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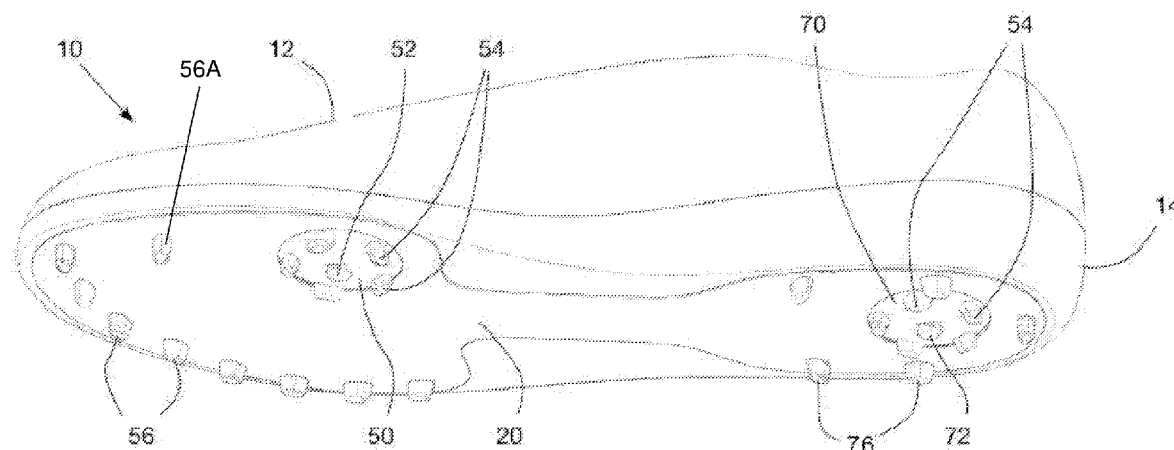


FIG. 1

(57) Abstract: A cleat plate for cleated footwear comprising a rigid forefoot plate, a rigid heel plate, and a flexible bridge element connecting the rigid forefoot plate and the rigid heel plate. The rigid forefoot plate includes a concave depression extending downward from the top of the rigid forefoot plate and configured to lie directly under the first metatarsal head of the wearer, wherein the depression extends as a convex surface below the bottom of the rigid forefoot plate and has plurality of cleats extending therefrom.



CLEATED FOOTWEAR

The present disclosure relates to new designs for cleated athletic shoes. The disclosure has particular applicability to cleated soccer footwear and will be described in connection with such utility, although the disclosure also may be advantageously used with
5 other cleated footwear including, but not limited to football boots, baseball shoes, track shoes, and the like. The disclosure also advantageously may be used with cleated footwear subject to unidirectional or asymmetric rotational motion such as golf shoes and sport shoes for shot put, discus, javelin, and the like.

As described in US Patent 7,143,530 athletic shoes are a combination of many
10 elements which have specific functions, all of which must work together for the support and protection of the wearer's foot during an athletic event. Cleated athletic shoes, particularly soccer boots, typically include a sole having an upper extending upwardly from the sole and into which the foot of the athlete is positioned and secured in place. The sole provides traction, protection, and a durable wear surface. In addition, a plurality of cleats are secured
15 to, or incorporated in, the sole and extend downwardly from the sole to provide traction to the shoe when the athlete runs on an athletic field or turf like surface. The design of athletic shoes has become a refined science. However, the advancement of that science to cleated footwear has in some ways been less rapid and less developed.

The sport of soccer imposes special demands upon player footwear. To begin with,
20 players run long distances. In a 90 minute match, a player may run as much as (or more than) 14 kilometers (over 8.5 miles). When practice sessions are also considered, a player may run in excess of 70 kilometers (43.5 miles) per week while wearing soccer shoes. It is thus important that soccer shoes protect and support the foot while minimizing discomfort.

The presence of cleats on the shoe sole presents additional problems in this regard.
25 Specifically, cleats can cause point pressures on a player's foot, particularly when the player is running over a hard playing field. Moreover, the long distances that a player must run, in combination with the side-to-side motions, foot-planting motions (for kicking a ball) and other common motions, can cause a player to become even more fatigued and injury prone than the player might be from simply running.

Pronation, or the rolling of a foot from the outside to the inside during running, is of special interest. In particular, pronation occurs as a runner's foot strikes the ground on the outside (or lateral) edge of the foot and the foot then rolls inward so as to place the inner (or medial) edge on the ground. A certain amount of pronation is natural and necessary for normal running. However, excessive pronation can lead to fatigue and injuries.

Also in the case of cleated footwear there is a "mismatch" between traction and available rotation during running, stopping and changing direction. Non-contact injuries to the knee are a major issue in sports, particularly soccer, where stopping abruptly and changing direction causes excessive rotational stress on the cruciate ligament in the knee.

Rupture of this structure is unfortunately common.

The present disclosure addresses the foregoing problems and other problems of the prior art by providing cleated footwear that controls motion of the wearer's foot, increases comfort and reduces fatigue, while also reducing stress by permitting normal foot joint flexibility while simultaneously maintaining traction while running, stopping and changing direction.

Cleated footwear normally is fabricated with a single rigid bottom plate with protrusions extending from the bottom outward towards the field surface. When cleats are placed directly under the first metatarsal head (which is traditional), they create an upward force on the wearer's first metatarsal head, causing the first metatarsal phalangeal joint (toe joint) to either reduce its ability to flex or completely lock up during the loading phase of running.

To facilitate both traction and flexibility, and also reduce stress on the cruciate ligament of the knee, we provide a cleat plate comprising a rigid forefoot plate and a rigid heel plate connected by a flexible bridge element. A specially shaped depression is formed extending downward from the top of the rigid forefoot plate and is configured to lie directly under the first metatarsal head of the wearer. The shape of this depression preferably is not simply round, but instead of oblique orientation, so as to permit the first metatarsal head of the wearer to plantarflex and evert while under load, i.e., in accordance with the teachings of prior US Patent 8,166,674 the contents of which are incorporated herein by reference. Since this depression is concave facing upwards and convex facing downward, the round bottom is

provided with cleats extending outward from the convex surface. The round bottom includes a central cleat about which several other cleats are radially arranged along the edges of the convex surface, and whose length is determined by the length of the central cleat.

Depending on the playing surface (i.e., grass or turf), the cleats may be made longer (grass)
5 or shorter (artificial turf) so that the total of them will be flat on any given surface.

