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(54) **Title**: DELIVERY SYSTEM AND INTERBODY CAGE ASSEMBLY

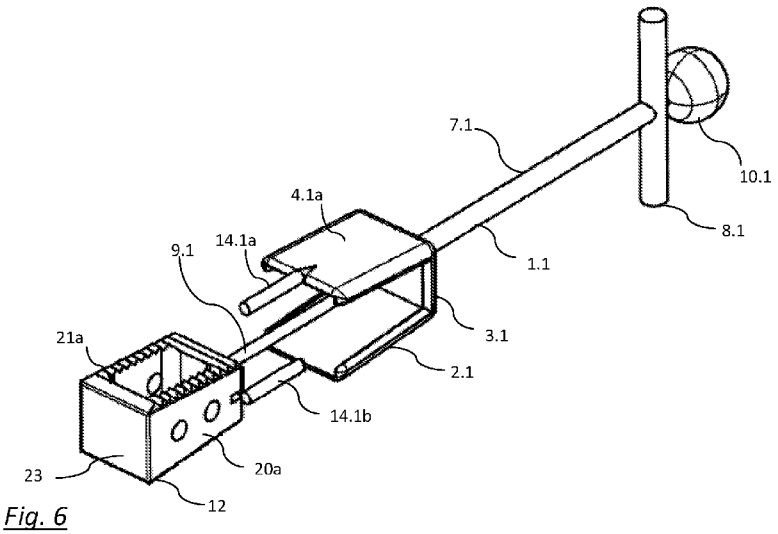

Fig. 6

(57) **Abstract**: Assembly of an interbody cage and a delivery system, wherein the delivery system comprises a shell designed to receive an interbody cage and comprises a distraction element in the shape of two opposing rods arranged on the anterior side of the shell. The two rods are designed to be introduced into the intervertebral space in a first position and to be rotated into a second position to distract the vertebrae, whereupon the delivery system may be inserted in such second position into the intervertebral space to, in a next step, deliver the cage into the intervertebral space, before the final removal of the delivery system. In further embodiments, the volume of the circumference of the shell is reduced, until the shell merely comprises of two extended rods and a connecting member capable of receiving the interbody cage and of delivering it according to the method of the invention.

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DELIVERY SYSTEM AND INTERBODY CAGE ASSEMBLY

The present invention relates to the field of medical devices, and more particularly to an assembly of an interbody cage and a delivery system.

Certain pathologies of the human spine, such as degenerated discs and facettes diseases, and dislocation of vertebrae, compromise the support capacity of the column and the sharing of the load.

The treatment of such pathologies in their advanced stages is achieved by various stabilization systems with intra-discal implants such as interbody cages, whether or not coupled with extra-discal systems, which combine the use of vertebral screws and plates or rods. Such intra-discal implants have significantly improved the treatment of pathologies of the human spine, in restoring the intervertebral space, which results in the decompression of the nerve roots and the acceleration of bony fusion of the adjacent vertebrae together.

Impactation cages represent an important category among interbody cages. These cages, which have a substantially parallelepiped shape, are inserted between the vertebrae by impactation. The downside of these cages is the difficulty of their insertion into the intervertebral space, notably through posterior or unilateral approaches notably transforaminal, lateral, oblique or anterio lateral, but also for anterior cages. The crenellations and dents which are integrated on the superior and inferior surfaces of the cage for the purpose of anchoring the cage into the vertebral plates to prevent its migration, once it is in its final position, represent an additional obstacle to its insertion.

WO 2009092960 discloses a delivery system for an intersomatic cage comprising opposing insertion rods positioned below the superior and inferior surfaces of the body of the cage, which removable rods serve to distract the intersomatic space by 90° rotation of the delivery system.

WO 2009144562 discloses a system comprising an intersomatic cage and a delivery system with retractable or removable rods which are arranged to protrude from the anterior side of the cage, from its two lateral sides or from its superior or inferior surfaces, such retractable or removable rods being capable of distracting two vertebrae through the lateral rotation of the cage or of the delivery system after which the intersomatic cage may be inserted between the vertebrae.

