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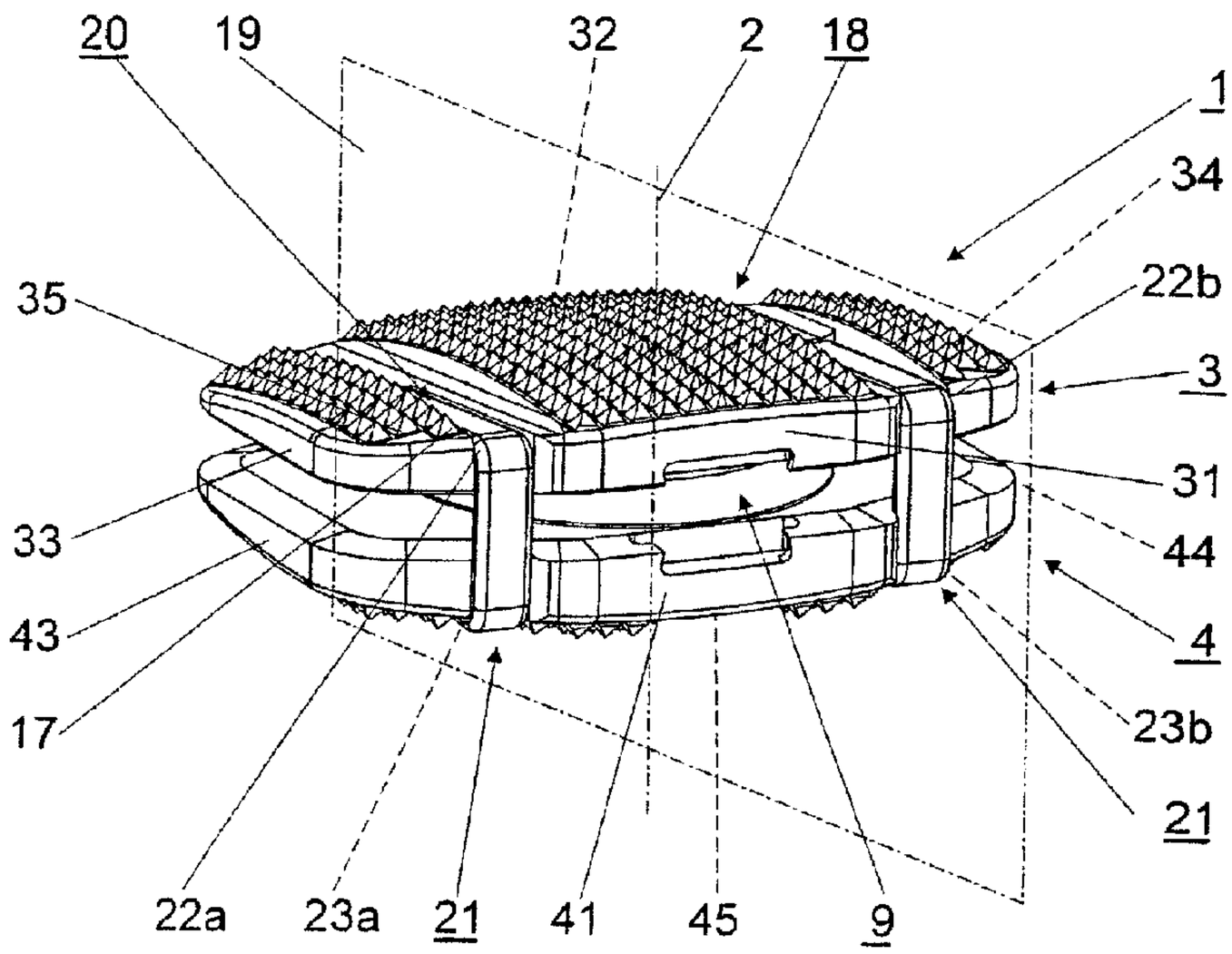

(57) Abrégé/Abstract:
The invention relates to an intervertebral implant (1), especially an artificial disk, having a central axis (2), an upper part (3), a lower part (4), a joint (9) which is axially arranged between the two parts (3;4), and removable blocking means (21). According to the invention, A) the upper part (3) has an upper apposition surface (35), a ventral lateral surface (31), a dorsal lateral surface (32), and two end lateral surfaces (33;34), and the upper apposition surface (35) can be applied to the base plate of a vertebral body located above the plate; B) the lower part (4) has a lower apposition surface (45), a ventral lateral surface (41), a dorsal lateral surface (42), and two end lateral surfaces (43;44), and the lower apposition surface (45) can be applied to the covering plate of a vertebral body located beneath the plate; C) the joint (9) comprises a convex joint part (12) having a first joint surface (10) and a complementary joint shell (13) having a second joint surface (11) that is mounted on the first joint surface (10) in a sliding manner; D) each of the two parts (3;4) comprises means (20) for receiving temporarily fixable blocking means (21) for fixing the two parts (3;4) in relation to each other; and E) the intervertebral implant (1) comprises at least one blocking means (21) that can be introduced into the means (20) and removed from the same.

Abstract

An intervertebral implant (1), in particular an artificial intervertebral disk, with a central axis (2), a top part (3), a bottom part (4) and a joint (9) arranged axially between the two parts (3, 4), and with removable locking means (21, wherein

A) the top part (3) has a top apposed surface (35), a ventral side surface (31), a dorsal side surface (32) and two lateral side surfaces (33, 34) and the top apposed surface (35) is suitable to be placed on the base plate of a body of the vertebra adjacent above,

B) the bottom part (4) has a bottom apposed surface (45), a ventral side surface (41), a dorsal side surface (42) and two lateral side surfaces (43, 44) and the bottom apposed surface (45) is suitable to be placed on the cover plate of a body of the vertebra adjacent below,

C) the joint (9) comprises a convex joint part (12) with a first articular surface (10) and a joint shell (13) matching it, with a second articular surface (11) mounted in a sliding manner on the first articular surface (10),

D) each of the two parts (3, 4) comprises means (20) to accommodate temporarily fastenable locking means (21) to fix the two parts (3, 4) relative one another, and

E) the intervertebral implant (1) comprises at least one locking means (21) that can be inserted into and removed from the means (20).

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English translation of the specification of the International Patent Application No. PCT/CH03/00496 "Zwischenwirbelimplantat mit temporären Blockiermitteln" in the name of Mathys Medizinaltechnik AG

Intervertebral implant with temporary locking means

The invention concerns an intervertebral implant, in particular an artificial intervertebral disk, according to the generic part of patent claim 1.

After the removal of a damaged, natural intervertebral disk or a damaged nucleus pulposus of an intervertebral disk, nowadays implants or prosthesises are placed in the intervertebral space of two adjacent bodies of the vertebra. The aim of implanting such implants is to bring about an as natural state as possible, i.e. particularly the original height of the intervertebral disk and consequently restore the original distance between two adjacent bodies of the vertebra. Furthermore, movements of adjacent bodies of the vertebra relative one another should be able to be carried out possibly without any hindrance of their natural behaviour. For this purpose the retention of the possibilities of movements when bending forward or backward, i.e. the flexion and the extension of the bodies of the vertebra as well as the lateral bending of the intervertebral bodies within the natural limits, is essential. The natural ligaments and muscles along the spine are left essentially intact, so that these will further stabilise the movements of a mechanical replacement of the intervertebral disk.

Such an intervertebral implant is known from US 5,556,431 Büttner. This known implant comprises a bottom and a top cover plate, the external surfaces of which can be placed on the cover and base plate, respectively, of the adjacent body of the vertebra, as well as a joint provided between the cover plates. This joint essentially consists of a spherical convex joint part and, as second joint part, two matching joint shells connected with the cover plates, so that the cover plates can polyaxially pivot relative one another. A disadvantage of this known intervertebral implant is, that although the two cover plates are connected with a joint part each, the joint parts are not held together.

This is where the invention wants to provide remedy. The object of the invention is to produce an intervertebral implant, that has a joint that can execute a rotary movement, parts of the joint can be pre-assembled in a state wherein they are locked relative one another and can be unlocked in-situ.

This objective is achieved by the invention with an intervertebral implant, particularly an artificial intervertebral disk, having the features of claim 1.

Further advantageous developments of the invention are characterised in the dependent claims.

The advantages achieved by the invention can be basically considered in that as a result of the intervertebral implant according to the invention

- lower manufacturing costs can be achieved,
- before being implanted, the implant can be pre-assembled, so that it does not have to be assembled by the surgeon and no erroneous manipulation can occur,
- prior to and during the implanting the implant cannot fall apart nor can parts get lost, and
- the joint parts are connected with the cover plates, so that they cannot move and damage the surrounding tissue.

In a preferred embodiment the locking means are made from one piece. The simple execution, achieved by this, allows a simple handling during the assembly as well as during the dismantling of the locking means on the intervertebral implant.

In another embodiment the locking means are so constructed, that an automatic fixing of the two parts is possible. This can be achieved, for example, by an at least partial elastic construction of same or by a wedge-effect during the assembly of the locking means. This will result in the advantage, that the fixing of the two parts is possible without any external influence, for example by manual assistance.

In yet another embodiment the means to accommodate the locking means comprise at least one top groove on the top part as well as at least one bottom groove on the bottom part, while the longitudinal axes of the groove intersect the ventral side surfaces of the relevant part. By this the advantage, that a simple execution of the means to accommodate the locking means is possible, is achieved. In addition, the grooves allow a removal of the locking means even when the tractioning instrument is still connected with the intervertebral implant.

In a further embodiment the grooves terminate in the ventral side surface of the relevant part. The result of this is, that after the implantation of the intervertebral implant the locking means can be simply extracted. In addition, the extraction of the locking means is carried out on the same axis as the implanting of the implant, so that no additional preparations in the intervertebral space are necessary.

In yet another embodiment the intervertebral implant has a central plane in the middle between the lateral side surfaces, the central plane containing the central axis, and it comprises on each side of the central plane a top groove and a bottom groove. This will bring with it the advantage, that by applying the locking means on both sides of the central plane a stable fixing of the two parts can be achieved. Furthermore, the fixing relative to the central plane is symmetrical, thus simplifying the in-situ manipulation of the surgical instruments.