In addition to cleats under the first metatarsal head we arrange a plurality of cleats essentially on a radius extending from the central cleat under the first metatarsal head, from the bottom of the toe region of the shoe and along the outer lateral bottom of the shoe. As so arranged the cleat design promotes both lateral traction and enhanced rotational motion.

10 The heel portion of conventional cleated footwear also may promote excessive traction and potential for injury. In accordance with the present disclosure, we provide a downwardly direct heel depression within the heel plate of the shoe configured to essentially underlie and match the underside of the human calcaneus bone. Preferably the heel depression is a slightly larger depression under the medial tuberosity and a very subtly
15 raised area under the lateral tuberosity, i.e., in accordance with the teaching of our prior US Patent 10,702,008, the contents of which are incorporated herein by reference. The bottom of the depression is provided with a central cleat and includes a plurality of cleats surrounding the central cleat in a pattern essentially on a radius emanating from the central cleat. Additional cleats are provided along the outer edge of the heel portion of the shoe,
20 also within a prescribed radius with the center being the cleat under the central aspect of the heel depression.

Also, in order to provide for flexibility, the heel plate and the forefoot plate are separated from one another and joined by a flexible bridge between the two, whereby the heel plate and the forefoot plate are capable of independent motion during activity.

25 More particularly, in one embodiment of the disclosure there is provided a cleat plate for cleated footwear comprising a rigid forefoot plate, a rigid heel plate, and a flexible bridge element connecting the rigid forefoot plate and the rigid heel plate. Preferably the rigid forefoot plate includes a concave depression extending downward from the top of the rigid forefoot plate and configured to lie directly under the first metatarsal head of the

wearer, wherein the depression extends as a convex surface below the bottom of the rigid forefoot plate and has plurality of cleats extending therefrom.

In a preferred embodiment of the disclosure depression includes a central cleat and a plurality of additional cleats radially arranged along edges of the convex surface of the depression. Also the rigid forefoot cleats preferably includes a further plurality of cleats located essentially on a radius extending from the a toe end of the rigid forefoot plate along an outer lateral bottom side of the rigid forefoot plate.

In yet another embodiment of the disclosure, the rigid rear heel plate includes a concave heel depression configured to underlie and match the underside of the wearer's calcaneus bone, wherein the heel depression extends as a convex surface below the bottom of the rigid heel plate and has a plurality of cleats extending therefrom.

Preferably the depression includes a central cleat and a plurality of additional cleats radially arranged along edges of the convex surface of the heel depression. Also, a further plurality of cleats preferably is provided in a pattern essentially on a radius extending from the central cleat along an outer edge of the rigid heel plate.

The disclosure also provides a cleated shoe comprising a cleat plate as above described.

In one embodiment the cleat plates are left and right shoe specific mirror images of one another. In such case the shoe preferably comprises a soccer shoe, a football boot, a baseball shoe, and a track shoe.

In yet another embodiment the flexible bridge member is adjusted to accommodate the wear's ball of foot length.

In another embodiment, the cleat plates have a central cleat configured to lie directly under the first metatarsal head of the wearer, and all additional cleats are radially arranged around the central cleat of each other.

In yet another embodiment, the cleat plates have a central cleat configured to lie directly underlie the calcaneus bone of the wearer, and all additional cleats are radially arranged around the central cleat of each shoe.

In yet another embodiment the cleat plates are different for left and right shoes, to accommodate unidirectional or asymmetric rotational movement of the wearer, as may be encountered in playing golf, or shot put, discus and javelin throw and the like.

Other features and advantages of the present disclosure will be seen from the following detailed description taken in conjunction with the accompanying drawings, wherein like numerals depict like parts, and wherein:

Fig. 1 is a perspective bottom view of a soccer shoe made in accordance with the present disclosure;

Fig. 2a is an exploded view of the soccer shoe of Fig. 1 looking down;

Fig. 2b is an exploded view of the soccer shoe of Fig. 1 looking up;

Fig. 3 is a top plan X-ray view of the foot support surface of the soccer shoe of Fig. 1;

Fig. 4 is a bottom plan view of the soccer shoe of Fig. 1;

Fig. 5 is a bottom plan view of a cleat plate for a pair of golf shoes showing the differences between the left shoe and the right shoe in accordance with the present disclosure;

Fig. 6 is a bottom plan view of a cleat plate for a pair of shoes optimized for rotation about the ball of either foot, in accordance with the present disclosure; and

Fig. 7 is a bottom plan view of a cleat plate for a pair of shoes optimized for rotation about the heel of either foot, in accordance with the present disclosure.

For simplicity, in the following detailed description and drawings only half a pair of shoes is illustrated and discussed, it being understood the other half of the pair of shoes is a mirror image.

Referring to Figs 1-4, there is illustrated a cleated soccer shoe 10 which includes an upper 12 which is attached to a midsole 14 which in turn is sandwiched between a cleat plate assembly 16 comprising a rigid heel plate 15 and rigid forefoot plate 17 as will be described in detail below, and an insole 18 which overlays the heel plate/forefoot cleat plate assembly 16. Midsole 14 in turn is sandwiched between the cleat plate assembly 16 and a base plate 20.

Referring in particular to Figs. 3 and 4, the soccer shoe includes a depressed area 23 in the forward region of the insole 18, which corresponds to a depressed area 22 in the first region of the upper, i.e., foot supporting surface of the forefoot plate 17. Depressed areas 22 and 23 are located to underlie substantially only the first metatarsal head of the wearer, and includes a hollow or depression relative to the remainder of the forefoot region, of asymmetric shape with the lowest point of the hollow or depression skewed to the medial side of the center, as taught in prior US Patent 8,166,674, the contents of which are incorporated herein by reference.

The depressed area 22 extends below the bottom surface of the forefoot plate as a rounded dome like structure 50. Dome like structure 50 includes a center cleat 52 and a plurality of individual cleats 54 radially disposed around the center cleat 52. Also attached to the forefoot plate are a plurality of radially disposed cleats 56 configured from in front of the big toe of the wearer and along the outside lateral edge of the shoe. One or more additional radially disposed perimeter cleats 56A may be added along the outside medial edge of the shoe for additional stability.