The present invention is an assembly of an interbody cage and a delivery system, wherein the delivery system comprises a shell designed to receive an interbody cage and comprises a distraction element in the shape of two opposing rods arranged on the anterior side of the shell. The two rods are designed to be introduced into the intervertebral space in a first position and to be rotated into a second position to distract the vertebrae, whereupon the delivery system may be inserted in such second position into the intervertebral space to, in a next step, deliver the cage into the intervertebral space, before the final removal of the delivery system. In further embodiments, the volume of the circumference of the shell is reduced, until the shell merely comprises of two extended rods and a connecting member capable of receiving the interbody cage and of delivering it according to the method of the invention.

The characteristics of the invention will appear more clearly from the description of various embodiments, which are solely provided as examples and are not limitative, and in which references will notably be made to the horizontal plane of the cage which will be assumed to be in a parallel plane to the plane of the adjoining vertebral bodies and to the vertical plane of the cage which is the plane perpendicular to the horizontal plane. In addition, the anterior side of the delivery system or of the cage designates that side which is adjusted against the vertebrae just before the introduction of said delivery system or cage in that space, and the posterior side of the delivery system or cage means the side

opposite to the anterior side. The description of these various embodiments refers to the attached schematic Figures in which:

- Figure 1 represents a perspective view of the delivery system according to the first embodiment assembled with an interbody cage, in a first position.
- Figure 2 represents a perspective view of the same delivery system as in Figure 1, but in a second position, after a 90° lateral rotation.
- Figure 3 represents a perspective view of the same assembly as in Figure 1, but with a dislodged cage.
- Figure 4 represents a lateral view of the shell and insertion rods components of the delivery system of the first embodiment.
- Figure 5a represents a lateral view of the shell and insertion rods components of the delivery system, with the insertion rods inserted between two schematic sections of two vertebral bodies, in a first position.
- Figure 5b represents the same view of the delivery system as in Figure 5a, after a lateral rotation of 90°.
- Figure 5c represents the same view of the delivery system as in Figure 5b, while the delivery system is pushed between two vertebrae.
- Figure 5d represents the same view of the delivery system as in Figure 5c, with the a partial dislodgement of the cage from the shell.
- Figure 5e represents the same view of the delivery system and the cage as in Figure 5d, while the delivery system is being removed.
- Figure 5f represents a lateral view of the schematic vertebral segment and the cage of the first embodiment.
- Figure 6 represents a perspective view of the delivery system according to the second embodiment, containing a cage.
- Figure 7 represents a perspective view of the delivery system according to the third embodiment fully assembled with a cage.
- Figure 8 represents a perspective view of the same delivery system as in Figure 7, but with a partially disassembled cage.

- Figure 9 represents a front view of the delivery system and cage of the third embodiment.
- Figure 10a represents the insertion rods of the delivery system and the cage, with the insertion rods components inserted between two schematic sections of two vertebrae, in a first position.
- Figure 10b represents the same view of the delivery system and cage as in Figure 10a, after a lateral rotation of 90°.
- Figure 10c represents the same view of delivery system and cage as in Figure 10b, while the delivery system is pushed between two vertebrae.
- Figure 10d represents the same view of delivery system and cage as in Figure 10c, during the removal of the delivery system.
- Figure 10e represents a lateral view of the schematic vertebral segment and the cage of the third embodiment.
- Figure 11 represents a perspective view of an assembly of the fourth embodiment with a crescent-shaped cage fully assembled with a delivery system with insertion rods comprising curved rims on their outer sides.
- Figure 12 is a blow-up representation of one outer side of an insertion rod with its rim of the assembly in Figure 11.
- Figure 13 represents a top-down view of the fully assembled delivery system and cage of the fourth embodiment.

According to Figures 1 and 2, a first embodiment of the invention describes a delivery system 1, comprising a hollow elongated body 2 which is closed on its posterior side 3, on each of its superior and inferior surfaces 4a, 4b, on each of its lateral sides 5a, 5b, and is open on its anterior side 6. This hollow elongated body 2 will be designated as “shell”. The shell’s lateral sides 5a, 5b, as described in Figure 4, define a trapezoidal shape, with the lower side on the posterior side 3 of the shell. The superior and inferior surfaces 4a, 4b of the shell 2, have a rectangular shape, as shown in Figure 5a. The overall shape of the shell has to be consistent with the overall shape of the interbody cage 12. In variations of the first embodiment, the shape of the shell 2 may also be fitting a crescent-shaped interbody cage similar to that of the fourth embodiment 12.3.

