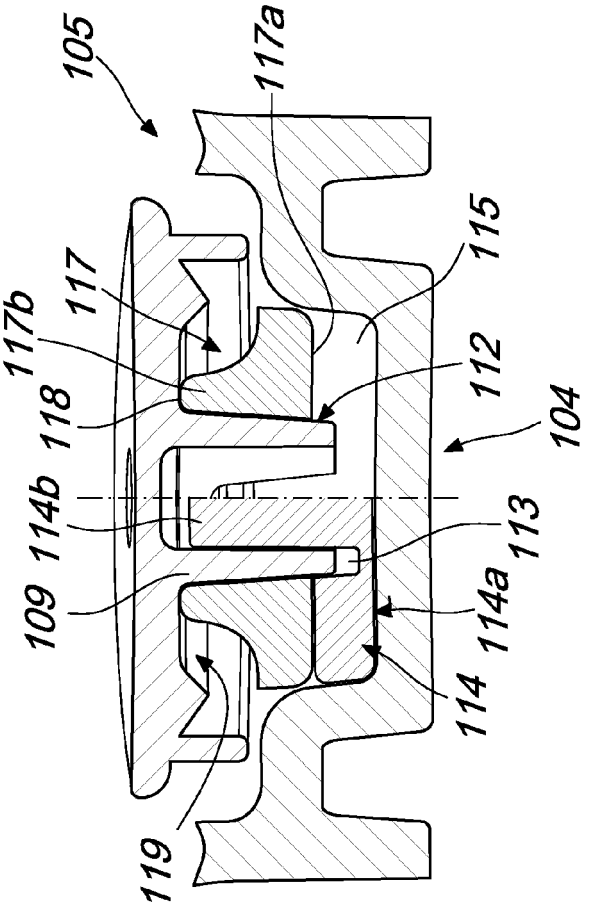
Fig. 6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117b
117
118
114b
109
119
115
112
104
113
114a
114

Fig. 7

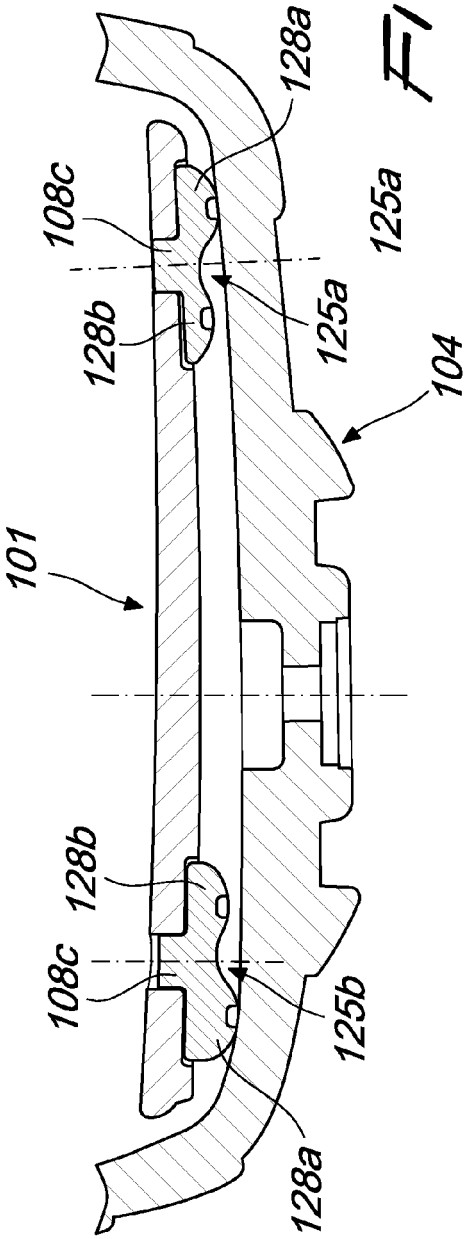
128a
108c
125a
128b
125a
104
101
128b
108c
125b
128a

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 12 15 1614

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