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(54) Shoe sole with improved muscular unconscious body response

(57) To improve the muscular unconscious body response to a shoe, a sole is proposed having a sandwich structure comprising
- a base element (22;50) acting as a support for the foot and which can be connected to a portion of upper or midsole,
- one or more inserts (24,26,28,30;52;84) coupled to the base element so as to project from the surface of the base element.
- a contact element with the ground (32;54;82) coupled to one or more inserts so as to cover it /them, where each insert is sufficiently deformable to
(ii) allow small oscillations of the contact element with the ground in relation to the base element along a plane (D,G;D2,D3) substantially parallel to the plane the latter is lying on, and
(ii) allow small oscillations of the contact element with the ground in relation to the base element along a directrix orthogonal to the latter.

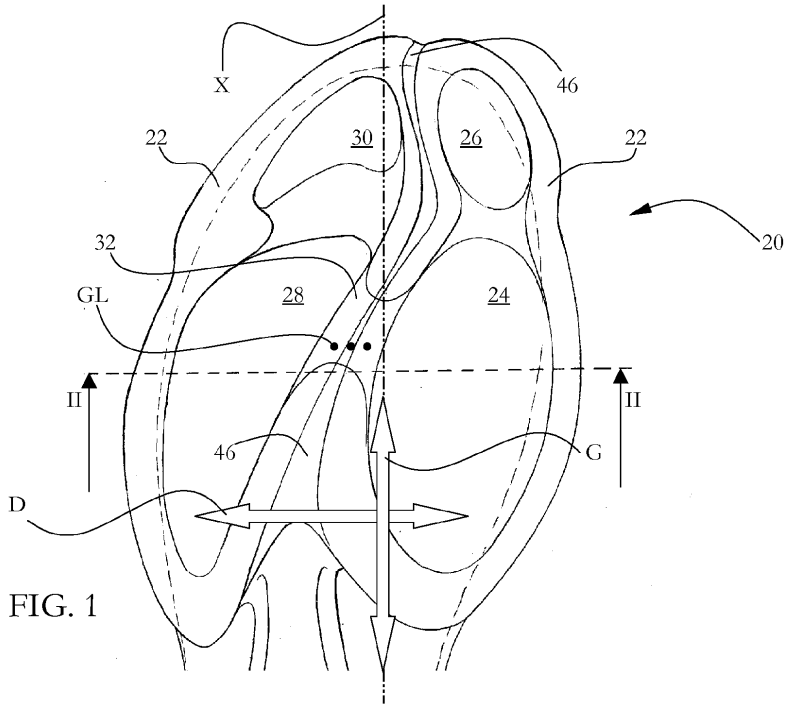


FIG. 1

EP 2 380 451 A1

Description

[0001] The present invention relates to an improved footwear sole in particular a generic shoe.

[0002] Soles generally consist of a single material all along the sole of the foot which does not vary in density. Despite this, from a bio-mechanical aspect two different types of pressure are exerted on the sole and heel so that the system is not optimised for movement of the foot or the absorption of impact.

[0003] Footwear is known of, for example, such as that described in the application EP10152804 which by means of special inserts make the foot slightly unstable when resting on the ground. To compensate the micro variations in balance caused by such instability the user's body is forced to use, and therefore train, a significant part of the musculature otherwise at rest, such as calves, buttocks, quadriceps, etc. As a result, the user exercises unconsciously in a relatively fatigue-free manner. The efficacy of such solution has been shown experimentally.

[0004] Using the same principle of muscular induction, it has been discovered how to further improve the performance of the sole.

[0005] The main object of the present invention is to extend the prior art, offering a sole with improved, and even different, abilities to stimulate a muscular reaction of the body without being subject to fatigue and/or without undertaking a physical exercise routine.

[0006] Another object is to obtain a sole which promotes muscular stimulation even in the absence of physical exercise, even during a merely erect posture.

[0007] This and other objects are achieved by means of a sole as defined in claim 1, while preferred embodiments of the invention are contained in the dependent claims.