In another embodiment the cross-section of the grooves, situated transversely to the central plane, narrows towards the top and bottom surfaces of the two parts, so that the grooves are constructed, for example, as dovetail guides, and can absorb forces parallel to the central axis in both directions.

In yet another embodiment the grooves are curved and have arch-shaped longitudinal axes, while the distances of the longitudinal axes towards the central plane increase relative to the ventral side surfaces. By this it will be achieved, that prior to implanting with pliers-like locking means the intervertebral implant can be locked and held together, so that the parts cannot be displaced relative one another during the implantation and none of the parts can be lost.

In a further embodiment the locking means comprise a joining web arranged parallel to the central axis and at the end of the joining web a leg or a transverse web. In the first case the locking means may be constructed, for example, as U-shaped clamps with elastic legs and/or an elastic joining web. In the second case a double-T shaped construction, for example, is possible. These configurations have the advantage of a simple manufacture of the locking means and consequently low costs. Furthermore, the manipulation of the locking means is simple. More complex embodiments of the locking means would be also more susceptible to breakage or jamming.

In another embodiment the locking elements have a pliers-like construction and comprise two jaws which can move relative one another about a pivot joint and can be introduced into the grooves, while the axis of rotation of the pivot joint preferably extends parallel to the central axis. By virtue of this a simple manufacture and thus low costs of the locking means can be achieved. Furthermore, the opening and closing of the locking means is possible without skewing.

In a further embodiment the convex joint part comprises a spherical first articular surface and the shell joint a second articular surface, matching the first one. By virtue of the spherical construction of the articular surfaces the advantage, that both parts can pivot polyaxially relative one another, is achieved.

The dimensions of the articular surfaces depend from the application, while in the various embodiments the radius of the first articular surface of the convex spherical joint part is between 3 mm and 25 mm, preferably between 4 mm and 20 mm.

In yet another embodiment the convex joint part and the joint shell are made from a metal/plastics material pair. By this the following advantages can be achieved:

- already proven combinations of replacement materials for joints, like for example a highly cross-linked polyethylene (X-UHMWPE) and a cobalt/chromium alloy, can be used,

- in the course of the relative sliding of the sliding surfaces low frictional forces can be achieved, and
- a damping of the axial impact loads can be achieved .

In another embodiment the articular surfaces A, B are coated with titanium carbide or amorphous carbon (ADLC), resulting in a considerable reduction of the coefficient of friction.

In yet another embodiment the two parts are coated with titanium on the apposed surfaces.

In a further embodiment the apposed surfaces have a convex shape and are adapted to suit the natural cover and base surfaces, respectively, of the adjacent bodies of the vertebra.

In yet another embodiment on their apposed surfaces the two parts are provided with macroscopic structures, which are preferably executed as protuberances.

According to various embodiments these protuberances may have:

- pyramid-like protuberances,
- at least one wedge-like rib which is symmetrical about the central plane, said rib standing along an antero-posterior straight line on the relevant apposed surface, or
- saw-tooth like serrations arranged symmetrically about the central plane.

By virtue of these developments of the macroscopic structures the advantages achievable are, that on the one hand torques about an axis of rotation, intersecting the apposed surfaces, can be better transferred from the bodies of the vertebra to the intervertebral implant, and on the other hand the area, to which the bones can adhere, is increased. The advantage of the serrations is, that they can easier penetrate into the end plates of the adjacent bodies of the vertebra. The pyramid-shaped protuberances have preferably a volume V between 0.12 mm^3 and 1.4 mm^3.

In another embodiment the protuberances are coated at least partially with hydroxylapatite or with a bi-phased hydroxylapatite-tricalcium phosphate mixture, thus achieving the advantage, that both materials mentioned are fully integrated in the bones or are even replaced by new, natural bone tissue.

In their various embodiments the locking means can have a maximum volume of 12 cm^3, preferably 6 cm^3.

In yet another embodiment the intervertebral implant comprises a sterile packaging, so that the pre-assembled intervertebral implant, fixed by the locking means, can be implanted by the surgeons in-situ without any prior manipulation.

The invention and developments of the invention are explained in detail in the following based on partly schematic illustrations of an embodiment.

They show in:

Fig.1 - a perspective view of an embodiment of an assembled intervertebral implant with locking means,

Fig.2 - an exploded view of the embodiment of the intervertebral implant with locking means, illustrated in Fig.1,

Fig.3 - a medio-lateral section of the embodiment of the intervertebral implant with locking means, illustrated in Figs.1 and 2,

Fig.4 - a perspective illustration of another embodiment of the intervertebral implant with the locking means inserted into the grooves,

Fig.5 - an exploded view of the embodiment of the intervertebral implant with locking means, illustrated in Fig.4,

Fig.6 - a section, parallel to the medio-lateral plane, through the grooves and the locking means of the embodiment of the intervertebral implant with locking means, illustrated in Figs.4 and 5,

Fig.7 - a medio-lateral section through the embodiment of the intervertebral implant with locking means, illustrated in Figs.4 and 5,

Fig.8 - a perspective illustration of a further embodiment of the intervertebral implant, with the locking means inserted into the grooves,

Fig.9 - a perspective illustration of the bottom part of the embodiment of the intervertebral implant illustrated in Fig.8, with the locking means retracted from the grooves,

Fig.10 - a top view on the bottom part of the embodiment of the intervertebral implant illustrated in Figs.8 and 9, with the locking means introduced into the grooves,

Fig.11 - a perspective view of the top part of an embodiment of the intervertebral implant with locking means,

Fig.12 - a lateral view on the top part of the embodiment of the intervertebral implant illustrated in Fig.5 with locking means,

Fig.13 - a lateral view on the top part of a further embodiment of the intervertebral implant with locking means, and

Fig.14 - a dorsal view on the top part of the embodiment of the intervertebral implant illustrated in Fig.7 with locking means.

The embodiment illustrated in Figs.1-3 essentially comprises a top part 3 with a top apposed surface 35 that intersects the central axis 2, to be placed on the base plate of the body of the vertebra adjacent above, a bottom part 4 with a bottom apposed surface 45 that intersects the central axis 2, to be placed on the cover plate of the body of the vertebra adjacent below, and a joint 9, provided between the two parts 3, 4, for the articulated joining of the two parts 3, 4. The joint 9 has a two-part construction, whereby the convex joint part 12 has a

spherical construction, a first articular surface 10 and is joined with the bottom part 4 and the joint shell 13, matching the convex joint part 12, has a second articular surface 11 and is joined with the top part 3. The top part 3 and the joint shell 13 are made of two parts in the embodiment illustrated here, so that the top part 3 can be manufactured, for example, from titanium or a cobalt-chromium alloy and the joint shell 13, for example, from a plastic material.

Each of the two parts 3, 4 comprise a ventral side surface 31, 41, a dorsal side surface 32, 42, as well as two lateral side surfaces 33, 34, 43, 44 extending transversely to them. There is the central plane 19 in the middle between the lateral side surfaces 33, 34, 43, 44 while in the case of a non-articulated joint 9 the central axis 2 is situated in this central plane 19. The protuberances 18 are constructed in this case as pyramid-like protuberances 17.

Furthermore, the two parts 3, 4 comprise means 20 to accommodate two locking means 21 which can be temporarily fastened and are intended for the detachable fixing of the two parts 3, 4 relative one another. In this case the means 20 comprise two grooves 22, 23 on the top part 3 and the bottom part 4, respectively, the longitudinal axes 24, 25 of the grooves being symmetrically distanced from the central plane 19 of the intervertebral implant 1. At the same time one top and one bottom groove 22a, 23a are provided equidistant on the left side of the central plane 19 and one top and one bottom groove 22b, 23b are provided equidistant on the right side of the central plane 19. The grooves 22, 23 terminate in the respective ventral side surfaces 31, 41, so that the locking means 21 can be ventrally introduced into and extracted from the grooves 22, 23. Furthermore, the grooves 22, 23 are open towards the apposed surfaces 35, 45.

Each of the two locking means 21 is constructed as a clamp 26 with two legs 27 and a web 28 joining the legs 27, in such a manner that on one side of the central plane 19 one leg 27 of one clamp 26 can be introduced into a top groove 22a and the other leg 27 of the same clamp 26 into the bottom groove 23a, so that the clamp 26 is arranged parallel to the central plane 19. In a similar manner the legs 27 of a second clamp 26 can be introduced into the grooves 22b, 23b on the other side of the central plane 19. The clamps 26 can be elastically deformed

parallel to the central axis 2, so that after their introduction into the grooves 22, 23 the legs 27 are spread and the locking means 21 can be detachably fastened on the two parts 3, 4 by the elastic clamping effect.

The embodiment illustrated in Figs.4-7 differs from the embodiment illustrated in Figs.1-3 only by another construction of the grooves 22, 23 and the locking means 21. The grooves 22, 23 are open towards the top and the bottom surfaces 36, 46, respectively, of the two parts 3, 4. In addition, the grooves 22, 23 narrow towards the top and bottom surfaces 36, 46, respectively, i.e. constructed as dovetail guides. Furthermore, the two blocking means 21 have a double-T shape and comprise a joining web 28 as well as at the end of that a transverse web 30. The blocking means 21 can be introduced into the grooves 22, 23 on each side of the central plane 19. The cross-section of the grooves 22, 23 decreases with the increasing distance from the ventral side surfaces 31, 41, so that when being introduced into the grooves 22, 23 the locking means 21 become wedged in them and will be detachably fastened in the two parts 3, 4.

Figs.8-10 illustrate an embodiment, which differs from that in Figs.1-7 only by a different construction of the grooves 22, 23 and of the locking means 21. The grooves 22, 23 are open towards the top and bottom surfaces 36, 46, respectively, of the two parts and have curved longitudinal axes 24, 25. The curvature of the grooves 22, 23 is so designed, that the distance between two grooves 22, 23 provided on one of the parts 3, 4, increases from the ventral side surface 31, 41. Furthermore, the grooves 22, 23 narrow towards the top and bottom, respectively, surfaces 36, 46. The locking means 21 comprise in this case two jaws 50 which can be introduced into the curved grooves 22, 23, with levers 51, that are joined by a pivot hinge 52 in a manner that they can pivot relative one another. The axis of rotation 49 of the pivot hinge 52 is parallel with the central axis 2. The jaws 50 have a U-shaped cross-section and comprise a joining web 28 each that is parallel with the central axis 2 and two transverse webs 30 each at their ends, so that when the locking means 21 are introduced into the grooves 22, 23, the two parts 3, 4 are also fixed parallel to the central axis 2. At the free ends 53 of the lever 51 an instrument can be fastened, with which the intervertebral implant 1 can be introduced into the intervertebral space

and after the implantation the locking means 21 can be simply extracted from the grooves 22, 23.