The heel plate 15 includes a heel cup 60 in the form of a lop-sided generally round shaped depression 62 extending from the foot supporting surface, with its lowest region on its medial side. There is a corresponding lop-sided generally round shaped depression 63 in the insole 18. These two depressions serve to reduce pressure on the plantar fascia of the wearer's foot as it travels from its attachment on the medial calcaneus to the proximal phalanges, i.e., as taught in our prior US Patent 10,702,008, the contents of which are incorporated herein by reference. Heel cup 60 typically is 1-4 mm deep at its lowest, preferably 2 – 3.5 mm deep, more preferably 2.5 – 3 mm deep. The depressed area 62 extends below the bottom surface of the forefoot plate as a rounded dome like structure 70. Dome like structure 70 includes a center cleat 72 located under the tuberosities of calcaneus and a plurality of individual cleats 74 radially disposed around the center cleat 72. Also attached to the heel plate are a plurality of radially disposed cleat elements 76.

The midsole 14 and based plate 20 are provided with holes 80, 82, 84, 86, 88 and 90 to accommodate the rounded depression structures 50, 62 and cleats 56, 76 extending from the bottom of heel plate 15 and forefoot plate 17.

Heel plate 15 and forefoot plate 17 are connected by a flexible bridge member 92 which provides flexibility permitting the heel plate and the forefoot plate to move independently of one another during activity.

5 A feature and advantage of the domed cleat of the present disclosure, with studs arranged around center of the dome is that the structure creates a cleat that will resist lateral, linear motion, and reduce resistance to rotary motion.

Also in a preferred embodiment, the cleat plate may have oval cleats arranged with the short axis in line with the center of rotation so that the first cleat “cuts” a path for the subsequent cleats, to reduce resistance to rotary motion about the center point of the dome
10 cleat.

Moreover, the domed cleat is located directly under the first metatarsal head, and the tuberosities of the calcaneus, providing centers of rotation around both the ball of the foot and the calcaneus.

Additionally, the foot supporting surface of the ball of foot dome has lowers the ball
15 of foot into the cleat plate, reducing leverage of lateral forces that would tend to cause the foot to invert.

Additionally, foot supporting surface of the calcaneus dome has the cradle surface that lowers the heel into the cleat plate, reducing the leverage of lateral forces that would tend to cause the foot to invert.

20 Also, the cleat plate is separated into two sections connected by a more flexible bridge that will allow pitch and roll while resisting yaw.

Various changes may be made in the foregoing disclosure without departing from the spirit and scope thereof. For example, while the disclosure has been made particularly with respect to soccer shoes, the disclosure advantageously also may beneficially be used with
25 other cleated footwear, including, for example those used in baseball, football, and track shoes advantageously may particularly benefit from our technology. Also, sports footwear such as golf shoes, and track shoes for shot put, discus, javelin, and the like in which the wearer imposes unidirectional or asymmetric rotational movement advantageously may benefit from our technology by fashioning the left and right shoes to accommodate such
30 movements. For example, as in the case of golf, the wearer’s feet pronate and supinate in

opposite directions during a swing. Thus, as illustrated in Fig. 5 the left and right shoes are fashioned to accommodate asymmetric rotational movement and would be different for left and right handed players. Also, as illustrated in figs. 6 and 7, the right shoe could be mirrored to create cleats that focus rotation around the balls of the feet, and likewise, the left shoe could be mirrored to focus rotation around the heels of the feet. Thus, for a right hand player the right shoe 80 may have a central cleat 50 configured to lie directly under the first metatarsal head of the wearer, and all additional cleats 56 on that shoe are radially arranged around the central cleat 50 of the right shoe, and with the left shoe 82 having a central cleat 70 configured to lie directly underlie the calcaneus bone of the wearer, and all additional cleats 56 on that shoe are radially arranged around the central cleat 70 of the left shoe 82. And, for a left handed player, the cleat patterns on the right and left shoes would be reversed. Also, by forming the cleat plate with a separate heel plate and forefoot plate, the shoe could be custom fitted to individuals depending on their ball of foot length by adjusting the length of bridge member 92, and the co-located holes 80 and 86 in midsole 14 and baseplate 20 and the co-located depressions 22 and 23 and the co-located cleated dome 50. The cleat plate and insole also may be 3D printed to custom fit the shoes to the wearer.

Claims:

1. A cleat plate for cleated footwear comprising
a rigid forefoot plate,
a rigid heel plate, and
5 a flexible bridge element connecting the rigid forefoot plate and the rigid heel plate.
2. The cleat plate of claim 1, wherein the rigid forefoot plate includes a concave depression extending downward from the top of the rigid forefoot plate and configured to lie directly under the first metatarsal head of the wearer, wherein the depression extends as a convex surface below the bottom of the rigid forefoot plate and has plurality of cleats
10 extending therefrom.
3. The cleat plate of claim 2, wherein the depression includes a central cleat and a plurality of additional cleats radially arranged along edges of the convex surface of the depression.
4. The cleat plate of claim 3, wherein the rigid forefoot cleats include a further plurality
15 of cleats located essentially on a radius extending from the toe end of the rigid forefoot plate along an outer lateral bottom side of the rigid forefoot plate.
5. The cleat plate of any of claims 1-4, wherein the rigid rear heel plate includes a concave heel depression configured to underlie and match the underside of the wearer's calcaneus bone, wherein the heel depression extends as a convex surface below the bottom
20 of the rigid heel plate and has a plurality of cleats extending therefrom.
6. The cleat plate of claim 5, wherein the depression includes a central cleat and a plurality of additional cleats radially arranged along edges of the convex surface of the heel depression.
7. The cleat plate of claim 6, further comprising a further plurality of cleats provided in
25 a pattern essentially on a radius extending from the central cleat along an outer edge of the rigid heel plate.
8. The cleat plate of any of claims 1-7, wherein the flexible bridge element is adjusted to accommodate the wearer's ball of foot length.
9. A cleated shoe comprising a cleat plate as claimed in any of claims 1-8.