The delivery system 1 also comprises a straight cannulated rod 7 connected at one end to the posterior side 3 of the shell 2 and at its other end to a handle 8. The delivery system 1 also comprises a mobile rod 9, which has a smaller diameter than the inner cylindrical cavity of the cannulated rod 7, and which is engaged through the full length of the cannulated rod 7 and through a bore arranged in the posterior side 3 of the shell 2. The mobile rod 9 is connected at its proximal end to a second handle 10. The distal end 11 of the mobile rod 9 is designed to engage a cage 12 to be implanted between one superior and one inferior vertebra 13a, 13b.

Two opposing insertion rods 14a, 14b are arranged on the shell 2 in one plane which is perpendicular to the anterior side 6 of the shell 2. One first insertion rod 14a is connected by its proximal end 15a to the anterior side 6 of the shell 2 at the level of the superior side 4a of the shell 2, and one second insertion rod 14b is connected by its proximal end 15b to the anterior side 6 of the shell 2 at the level of its inferior side 4b. The outer sides 16a, 16b of the insertion rods 14a, 14b define a long dimension D, and the diameter of the cross-section of each insertion rod 14a, 14b, which is essentially constant, defines a small dimension.

The purpose of the shell 2 is to receive a cage 12 within its cavity 17. The cavity 17 has a dimension marginally superior to the dimensions of the cage 12. If the cage 12 is made of elastic material, the cavity 17 may have a smaller dimension than the dimensions of the cage 12 and the cage may be received in the shell in a compressed configuration. The cage 12 may be held in the shell 2 without any connecting means, or may be held through any possible technical connecting means, such as with a system of grooves arranged on the lateral sides 20a, 20b of the cage 12, or on the superior and inferior surfaces 21a, 21b of the cage 12, such grooves fitting the shape of corresponding rails on the inner sides of the shell 2, or vice versa with rails arranged on any of the superior or inferior surfaces 21a, 21b or lateral sides 20a, 20b of the cage 12, and grooves arranged on any of the inner sides in the cavity 17 of the shell. The cage 12 may also be connected at its posterior side 22 to the distal end 11 of

the mobile rod 9. In Figures 1 and 2, only the anterior side 23 of the cage is visible.

The insertion rods 14a, 14b are designed to expand the intervertebral space between the two vertebrae 13a, 13b for the provisional insertion of the delivery system 1 and the final implantation of the cage 12.

The delivery system 1 is designed to operate in two different sequential positions described in Figures 1 and 2, actuated through a 90° lateral rotation of the first handle 8 of the cannulated rod 7.

As shown in Figures 3 and 5e, the purpose of the mobile rod 9 is to push the cage 12 out of the shell 2 at the desired moment.

Figure 4 represents the shell 2 of the delivery system 1 viewed laterally with the insertion rods 14a, 14b positioned in a vertical plane, which corresponds to the distracting position of the shell 2 insertion rods 14a, 14b shown in Figures 5b to 5e, when the shell is pushed forward into the intervertebral space with the outer sides 16a, 16b of the insertion rods 14a, 14b and the superior and inferior surfaces 4a, 4b of the shell 2 engaging the superior and inferior vertebrae 13a an 13b, respectively.

According to Figure 4, the insertion rods 14a, 14b each have a distal end 18a, 18b, and a proximal end 15a, 15b where they connect with the anterior side 6 of the shell 2, defining a depth D'. Beyond the level of the anterior side 6 of the shell 2, the circular cross-section of the insertion rods 14a, 14b becomes semi-circular and the outer sides 16a, 16b of the insertion rods 14a, 14b thin down as they stretch over an extending portion 19a, 19b on the superior and inferior surfaces 4a, 4b of the shell 2. The purpose of these extending portions 19a, 19b, is to solidify the connection of the insertion rods 14a, 14b to the shell 2 and also to prolong the engagement of the outer sides 16a, 16b of the insertion rods with the adjoining vertebrae 13a, 13b and thus to secure a more stable trajectory of the delivery system 1 as it is pushed into the intervertebral space. The length of the extending portions 19a, 19b may be more important

than shown in Figures 3a and 3b. The profile of these extending portions 19a, 19b may also be different than semi-circular, and may for instance have the cross-section of a wedge along the longitudinal axis of the extending portions 19a, 19b, so as to better engage with the adjoining vertebrae 13a, 13b. The extending portions 19a, 19b of the insertion rods 14a, 14b may also be extending along the inner sides of the superior and inferior surfaces 4a, 4b or of lateral sides 5a, 5b of the cavity 17 of the shell 2, or in one or more of the corners between the inner sides of the superior or inferior surfaces 4a, 4b and the inner sides of lateral sides 5a, 5b of the cavity 17, and define rims in said cavity 17, compatible with corresponding grooves on the superior or inferior surfaces 21a, 21b of the cage 12 and/or on the lateral sides 20a, 20b of the cage 12.