In addition to the pyramid-like protuberances 17 illustrated in Figs.1-10, the protuberances 18, as illustrated in Figs.11 and 12, may comprise a wedge-shaped rib 38 on each of the top and bottom apposed surfaces 35, 45, said ribs being taller than the pyramid-like protuberances 17 and situated on the apposed surfaces 35, 45 parallel to a straight line situated in the central plane 19 (Fig.1). For an easier introduction of the intervertebral implant 1 into the intervertebral space, the height of the ribs 38 decreases towards the dorsal lateral surface 32.

A further embodiment of the protuberances 18 is illustrated in Figs.13 and 14. The serrations 39, which are taller than the pyramid-shaped protuberances 17, are constructed partly with saw-tooth shapes, wherein the steeper flank is facing the ventral lateral surface 31. In this case the serrations 39 are situated on a straight line situated in the central plane 19 (Fig.1) and extend from the ventral lateral surface 31 up to the dorsal lateral surface 32.

In Figs.11-14 only the top part 3 is illustrated in the form of an example. In an analogous manner the same construction of the protuberances 18 with pyramid-shaped protuberances 17, a rib 38 (Figs.11 and 12) or serrations 39 (Figs.13 and 14) can be applied to the bottom part 4.

Description of the operating technique:

The surgeon present the intervertebral disk anteriorly by a transperitoneal or retroperitoneal access. He removes the intervertebral disk (diskectomy) up to the stage required for the width of the implant. By means of a suitable instrument the surgeon can distract the intervertebral space, so that to produce a relief (decompression) with the subsequently inserted intervertebral implant. With the aid of a trial implant the surgeon can determine the size of the implant. The distractor is still in use.

The surgeon can now insert the intervertebral implant into the prepared intervertebral disk space by means of a suitable instrument and the temporary

locking means. Because in the meantime all instruments are still in use, the final position of the implant has to be found by striking and shifting, using instruments intended for this use. So that the implant would retain the functional mobility, the temporary locking means and the associated instruments have to be removed afterwards. Finally, the surgeon can extract the distractor and close the wound.

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English translation of the amendments under PCT Article 19 of the International Patent Application No. PCT/CH03/00496 "Zwischenwirbelimplantat mit temporären Blockiermitteln" in the name of Mathys Medizinaltechnik AG

Patent claims

1. An intervertebral implant (1), in particular an artificial intervertebral disk, with a central axis (2), a top part (3), a bottom part (4) and a joint (9) arranged axially between the two parts (3, 4), wherein

A) the top part (3) has a top apposed surface (35), a ventral side surface (31), a dorsal side surface (32) and two lateral side surfaces (33, 34) and the top apposed surface (35) is suitable to be placed on the base plate of a body of the vertebra adjacent above,

B) the bottom part (4) has a bottom apposed surface (45), a ventral side surface (41), a dorsal side surface (42) and two lateral side surfaces (43, 44) and the bottom apposed surface (45) is suitable to be placed on the cover plate of a body of the vertebra adjacent below,

C) the joint (9) comprises a convex joint part (12) with a first articular surface (10) and a joint shell (13) matching it, with a second articular surface (11) mounted in a sliding manner on the first articular surface (10),

characterised in that

D) each of the two parts (3, 4) comprises means (20) to accommodate temporarily fastenable locking means (21) to temporarily fix the two parts (3, 4) relative one another, and

E) the intervertebral implant (1) comprises at least one temporary locking means (21) inserted into the means (20), which is suitable to be introduced into the intervertebral space together with the intervertebral implant (1) and to be removed after the implantation of the locked intervertebral implant (1) has been effected, such that the implanted intervertebral implant (1) receives its functional mobility.

2. An intervertebral implant (1) according to claim 1, characterised in that the locking means (21) is made from one piece.

3. An intervertebral implant (1) according to claim 1 or 2, characterised in that the locking means (21) allow an automatic fixing of the two parts (3, 4).

4. An intervertebral implant (1) according to any one of claims 1 to 3, characterised in that the means (20) comprise at least one top groove (22) on the top part (3) as well as at least one bottom groove (23) on the bottom part (4), while the longitudinal axes of the grooves (22, 23) intersect the ventral side surfaces (31, 41) of the respective part (3, 4).

5. An intervertebral implant (1) according to claim 4, characterised in that the grooves (22, 23) terminate in the ventral side surface (31, 41) of the respective part (3, 4).

6. An intervertebral implant (1) according to claim 4 or 5, characterised in that in the middle between the lateral side surfaces (33, 34, 43, 44) it has a central plane (19) that contains the central axis (2) and comprises a top groove (22a, 22b) and a bottom groove (23a, 23b) on each side of the central plane (19).

7. An intervertebral implant (1) according to claim 6, characterised in that the cross-section of the grooves (22, 23) situated perpendicularly to the central plane (19) narrows towards the top and bottom surfaces (36, 46), respectively, of the two parts (3, 4).

8. An intervertebral implant (1) according to claim 6 or 7, characterised in that the grooves (22, 23) are curved and have arch-shaped longitudinal axes, while the distances of the longitudinal axes towards the central plane (19) increase relative to the ventral side.

9. An intervertebral implant (1) according to any one of claims 1 to 6, characterised in that the locking means (21) comprise a joining web (28) that is arranged parallel to the central axis (2) and at the end of it a leg (27) or a transverse web (30) each.

10. An intervertebral implant (1) according to claim 8, characterised in that the locking means (21) have a pliers-like construction and comprise two jaws (50)

which can move relative one another about a pivot hinge (52) and can be introduced into the grooves (22, 23).

11. An intervertebral implant (1) according to claim 10, characterised in that the axis (49) of rotation of the pivot hinge (52) extends parallel to the central axis (2).

12. An intervertebral implant (1) according to any one of claims 1 to 11, characterised in that the convex joint part (12) has a spherical construction.

13. An intervertebral implant (1) according to claim 12, characterised in that the radius of the first articular surface (10) of the convex spherical joint (12) part is between 3 mm and 25 mm.

14. An intervertebral implant (1) according to claim 13, characterised in that the radius of the first articular surface (10) of the convex spherical joint (12) part is between 4 mm and 20 mm.

15. An intervertebral implant (1) according to any one of claims 1 to 14, characterised in that the convex joint part (12) and the joint shell (13) are made from a metal/plastics material pair.

16. An intervertebral implant (1) according to any one of claims 1 to 15, characterised in that the articular surfaces (10, 11) are coated with titanium carbide or amorphous carbon (ADLC).

17. An intervertebral implant (1) according to any one of claims 1 to 16, characterised in that the two parts (3, 4) are coated with titanium on the apposed surfaces (5, 7).

18. An intervertebral implant (1) according to any one of claims 1 to 17, characterised in that the apposed surfaces (5, 7) have a convex construction.

19. An intervertebral implant (1) according to any one of claims 1 to 18, characterised in that the apposed surfaces (5, 7) of the two parts (3, 4) are provided at least partially with macroscopic structures.

20. An intervertebral implant (1) according to claim 19, characterised in that the macroscopic structures are protuberances (18).

21. An intervertebral implant (1) according to claim 20, characterised in that the protuberances (18) comprise pyramid-like protuberances (17)

22. An intervertebral implant (1) according to claim 20 or 21, characterised in that the protuberances (18) comprise at least one wedge-shaped rib (38) that is symmetrical about the central plane (19) and is situated on the respective apposed surfaces (31, 41) in a straight line that is parallel to the central plane (19).

23. An intervertebral implant (1) according to claim 20 or 21, characterised in that the protuberances (18) comprises saw-tooth like serrations (39) arranged symmetrically about the central plane (19).

24. An intervertebral implant (1) according to any one of claims 21 to 23, characterised in that a pyramid-shaped protuberance (17) has a volume V between 0.12 mm^3 and 1.4 mm^3.

25. An intervertebral implant (1) according to any one of claims 20 to 24, characterised in that the protuberances (18) are coated at least partially with hydroxylapatite or with a bi-phased hydroxylapatite-tricalcium phosphate mixture.

26. An intervertebral implant (1) according to any one of claims 1 to 25, characterised in that the locking means (21) have a maximum volume of 12cm^3.

27. An intervertebral implant (1) according to claim 26, characterised in that the locking means (21) have a maximum volume of 6 cm^3.

28. An intervertebral implant (1) according to any one of claims 1 to 27, characterised in that it comprises a sterile packaging.