10. The cleated shoe as claimed in claim 9, wherein the cleat plates are left and right shoe specific mirror images of one another.
11. The cleated shoe as claimed in claim 10, wherein the shoe is selected from the group consisting of a soccer shoe, a football boot, a baseball shoe, and a track shoe.
- 5 12. The cleated shoe as claimed in any of claims 9-11, wherein the flexible bridge element is adjustable to accommodate the wearer's ball of foot length.
13. A pair of cleated shoes as claimed in any of claims 9-12, wherein the cleat plates have a central cleat configured to lie directly under the first metatarsal head of the wearer, and all additional cleats are radially arranged around the central cleat of each shoe.
- 10 14. A pair of cleated shoes as claimed in any of claims 9-12, wherein the cleat plates have a central cleat configured to lie directly underlie the calcaneus bone of the wearer, and all additional cleats are radially arranged around the central cleat of each shoe.
15. A pair of cleated shoes as claimed in any of claims 9-14, wherein the cleat plates are different for left and right shoes.
- 15 16. A pair of cleated shoes as claimed in claim 15, wherein one of the left or the right shoe has a central cleat configured to lie directly under the first metatarsal head of the wearer, and all additional cleats on that one shoe are radially arranged around the central cleat of that one shoe, and the other of the left or the right shoe has a central cleat configured to lie directly underlie the calcaneus bone of the wearer, and all additional cleats on that one shoe are radially arranged around the central cleat of that one left shoe.
- 20 17. The pair of cleated shoes as claimed in claim 15, wherein the shoes are selected from the group consisting of golf shoes, shot put shoes, discus shoes and javelin shoes.