[0008] The sole according to the invention has a sandwich structure comprising:

- a base element acting as a support for the foot which can be connected to a portion of upper or intersole,
- one or more inserts coupled to the base element so as to project from it,
- a contact element with the ground coupled to one or more inserts so as to cover it/them,
  where each insert is sufficiently deformable to

  (i) allow small oscillations of the contact element with the ground (such as several fractions of a millimetre to a couple of millimetres) in relation to the base element along a plane substantially parallel to the plane the latter is lying on , and
  (ii) allow small oscillations of the contact element with the ground in relation to the base element (such as several fractions of a millimetre to a couple of millimetres) along a diretrix orthogonal to the latter.

[0009] The following description of a preferred embodiment will highlight the advantages of the invention, also illustrated in the attached drawings where:

fig.1 shows a view from below in transparency of the front part of a sole according to the invention;
fig.2 shows a cross-section view along the plane II-II;
fig.3 shows a lateral view of the sole in fig.1;
fig.4 shows a front view of a footwear fitted with the sole in fig. 1 in a first configuration;
fig.5 shows a front view of a footwear fitted with the sole in fig.1 in a second configuration;
fig.6 shows a view from below in transparency of the rear part of a sole according to the invention;
fig.7 shows a lateral view along the plane VII-VII;
fig.8 shows a lateral view of the sole in fig.6;
fig.9 shows a view from behind of a footwear fitted with the sole in fig.6 in a first configuration;
fig.10 shows a front view of a footwear fitted with the sole in fig.1 in a second configuration;
fig.11 shows a cross-section view of a variant of fig.2.

[0010] The front of a sole 20 is partially visible in fig. 1. Here and henceforth in the description, the sole will be considered as positioned when in use, so that the part in contact with the ground is the bottom part.

[0011] The sole 20 comprises an upper layer 22 which has seats or concavities housing four deformable inserts 24,26,28,30 with zero backlash. The inserts 24,26,28,30 are positioned roughly symmetrically around a longitudinal axis X of the sole 20, are distanced from each other and project a certain distance from the layer 22. In practice, the inserts 24,26,28,30 are islands of different material glued into the layer 22. The layer 22 is preferably coupled underneath to an intersole (not shown) .

[0012] The inserts 24, 28 are larger than the others, drop-shaped and are positioned alongside the sole of the foot. The inserts 26, 30, smaller and of a roughly oval shape, are positioned alongside under the toe of the foot.

[0013] The inserts 24,26,28,30 are entirely covered by a layer 32 which comes into contact with the ground. In particular, the layer 32 is a rubber strip glued onto the inserts 24, 26, 28, 30. The layer 32 extends over the layer 22 even in the areas between the various inserts 24,26,28,30 and in these areas is locally glued at anchorage points GL.

[0014] The layer 32 or parts of it can thus freely oscillate in relation to the layer 22 along a plane (see diretrix D or G in fig.1) roughly parallel to the layer 22, thanks to the deformation of the inserts 24,26,28,30. The effect is shown in figures 4 and 5, where a complete shoe 40 is shown which uses the sole 20.

[0015] The part of the shoe 40 which rests on the ground is, on the front part, the layer 32 which can flex on the inserts 24, 26, 28, 30. The foot of a person wearing the shoe 40 is hugged in the upper and rests firmly on the layer 22 (for example by means of an intermediate intersole). Between the part resting on the ground consisting of the layer 32, and the layer integral with the foot,

the layer 22, are the inserts 24, 26, 28,30. These can mechanically deform laterally (along the directrix D and G). Consequently the areas of the foot overlying the inserts 24,26,28,30 do not have a stable support on the ground but can constantly "vibrate" to the right or left, backwards or forwards, often alternately. The user's body detects these micro shifts in position and to restore stability activates the muscles needed to re-establish balance. Constant, unconscious training results which tones the musculature.

[0016] Preferably, the inserts 24,26,28,30 are also elastically compressible vertically, in other words orthogonal to the ground . This way the inserts 24, 26, 28, 30 also permit a vertical movement, in that they do not only "oscillate" in relation to the base element 22, but also compress and dilate thanks to the characteristics of elasticity and impact absorption. An boosted effect of induced muscular mobility results for the person wearing the footwear.

[0017] In fig. 6 the rear part of a sole 42 is partially visible which at the front may be like the sole 22, for example. The sole 42 has a sandwich structure like the sole 20, and comprises an upper layer 50 which has seats or concavities which a single deformable heel insert 52 of a round shape is housed in without play. The insert 52 is positioned in the centre of the sole 42, under the heel.