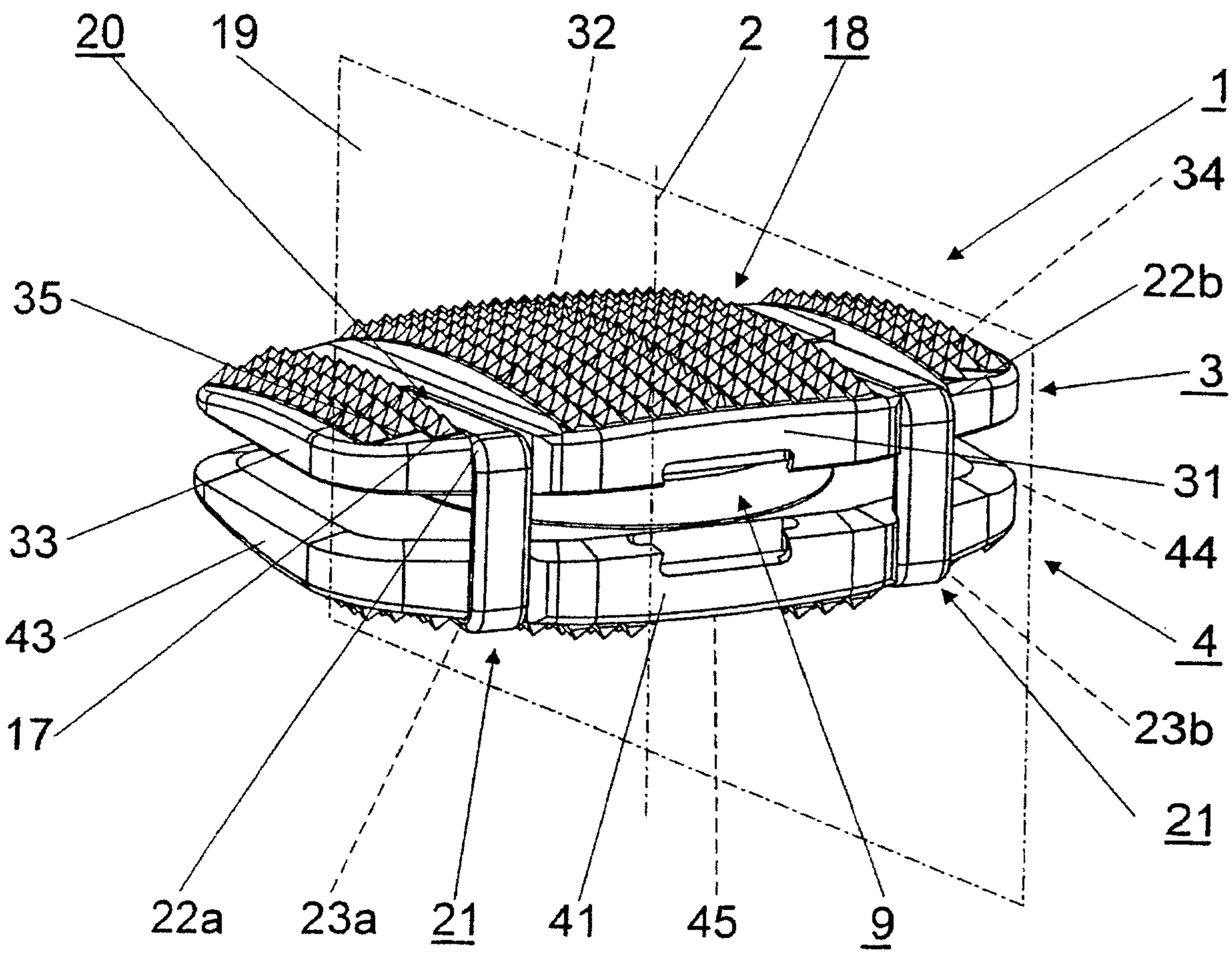

Fig. 1

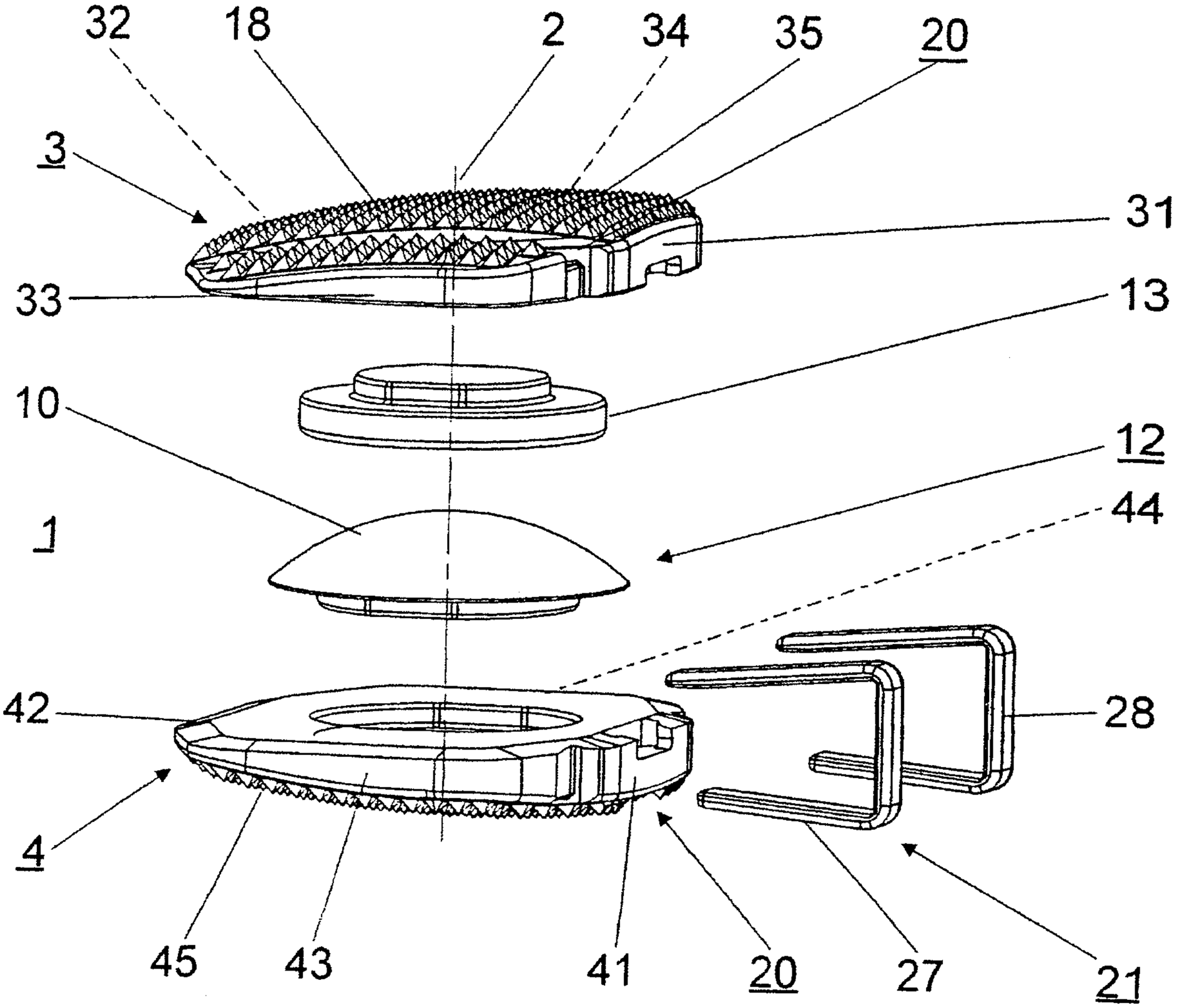

Fig. 2

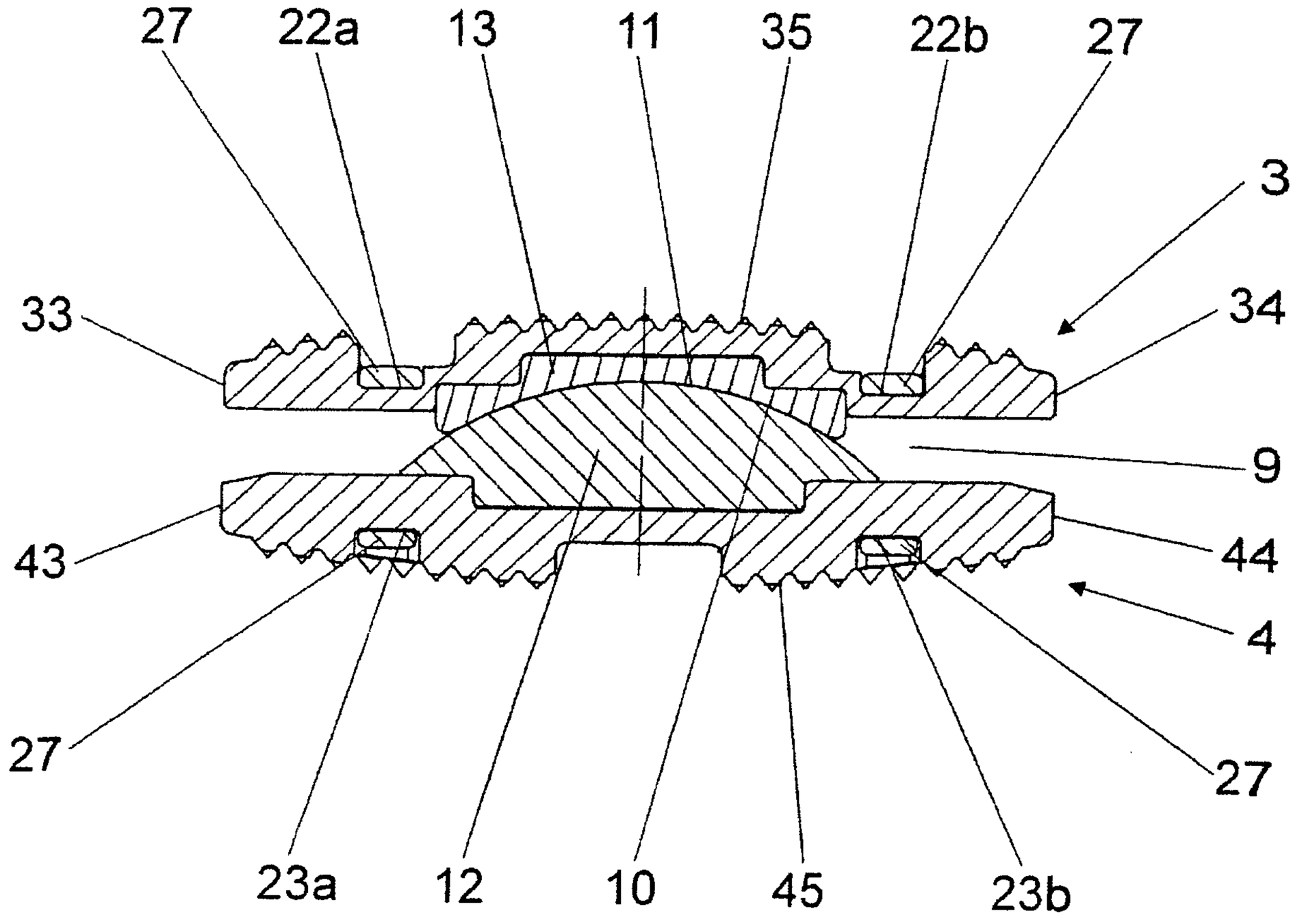

Fig. 3

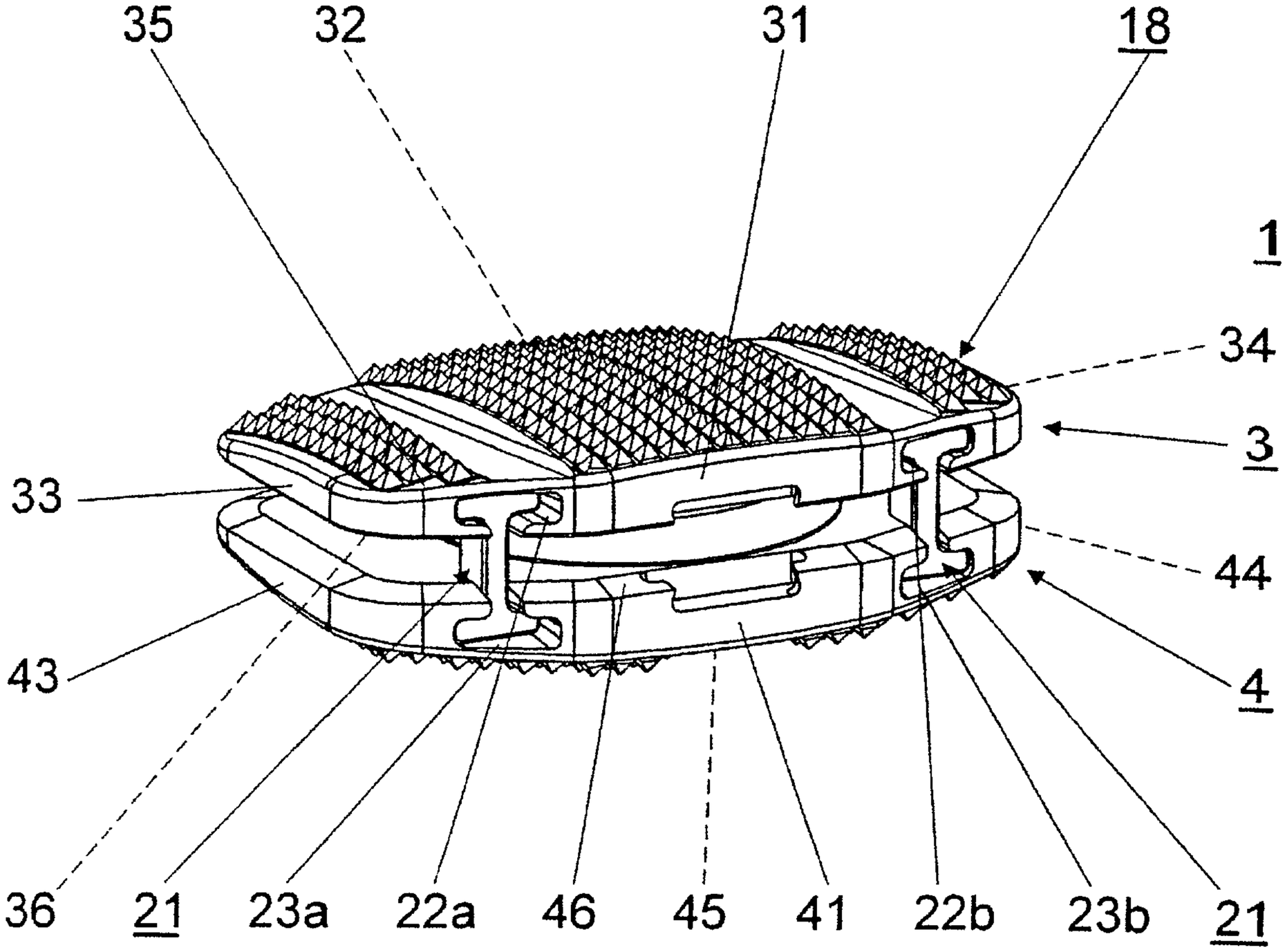