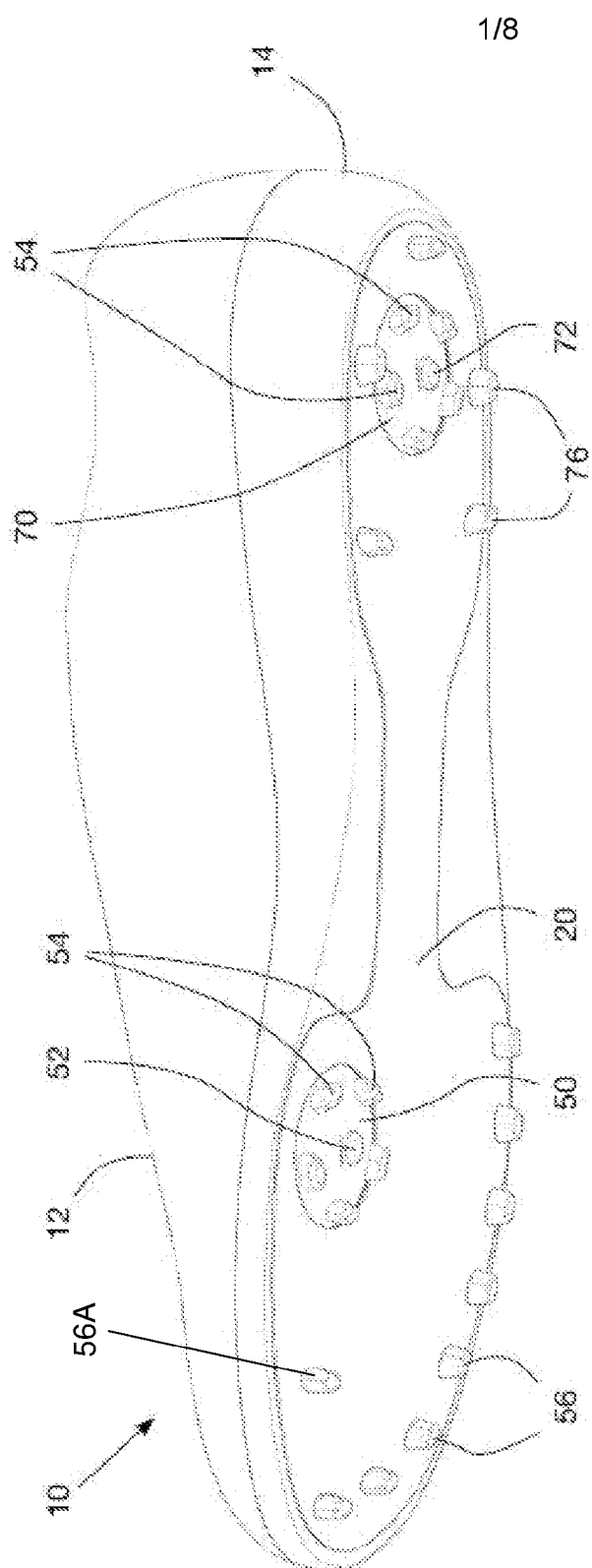


FIG. 1

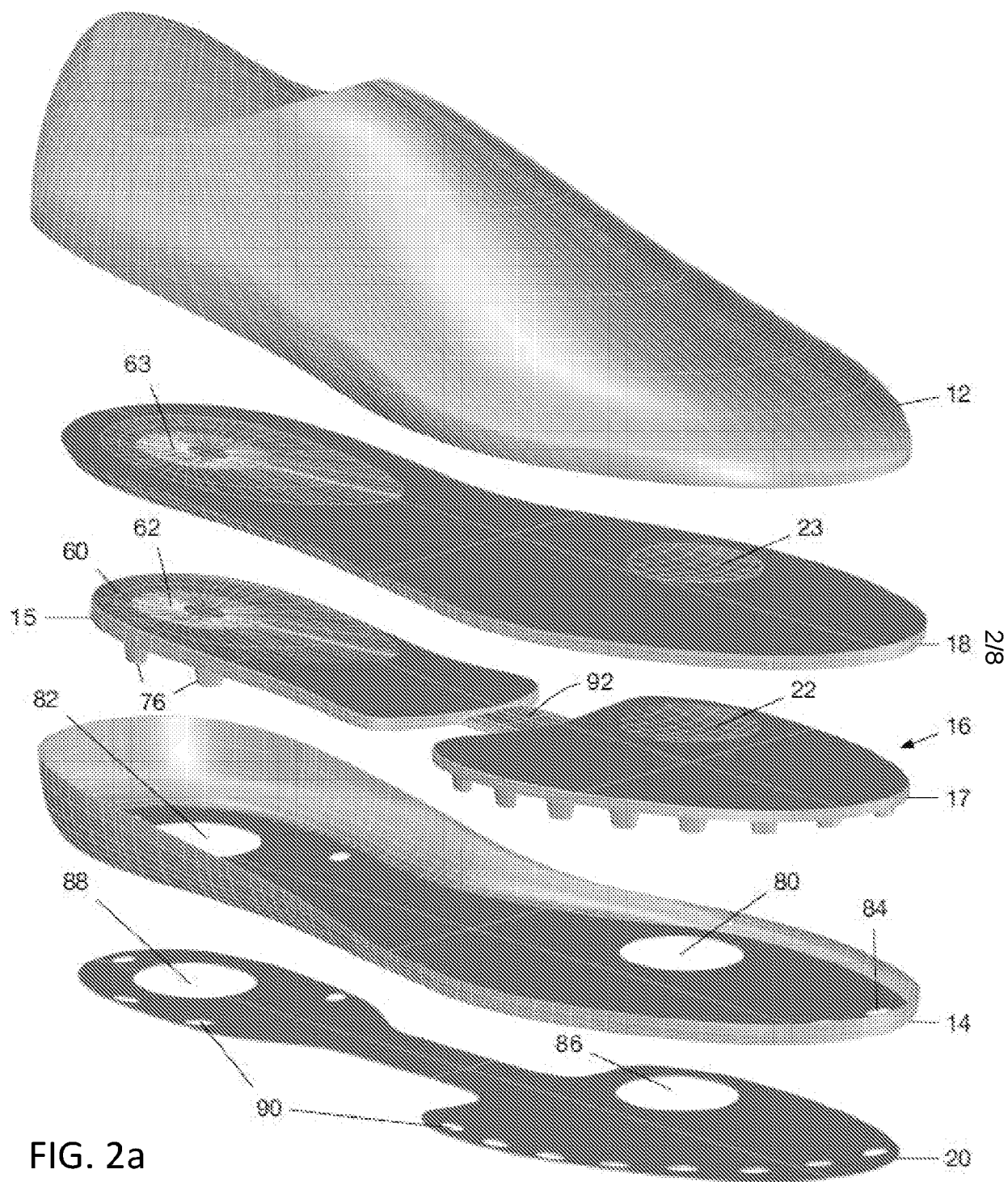