According to Figures 5a to 5f, the purpose of the insertion rods 14a, 14b is to be first inserted into the intervertebral space when the shell 2 of the delivery system 1 is in a first position, by preferably the insertion of the rods' entire depth D'. This causes the insertions rods' 14a, 14b lateral sides to engage the adjoining vertebrae 13a, 13b. The delivery system is then rotated 90° into a second position, as shown in Figure 5b by actuation of a 90° rotation of the handle 8 of the cannulated rod 7. The outer sides 16a, 16b of the insertion rods 14a, 14b now engage the vertebrae 13a, 13b along their depth D'. This causes the intervertebral space to be expanded of a distance equal to le long dimension D. As described in Figure 5c, the delivery system 1 is then pushed between the two adjoining vertebrae 13a, 13b. Figure 5d describes the cage 12 being pushed out and dislodged from the shell 12 by means of the mobile rod 9 actuated via its handle 10. Figure 5e describes the superior and inferior surfaces 21a, 21b of the cage 12 having engaged and anchored into the adjoining vertebrae 13a, 13b, and the shell 2 being removed from the intervertebral space, while the distal end 11 of the mobile rod 9 remains connected to the posterior side 22 of the cage 12. Figure 5f describes the cage 12 after the removal of the mobile rod 9 and of the delivery system 1.

According to a second embodiment of the invention, Figure 6 describes a delivery system 1.1 similar to the delivery system 1 of the first embodiment, with a shell 2.1 arranged with flanges from the edges of the superior and inferior surfaces 4.1a, 4.1b but no lateral sides. The shell 2.1 in this second embodiment may only hold the cage 12 by the inner sides of its flanged superior and inferior surfaces 4.1a, 4.1b, by the inner side of its posterior side 3.1 or by the distal end 11 of the mobile rod 9.

For the delivery of the cage 12, the delivery system 1.1 of the second embodiment operates in the same manner as the delivery system 1 of the first embodiment, such as described in Figures 5a to 5f.

In variations of the first and second embodiments, the insertion rods 14a, 14b, may also be arranged on the anterior side 6 of the shell 2, 2.1 in a plane that does not cross the medial longitudinal axis of the shell 2, 2.1 and may thus be positioned in an ex-centered plane, or positioned in a diagonal plane, whether or not crossing the medial longitudinal axis of the shell. In additional variations of the second embodiment, the shapes of the superior and inferior surfaces 4.1a, 4.1b of the shell 2.1 may be shaped to cover less shell surface: for instance, the superior and inferior surfaces 4.1a, 4.1b may dove-tail from the proximal end 15.1a, 15.1b of the insertion rods 14.1a, 14.1b towards the posterior side 3.1 of the shell 2.1. The dove-tailing shape of the shell 2 may also cover a portion of the lateral sides 5a, 5b of the shell 2.1, towards its posterior side 3.1.

Figures 7 and 8 describe a third embodiment of the invention, with a delivery system 1.2 wherein the shell of the first and second embodiments have been further reduced on the superior and inferior surfaces of the shell to the size of the diameter of the insertion rods 14.2a, 14.2b, and on the posterior side of the now virtual shell to a narrow connecting member 24. Figure 7 shows the delivery system 1.2 and the cage 12.2 in a fully assembled configuration, with the connecting member 24 of the delivery system 1.2 engaged with the posterior side 22.2 of the cage 12.2. Figure 8 shows the delivery system 1.2

disengaging from the cage 12.2. The connecting member 24 may have two teeth 25a, 25b designed to engage with two corresponding indentations 26a, 26b arranged on the posterior side 22.2 of the cage 12.2. The mobile rod 9.2 engages through a bore arranged in the connecting member 24. The mobile rod 9.2 may have a threaded tip 11.2 to connect with a threaded hole arranged at the posterior side 22.2 of the cage 12.2. The function of the mobile rod 9.2 may be to only maintain the cage 12.2 in place while the remainder of the delivery system 1.2, comprising of the insertion rods, the connecting member 24 and the rods 7.2, 9.2 is being removed. Alternatively, the mobile rod 9.2 may also be used to push the cage 12.2 forward in a gliding motion along the inner sides of the insertion rods 14.2a, 14.2b, or beyond the distal ends 18a, 18b of the insertion rods between the two vertebrae 13a, 13b.