Fig. 4

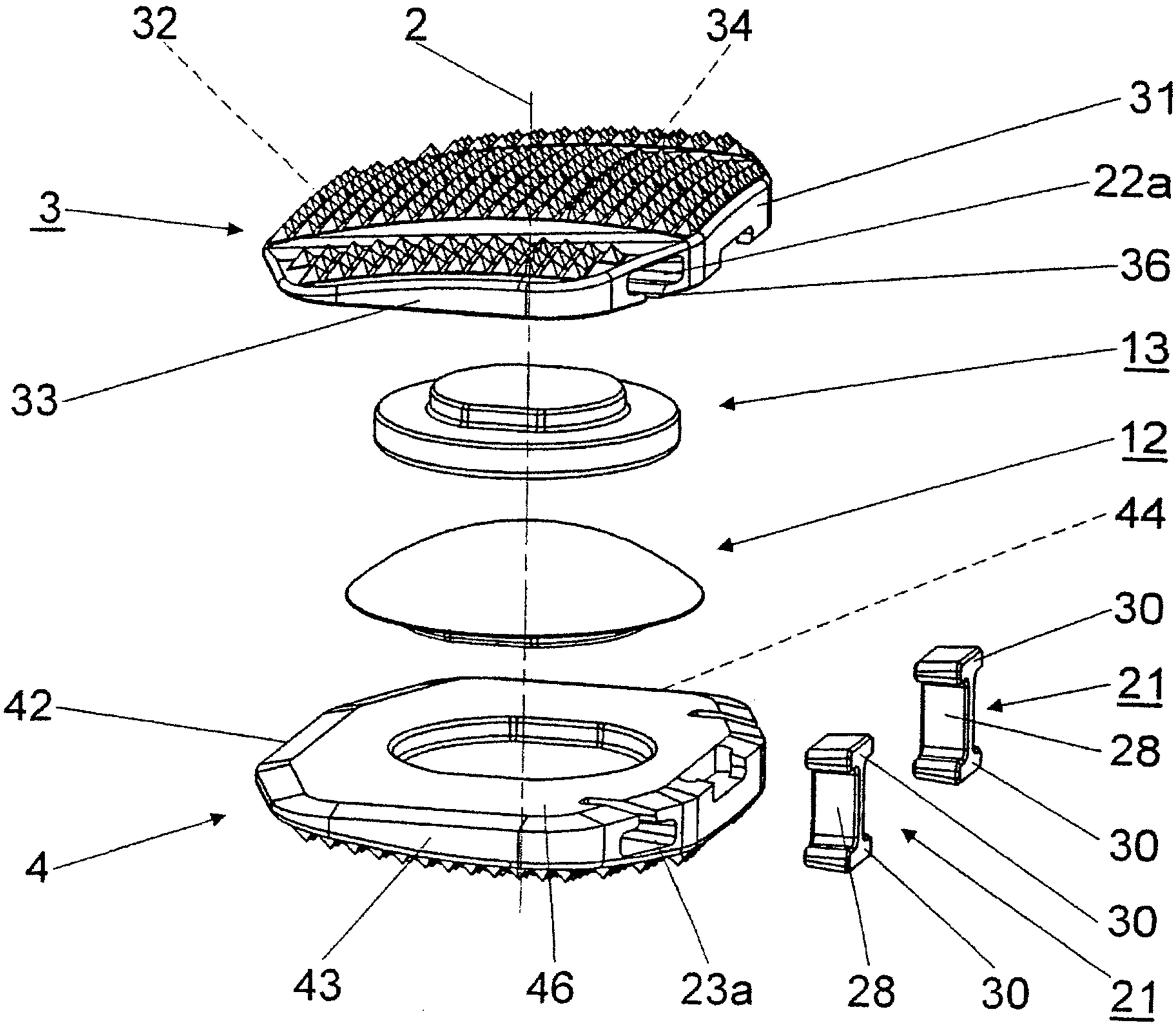

Fig. 5

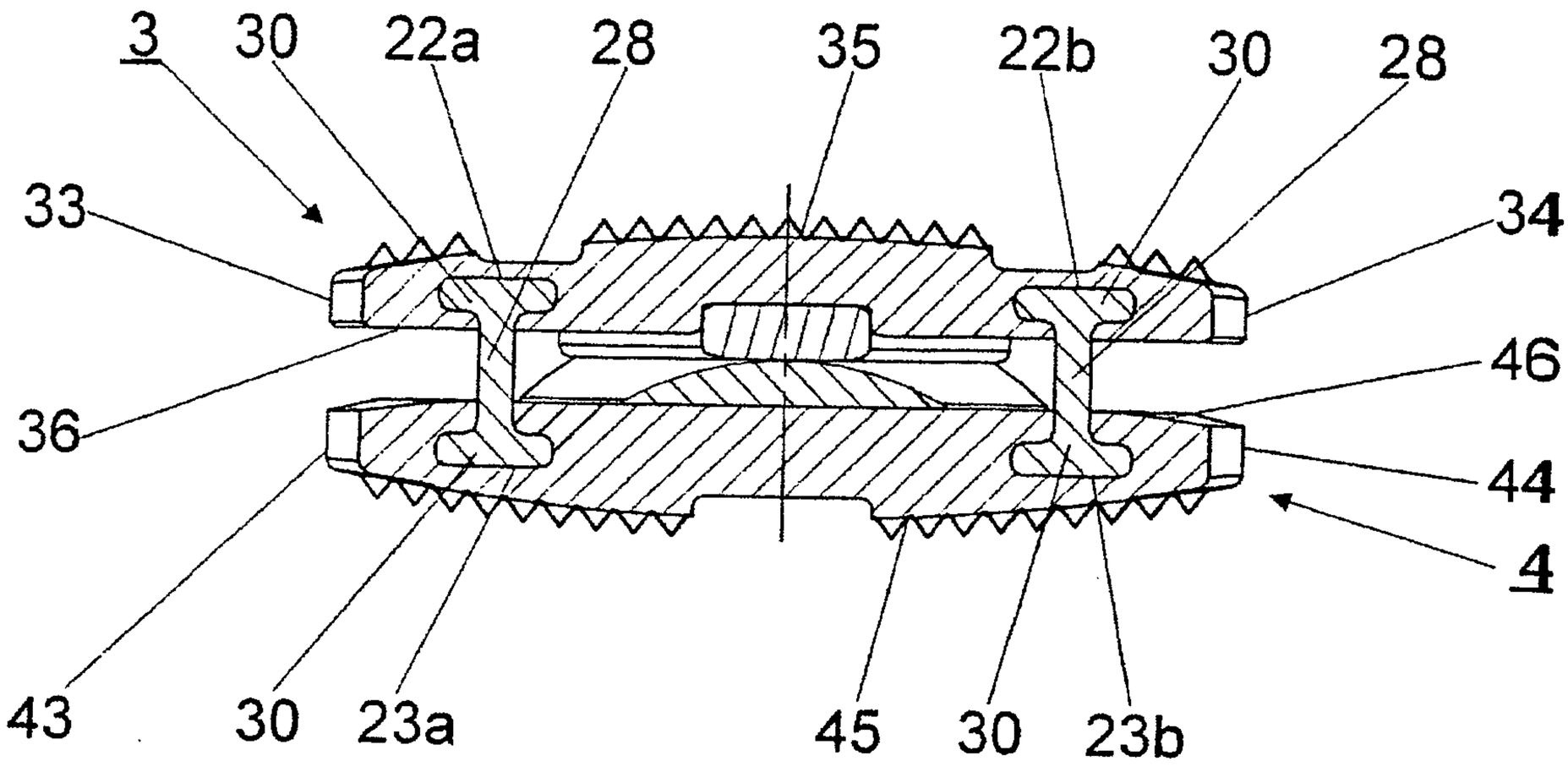
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Fig. 6