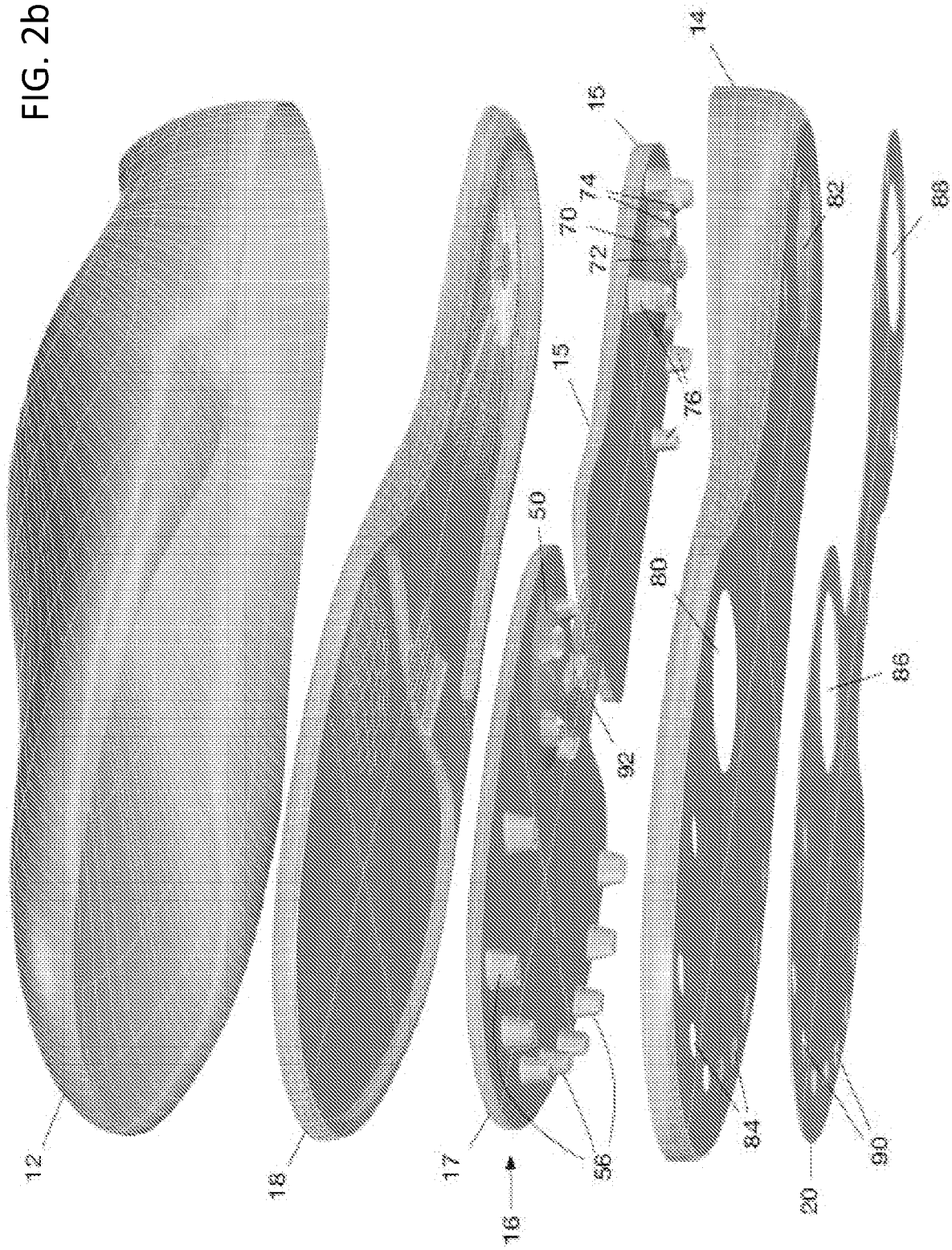
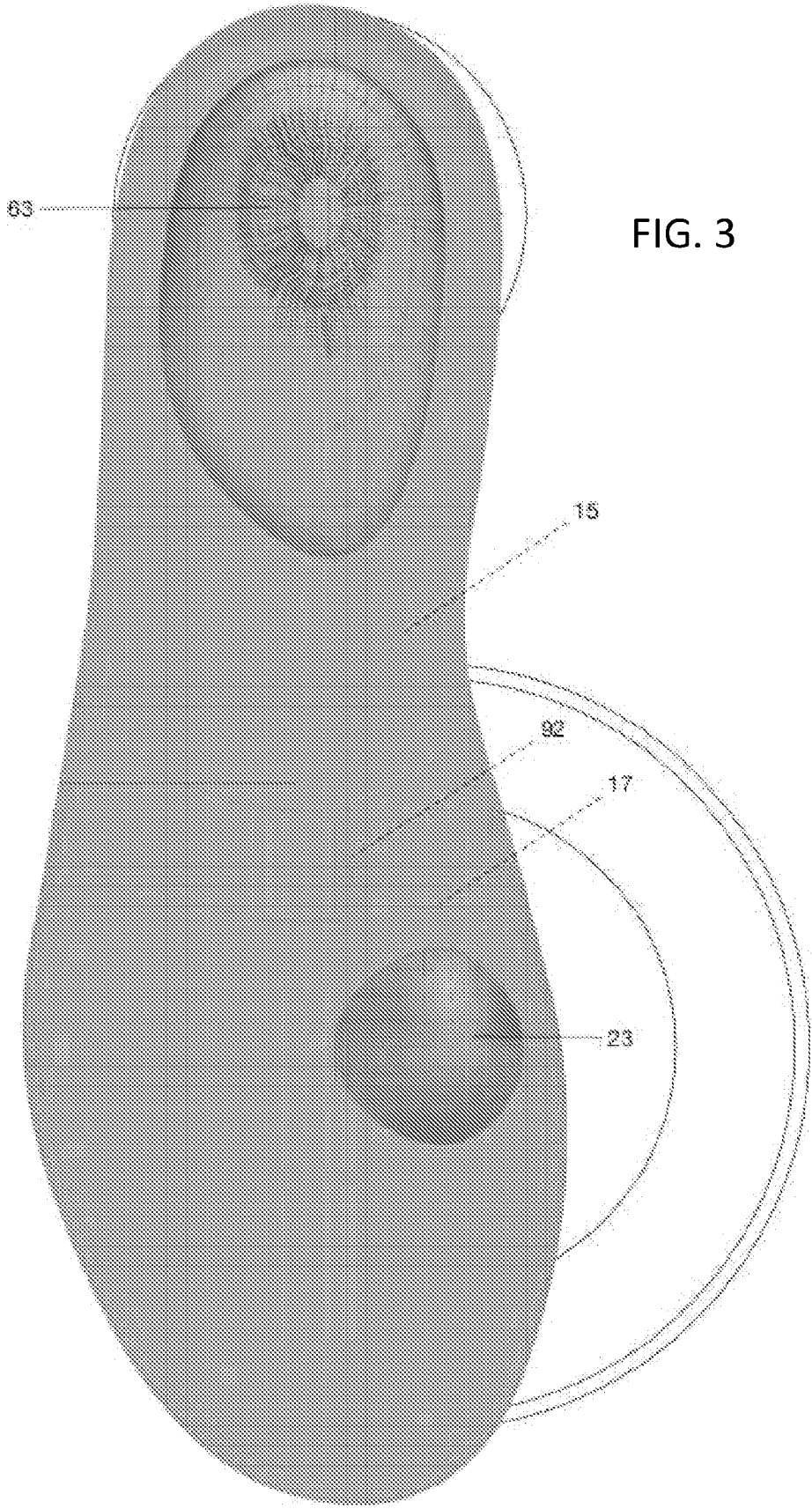