[0018] The insert 52 is entirely covered by a layer 54 which comes into contact with the ground. In particular, the layer 32 is a rubber strip glued onto the insert 54, and there are no points of contact, and therefore attachment, between the layer 54 and the layer 50.

[0019] It follows that the layer 54 can freely oscillate in relation to the layer 50 along a plane roughly parallel (see directrix D2 or D3 in fig.6) to the layer 50 thanks to the deformation of the insert 54. The effect is shown in fig. 9 and 10, where a complete shoe 50 is shown which uses the sole 42.

[0020] The support point of the shoe 60 is, on the rear part, the layer 54 which can float on the insert 52. As before, the foot inside the shoe 60 is hugged by the upper and rests firmly on the layer 50, while in the ground support, consisting of the layer 54, the insert 52 is interposed. The latter may mechanically deform so that the foot can oscillate over the layer 54 (arrow H).

[0021] Consequently, as described above, the foot does not have absolute stability and to impose it must activate the muscles needed for equilibrium.

[0022] Preferably, the insert 52 is also elastically compressible vertically, in other words orthogonally to the ground. This way it also permits a vertical movement of the foot in that it compresses or dilates. A boosted effect of muscular mobility results for the person wearing the footwear.

[0023] The front or rear parts of the sole described permit a toning effect of legs and buttocks by simply walking, even more so if the two structures described are combined in a single sole.

[0024] For all the variants described the deformation of the inserts is preferably of an elastic type, that is they return to their original form once the phase of pressure of the foot has finished.

[0025] The base which an insert and the membrane or layer covering it lie on may be made with known materials used in the footwear sector such as generally rubber. It is the inserts, preferably in PU, which determine the characteristics of the sole. All the inserts described are positioned in the points of maximum pressure of the foot during the various phases of walking, adapting to the rolling phases and areas of bending.

[0026] A space or channel 46 may be associated with the sole 20 which divides the sole or element 22 into two parts roughly along the axis X. Each part houses an insert under the sole of the foot and a toe insert. The channel 46, allows the sole 20 to distance itself slightly outwards (by several mm or fraction of millimetre) along the directrix D, a movement which makes the two pairs of inserts move away from each other and enables maximum comfort of the foot during the phase of maximum pressure on the sole which naturally tends to widen. The channel 46 may also take the form of a simple groove, tunnel, recess in the sole or incision of the sole.

[0027] Fig.11 shows a variation 80 of the sole 20, to be compared to figure 2. The inserts, here indicated by reference numeral 84, are not coupled to the layer overlying the base 86 but, by means of the apertures or windows in the layer 86, directly to an intersole 88. As before, a layer or element for contact with the ground 82 is coupled to and covers the inserts 84. Functionally, the sole 80 is identical to the previous one, but is lighter thanks to the reduction of material in the layer 86. The same concept can be applied to the sole 42.

[0028] Preferably the inserts placed under the sole of the foot and the inserts in the heel are of variable density to each other to better follow the biomechanics of the walk. For example, a different type of PU can be used for each insert.

[0029] In addition, each insert may in itself be of varying density, to increase the spatial resolution and precision of the shock absorbing action.

[0030] For example, for each insert a type of PU can be used which varies its density within the insert itself.

Claims

1. Sole (20;42;80) having a sandwich structure comprising

   - a base element (22;50) acting as a support for the foot and which can be connected to a portion of upper or intersole,
   - one or more inserts (24,26,28,30; 52; 84) coupled to the base element so as to project from the surface of the base element.
   - a contact element with the ground (32; 54;82) coupled to one or more inserts so as to cover it

/them, where each insert is sufficiently deformable to

(ii) allow small oscillations of the contact element with the ground in relation to the base element along a plane (D, G; D2,D3) substantially parallel to the plane the latter is lying on, and
(ii) allow small oscillations of the contact element with the ground in relation to the base element along a directrix orthogonal to the latter.

2. Sole (20) according to claim 1, wherein the base element (22) comprises a portion of the sole of the foot, the portion of the sole of the foot comprising a plurality of said inserts (24,26,28,30) which are distributed under the sole of the foot and are coupled to elements of contact with the ground (32).