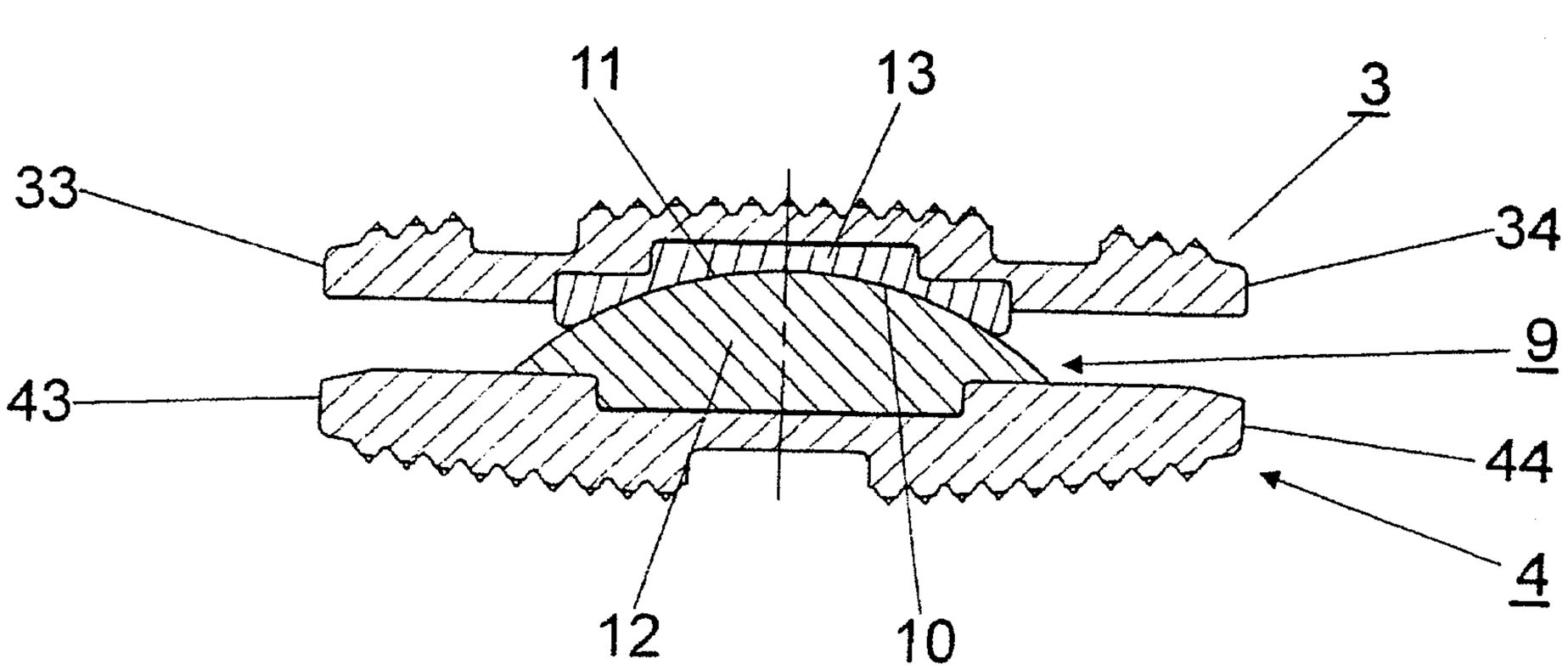
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Fig. 7