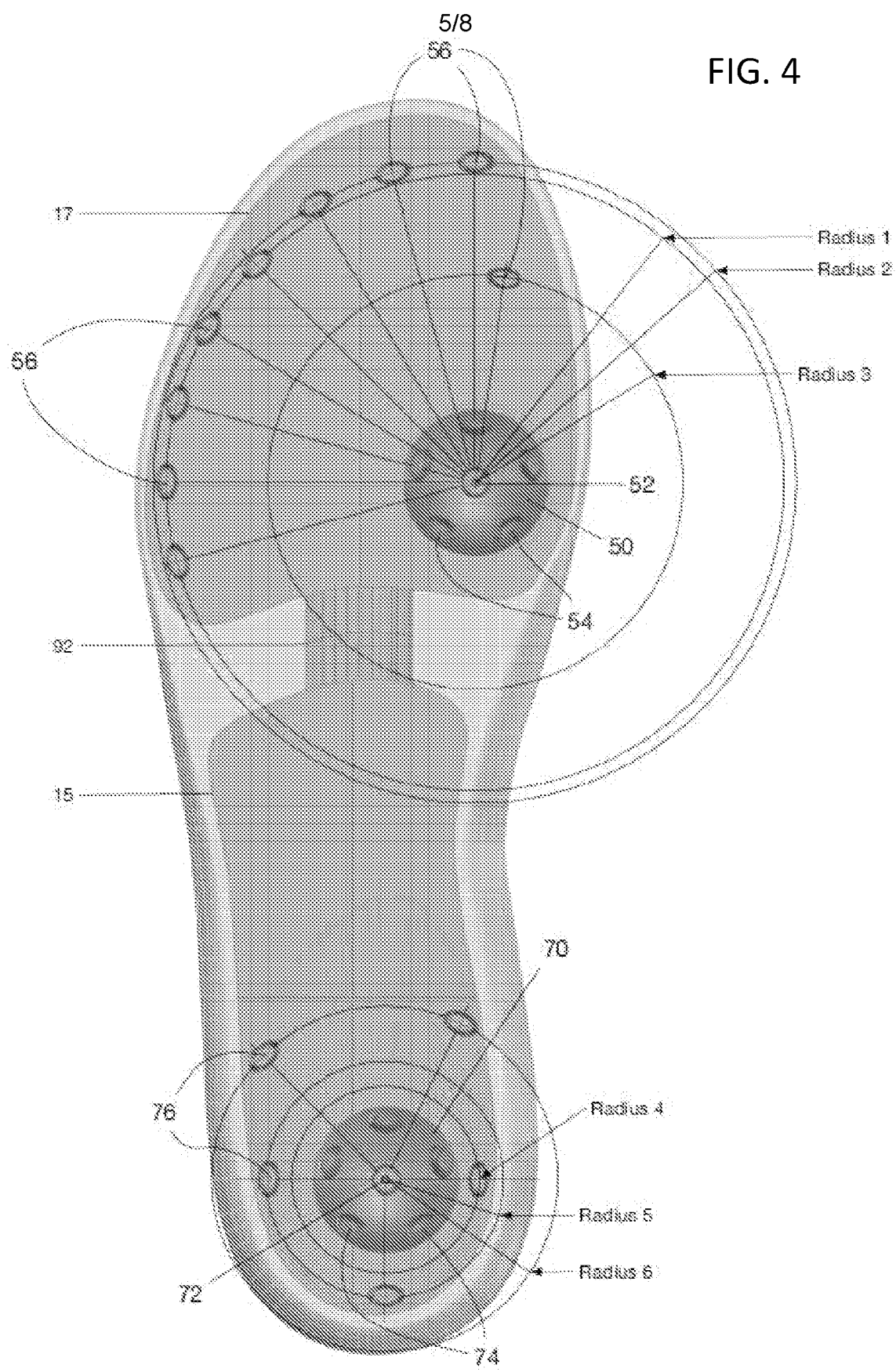
FIG. 2a

FIG. 2b



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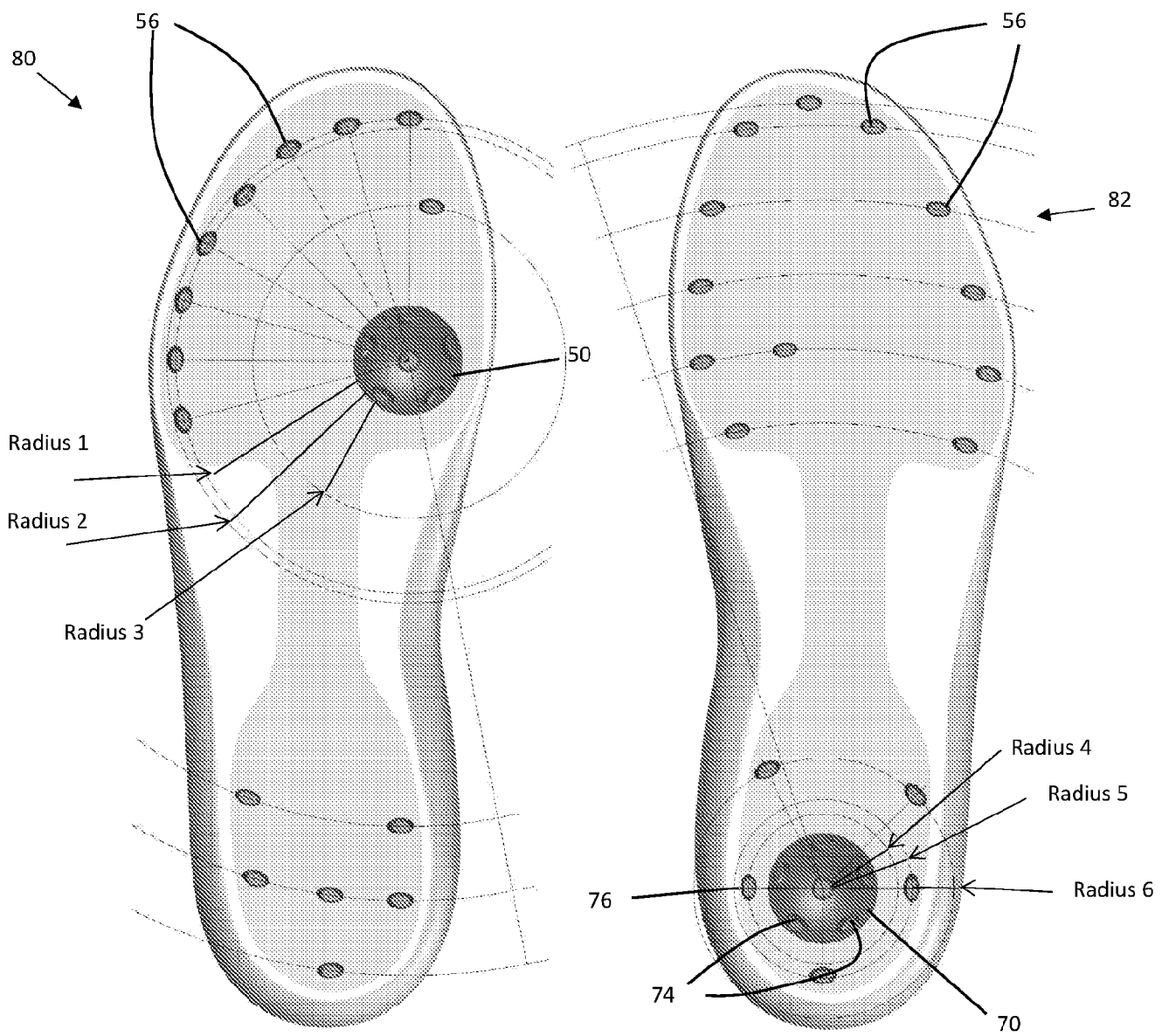