3. Sole according to claim 1 or 2, wherein the base element comprises a heel portion, the heel portion comprising centrally a single insert (52) which a contact element with the ground (54) is coupled to.

4. Sole (20) according to any of the previous claims, wherein the base element (22; 50) comprises seats for partially housing one or more inserts, which are sized so as to project from said seats beyond the surface of the base element .

5. Sole according to any of the previous claims, wherein the inserts are distanced from each other by free portions of the base element, an insert being covered by and coupled to the contact element with the ground having point attachment zones to the base element in one or more of said free portions.

6. Sole according to any of the previous claims, wherein a contact element with the ground is fitted so as to extend over and cover two or more inserts.

7. Sole according to claim 6, wherein a contact element with the ground comprises a flexible covering membrane which extends over and covers two or more inserts.

8. Sole according to any of the previous claims, wherein the base element comprises a recess (46) roughly at the centre, along said lying plane, which divides it into two parts and is adapted to allow small relative shifts between said parts.

9. Sole (80) according to any of the previous claims, wherein the base element comprises through-apertures which said inserts (84) are inserted in.

10. Sole according to any of the previous claims, wherein the inserts, some or all, are made in materials of differing density.

11. Sole according to any of the previous claims, wherein one or each insert is made of a material of varying density.

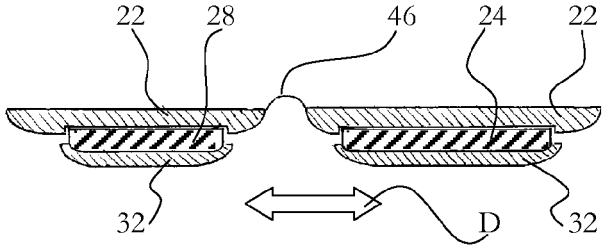


FIG. 2

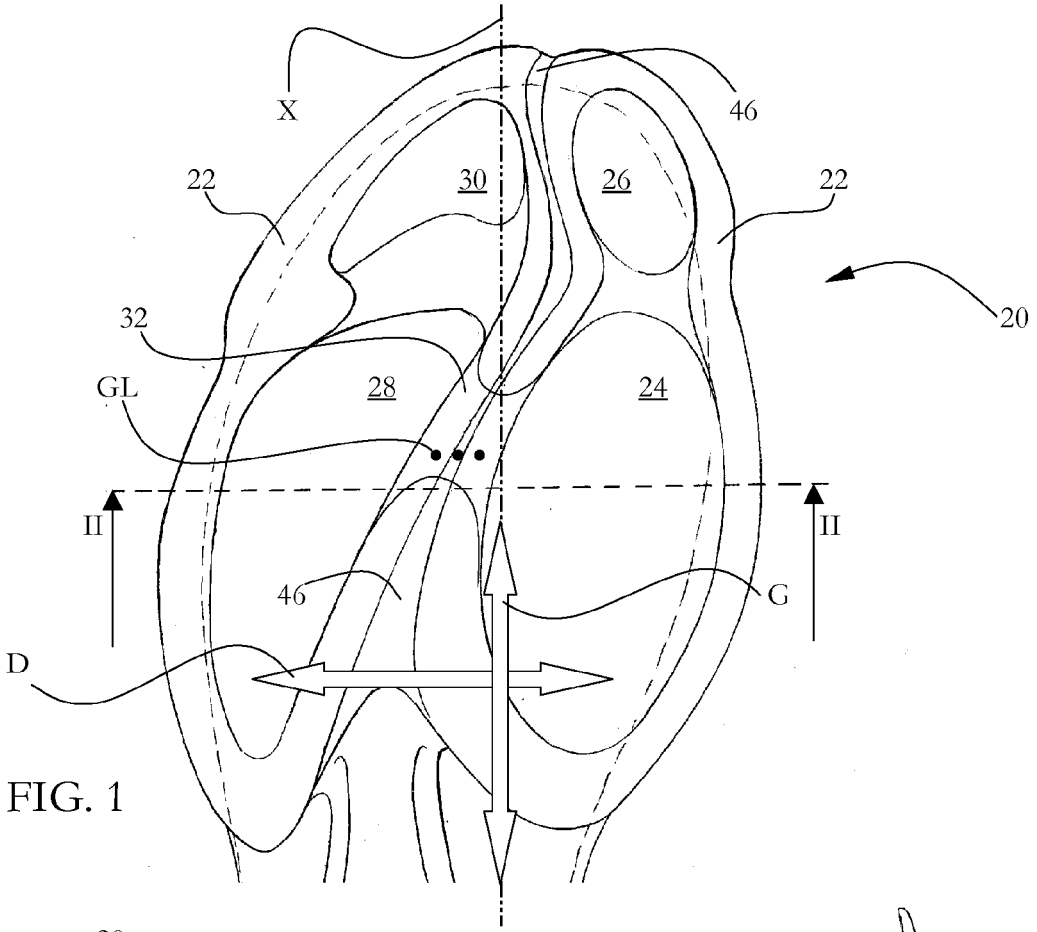


FIG. 1

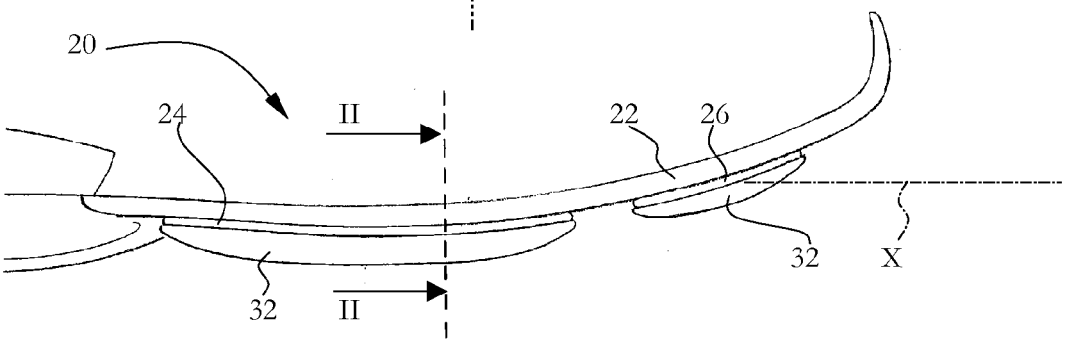


FIG. 3

FIG. 4

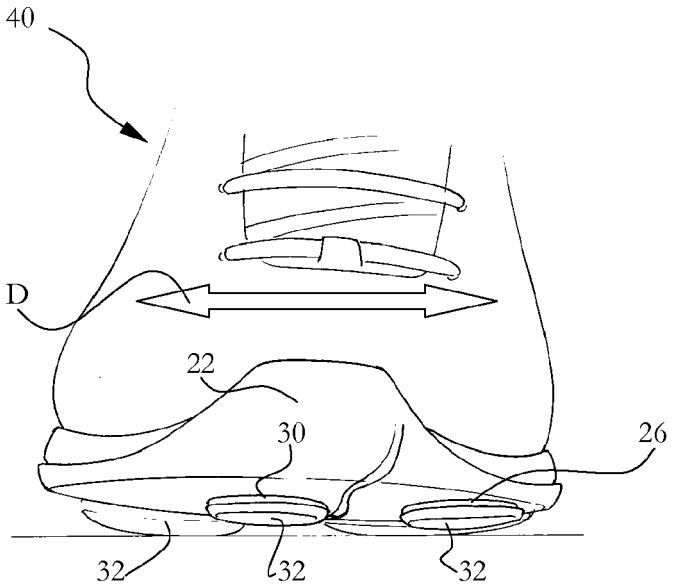
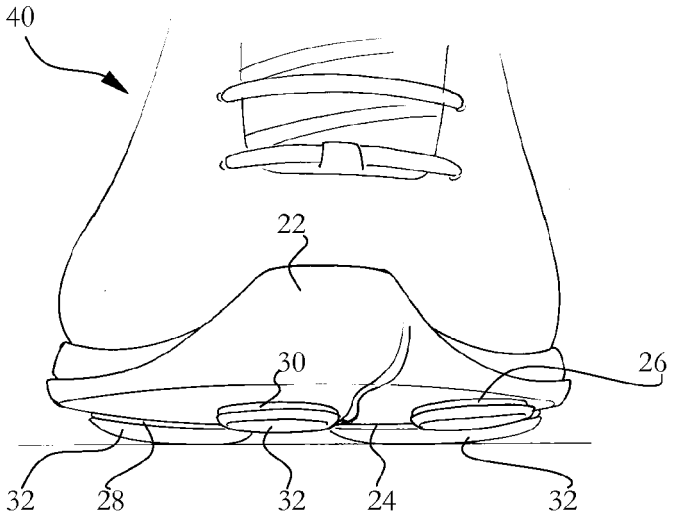