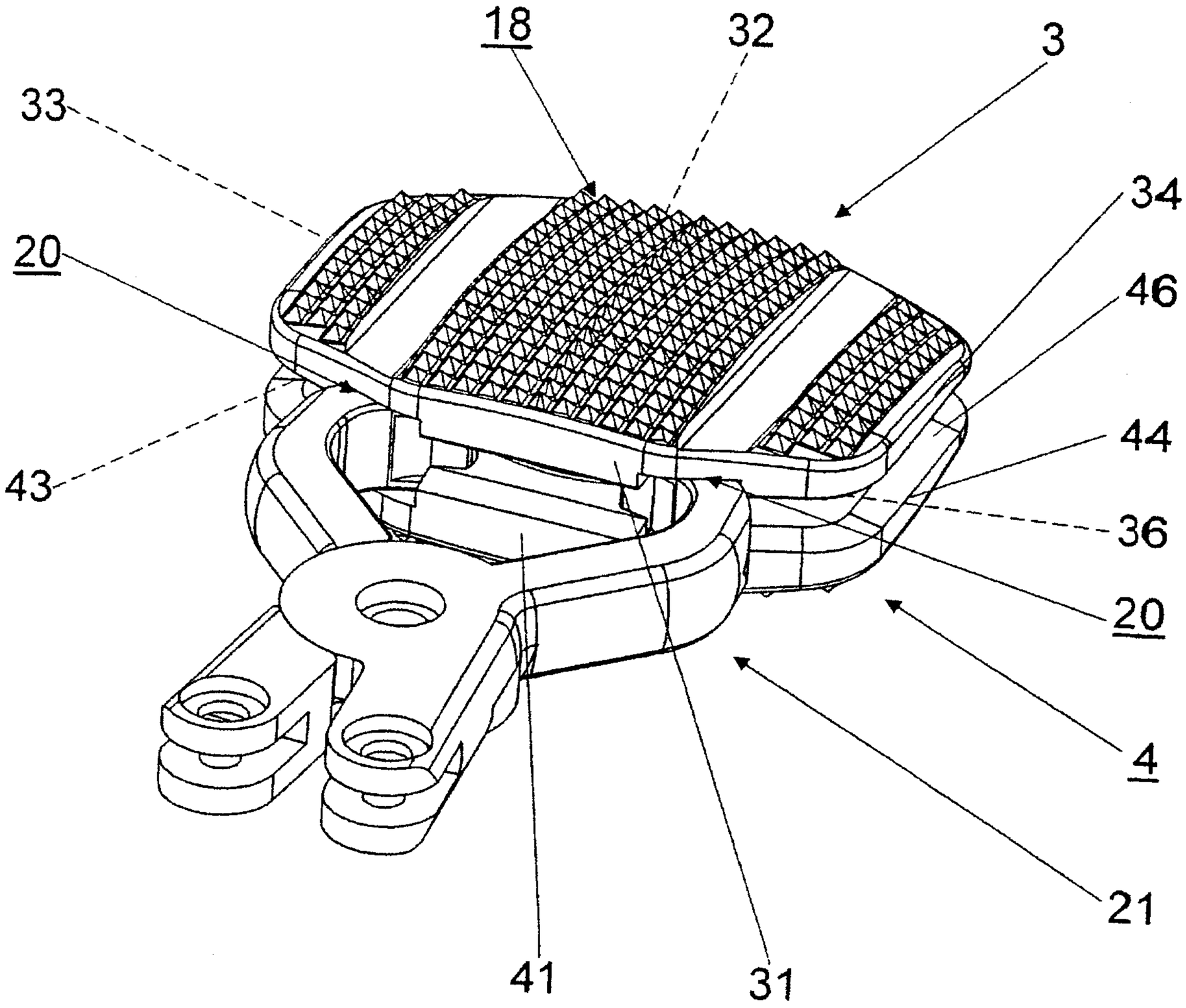


Fig. 8

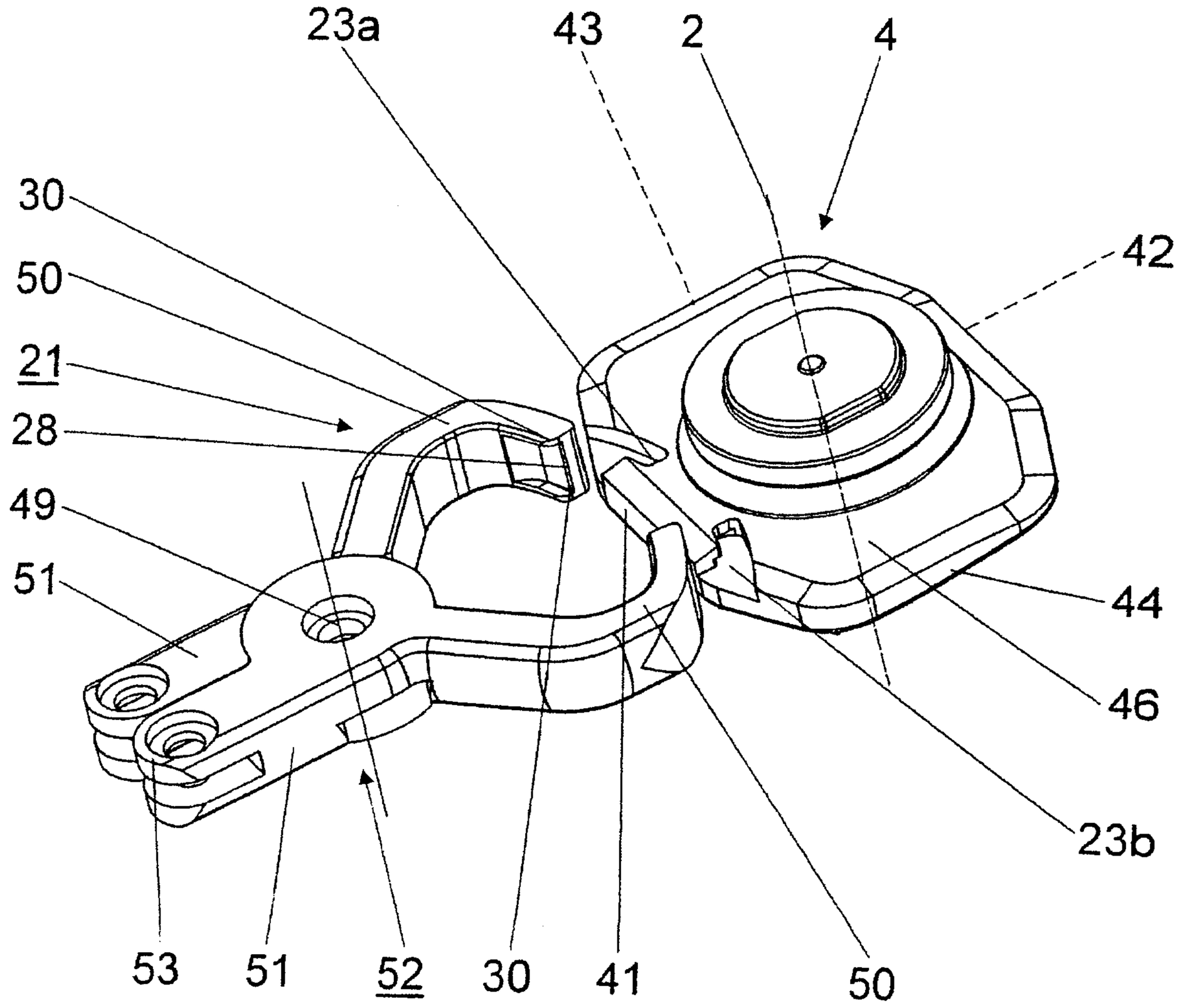


Fig. 10

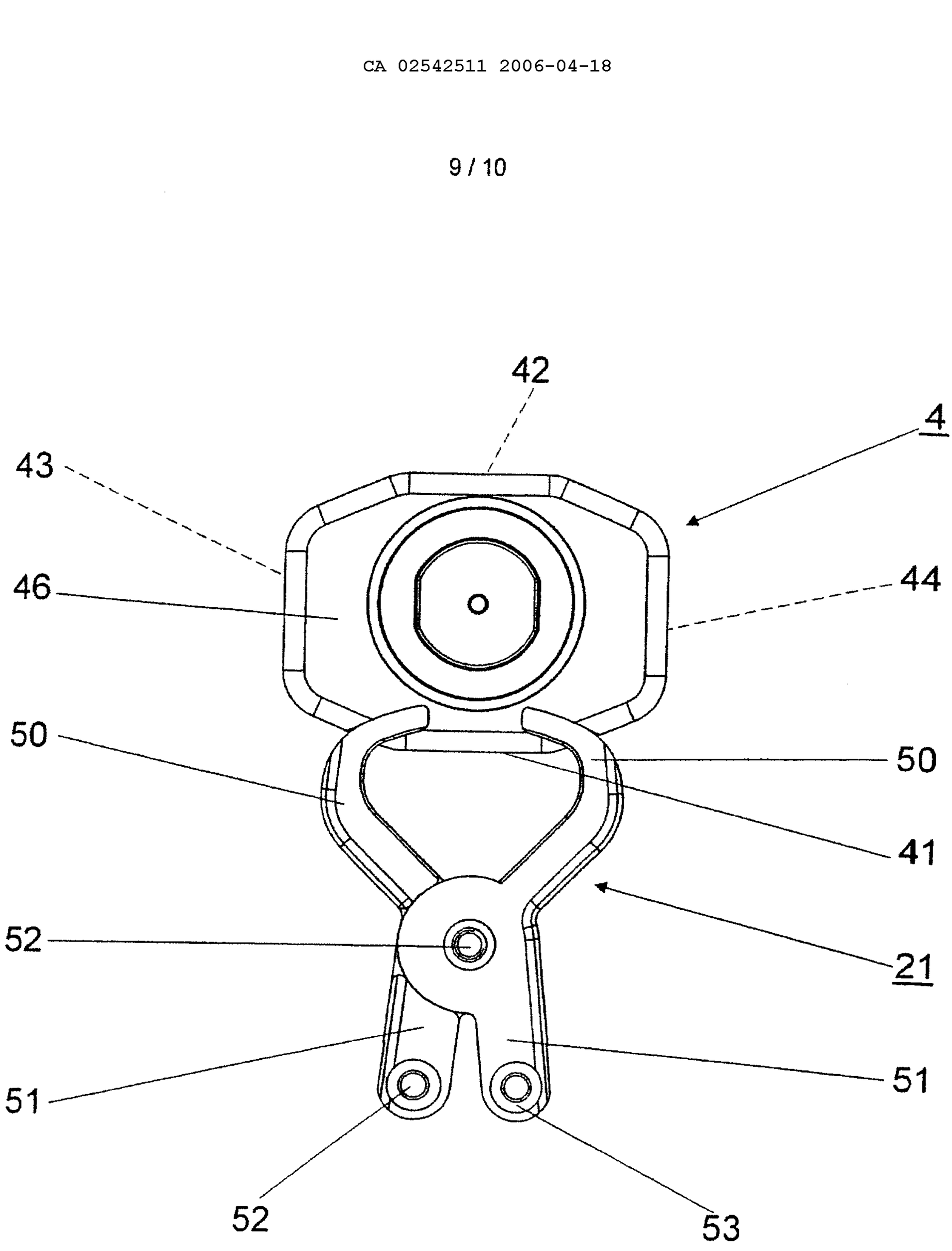


Fig. 9

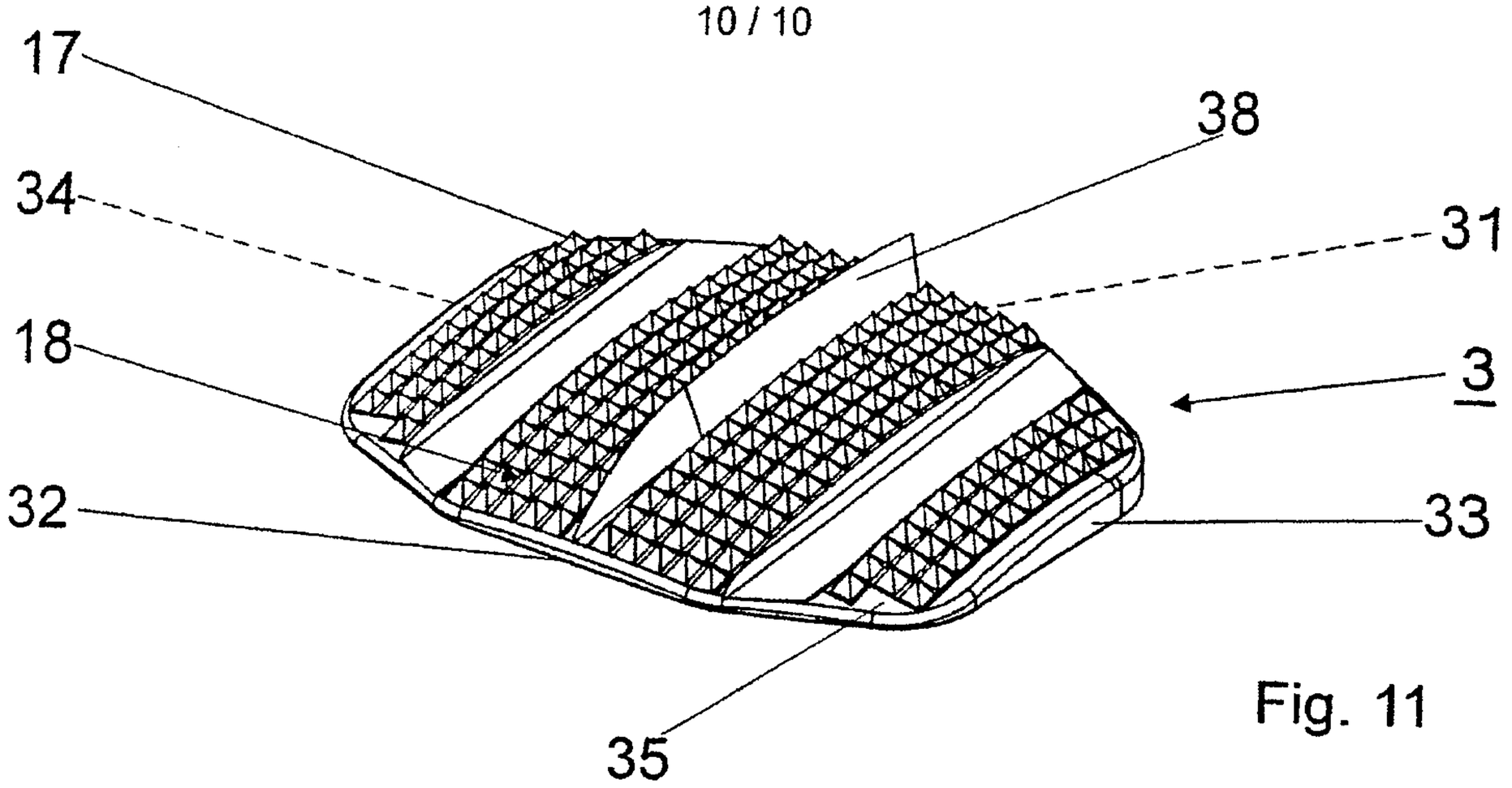


Fig. 11