FIG. 5

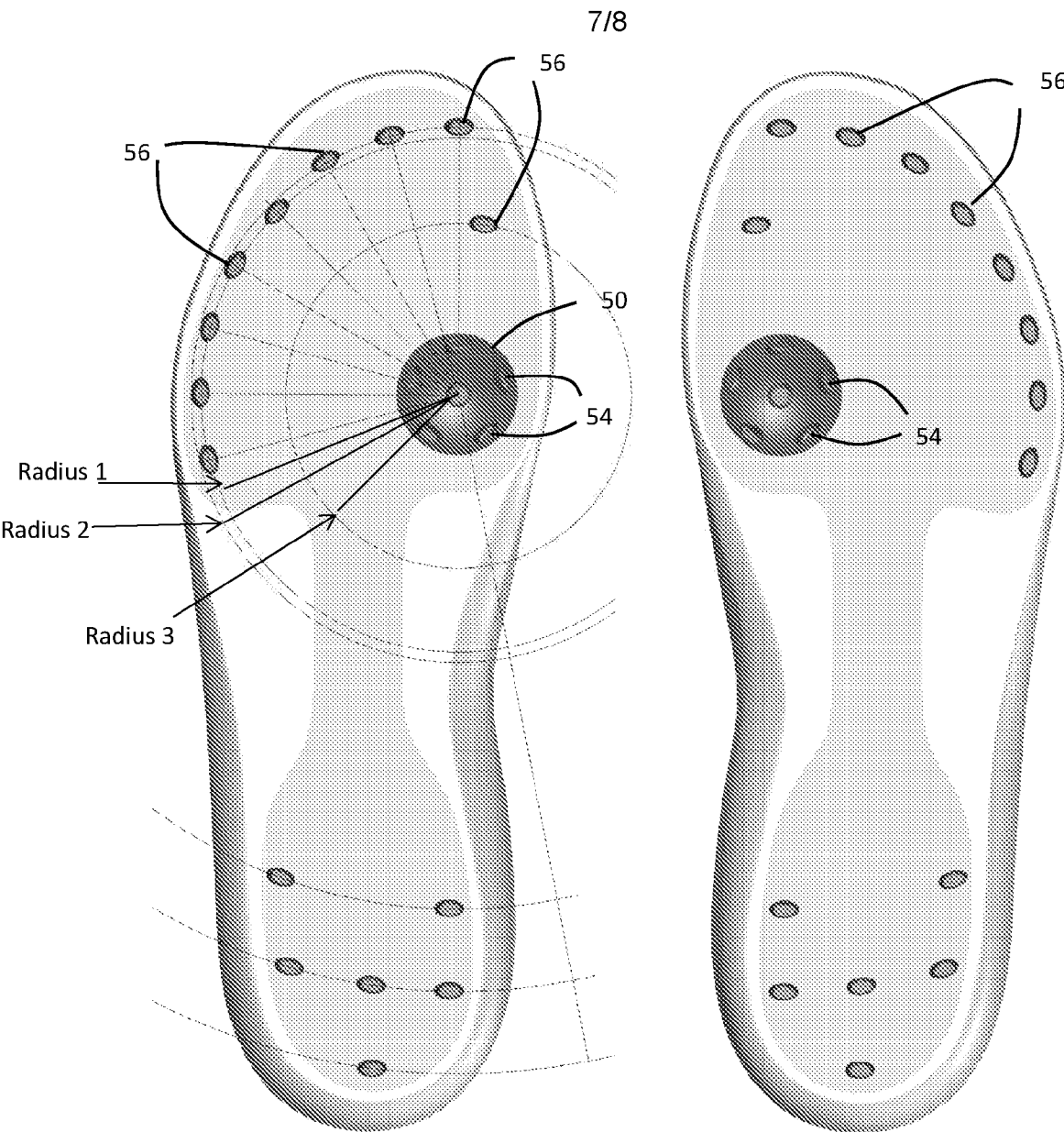


FIG. 6

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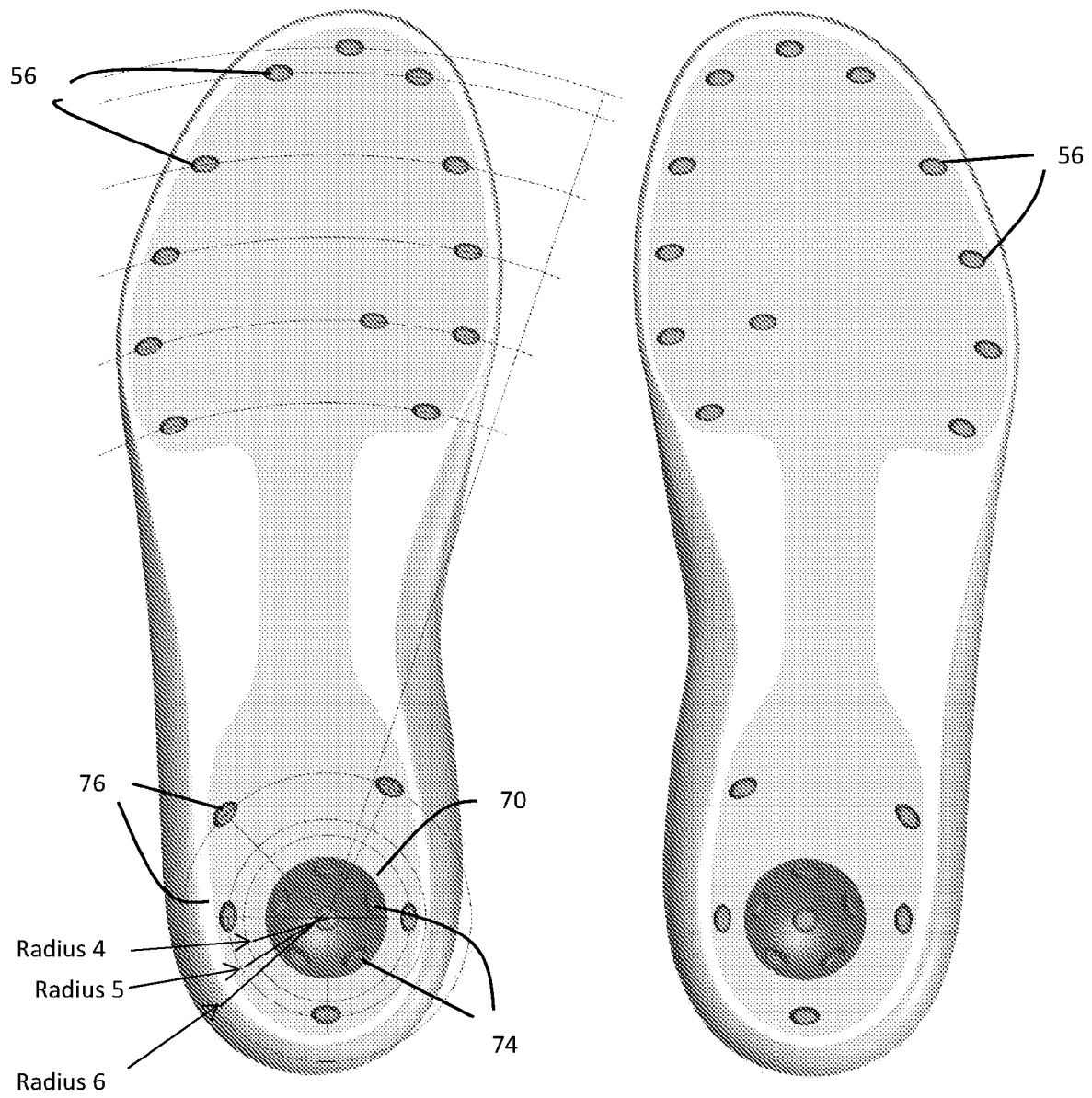


FIG. 7