FIG. 5



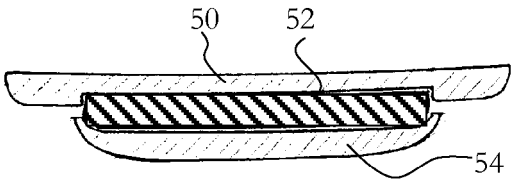


FIG. 7

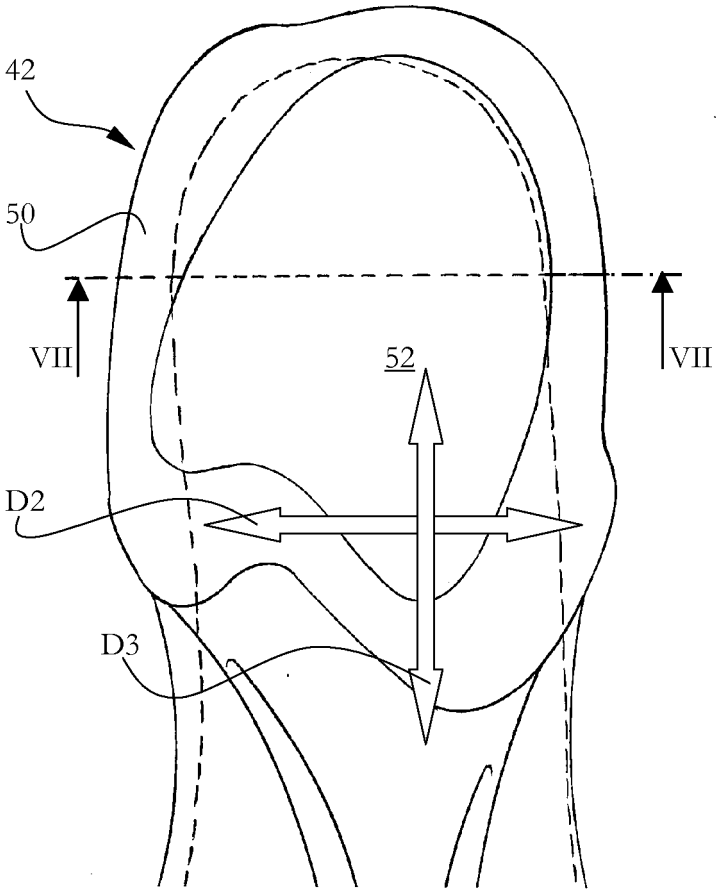


FIG. 6

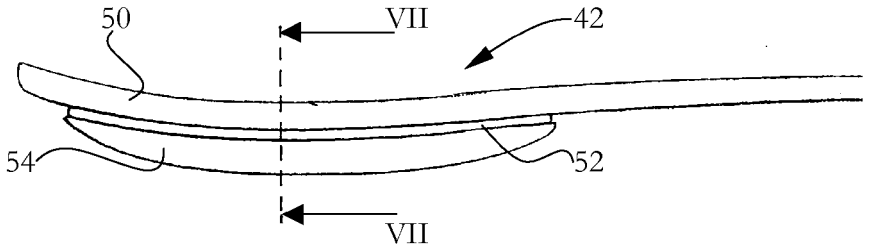


FIG. 8

FIG. 9

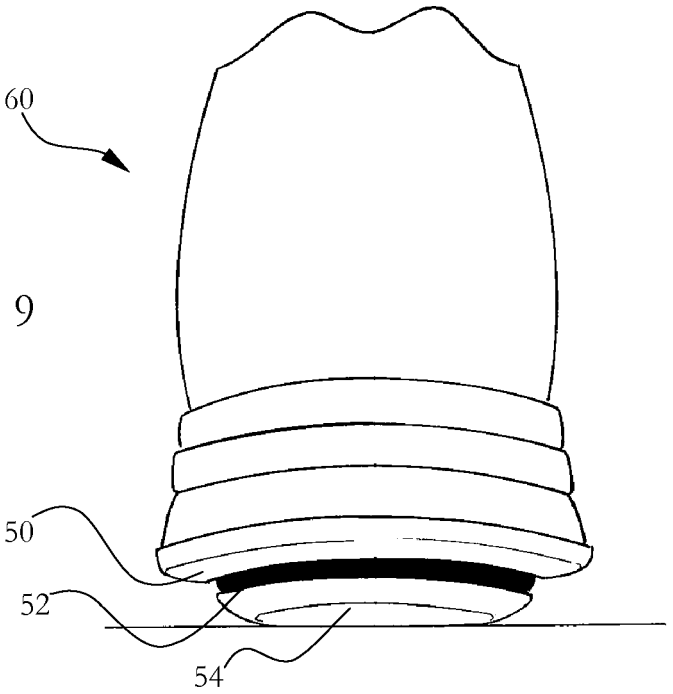
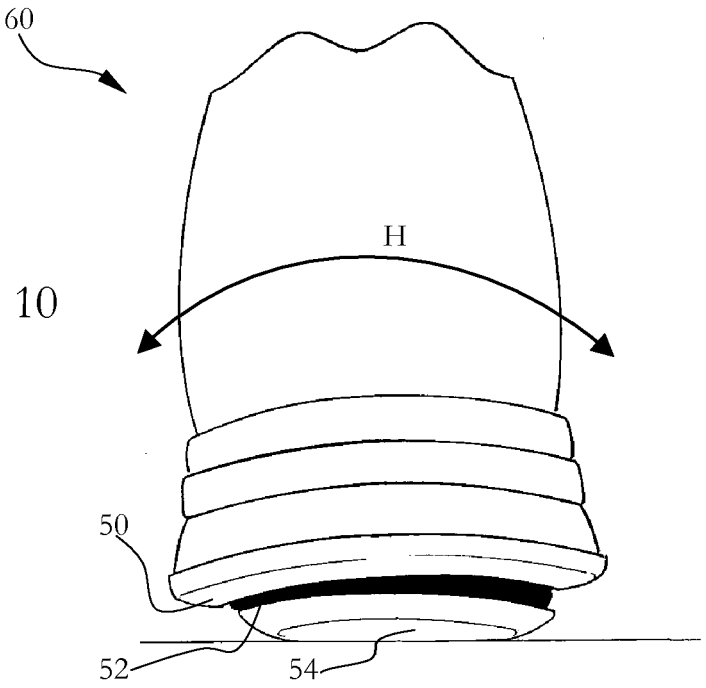


FIG. 10



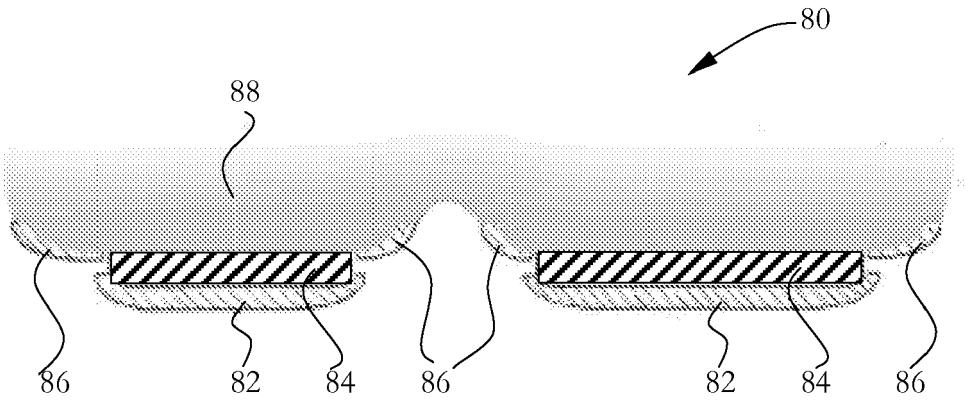


FIG. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 11 16 3210

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TECHNICAL FIELDS SEARCHED (IPC)

A43B
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 July 2011	Vesin, Stéphane

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