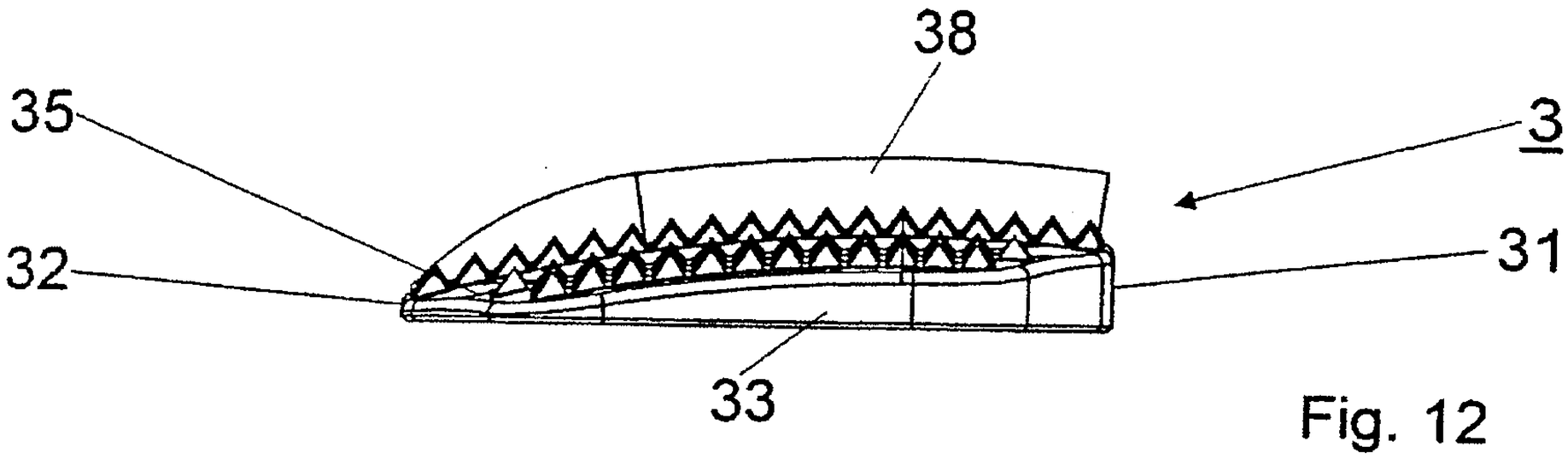


Fig. 12

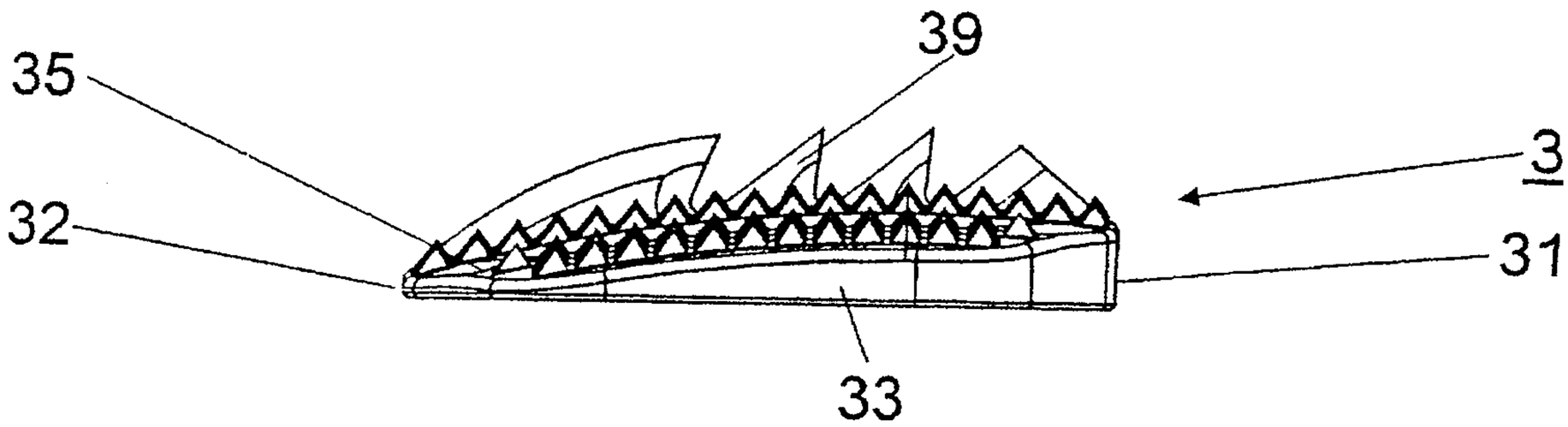


Fig. 13

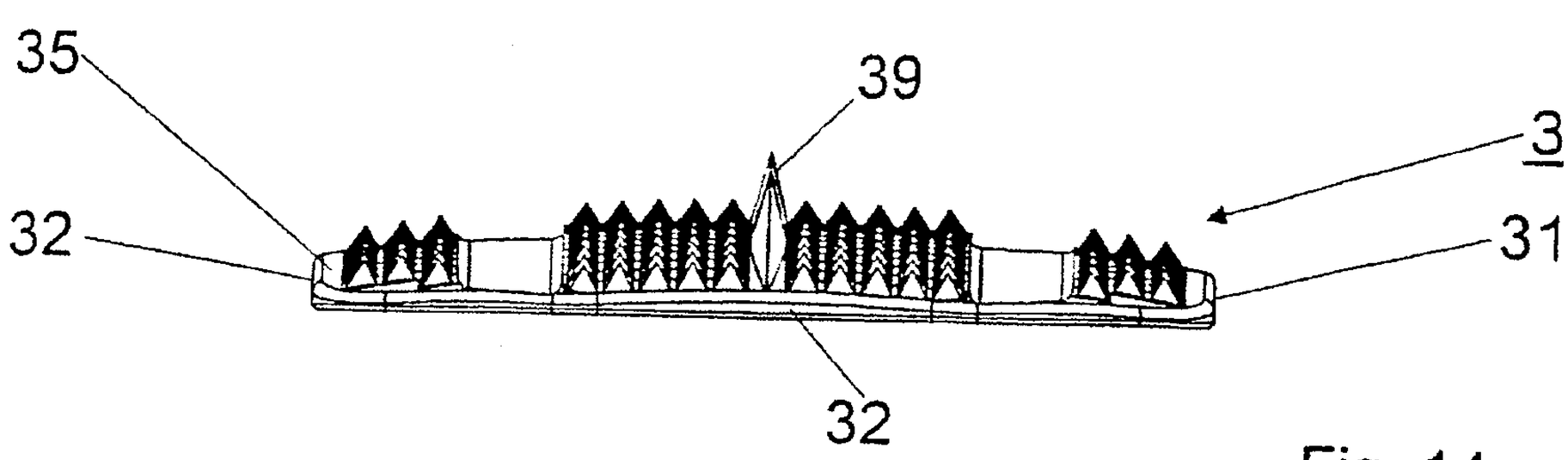
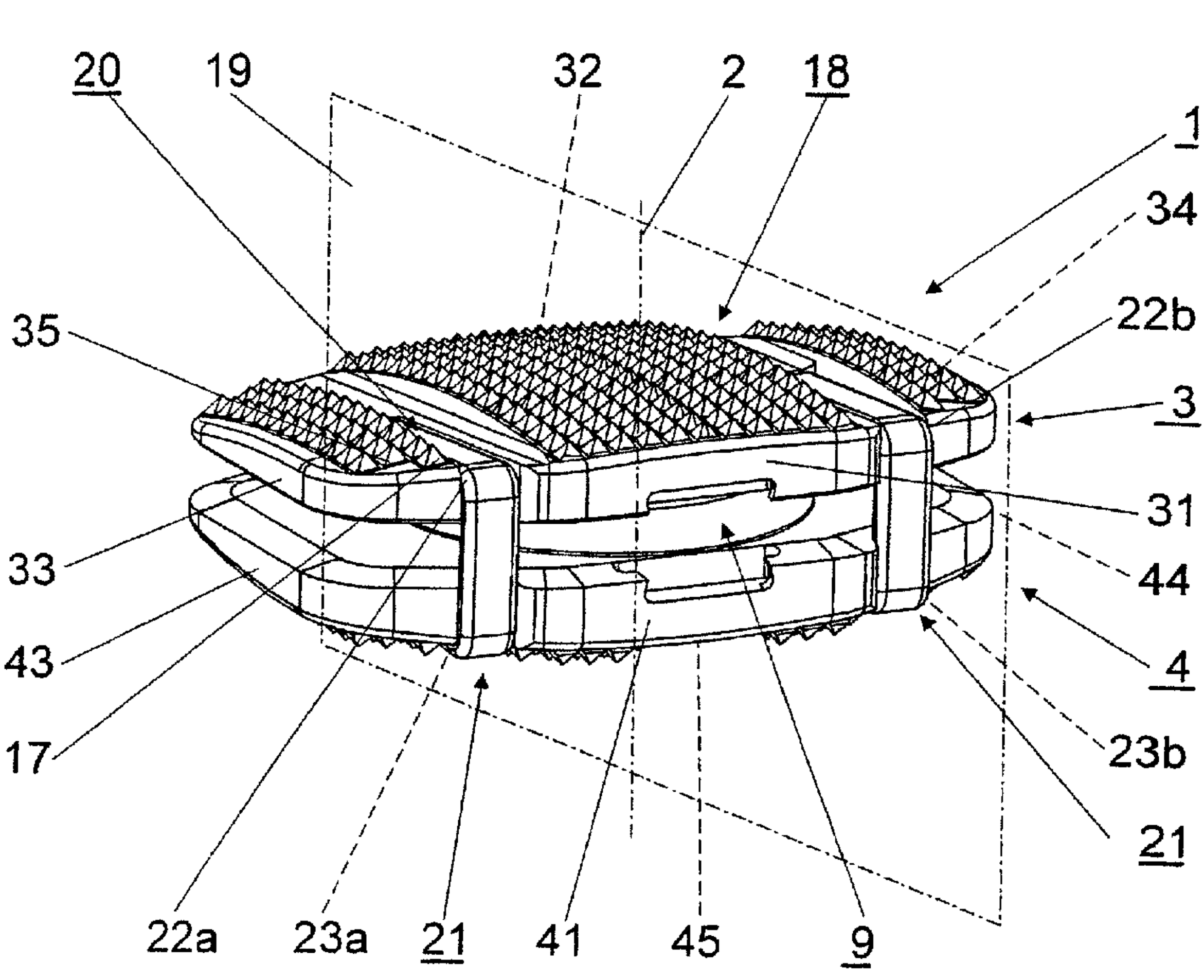


Fig. 14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