In a variation of the delivery system 1.2, the two insertion rods 14.2a', 14.2b' may be arranged in one single "U shaped" member like a diapason. In such a variation the connecting member 24' may have a similar cross-section as the rods 14.2a', 14.2b' but in a bended configuration, and may have the other features of the connecting member 24, such as the teeth 25a, 25b and the bore for the pass-through of the mobile rod 9.2.

The cage 12.2 described in Figures 7 and 8 has crenelated superior and inferior surfaces 21.2a, 21.2b following an elliptical shape. According to Figure 9, the height H between the crenelated superior and inferior surfaces 21.2a, 21.2b at their highest point is smaller than the distance between the outer sides 16.2a, 16.2b of the insertions rods 14.2a, 14.2b, which define the long dimension D. Only the outer sides 16.2a, 16.2b of the insertions rods 14.2a, 14.2b exceed the level of the crenelated superior and inferior surfaces 21.2a, 21.2b. Figures 7, 8 and 9 also describe how the inner sides of the insertions rods 14.2a, 14.2b barely engage the bottom of the longitudinal grooves 27a, 27a', 27b, 27b', arranged on the anterior side 23.2 and the posterior side 22.2 of the cage 12.2, and how none of the lateral sides of the insertions rods 14.2a, 14.2b engages any section of the longitudinal grooves 27a, 27a', 27b, 27b'.

Figures 10a to 10c describe the insertion process of the delivery system 1.2 of the third embodiment between two vertebrae 13a, 13b, and the delivery of the cage 12.2 into the intervertebral space, which is similar to the insertion process for the first and second embodiments. Figure 10a describes the delivery system 1.2 in a first position with the distal portion 18.2a, 18.2b of the insertion rods 14.2a, 14.2b inserted between the vertebrae 13a, 13b. The crenelated superior surface 21.2a of the cage 1.2 as well as the insertion rod 14.2b of the delivery system 1.2 are visible from this lateral vantage point. Figure 10b describes the delivery system 1.2 in a second position after a 90° rotation of the cannulated rod 7.2 by the handle 8.2. The distance between the vertebrae 13a and 13b expands to the long dimension D. Figure 10c shows the delivery system 1.2 being pushed between the vertebrae 13a, 13b, and Figure 10d shows the delivery system 1.2 being pulled back from the intervertebral space, while the cage 12.2 is being pushed forward or held in place by the mobile rod 9.2. Alternatively, the cage 12.2 may be pushed forward in its gliding motion on the inner sides of the insertion rods 14.2a, 14.2b until the crenelated superior and inferior surfaces 21.2a, 21.2b engage the vertebrae 13a, 13b, whereupon the delivery system 1.2 is pulled back. Figure 10e describes the cage 12.2 engaged with the two vertebrae 13a, 13b after full removal of the delivery system 1.2.

Figures 11, 12 and 13 describe a fourth embodiment of the invention, wherein the delivery system 1.3 is arranged with insertion rods 14.3a, 14.3b which have a cross-section in the shape of a half-moon on their distal portion 18.3a, 18.3b and a cross-section in the shape of a rectangle on their portion engaging the superior and inferior surfaces 21.3a, 21.3b of the cage 12.3. At their proximal ends 15.3a, 15.3b, the insertion rods connect with the connecting member 24.3. The outer sides 16.3a, 16.3b of the rectangular cross-sectioned portion of the insertion rods 14.3a, 14.3b comprise longitudinal curved rims 28a, 28b. As described in Figure 12, the rims 28a, 28b are arranged to each define a ridge 29a, 29b which is a suitable profile to engage the vertebrae 13a, 13b and thereby cause a thin carving in their endplates. The rims 28a, 28b may also

have different cross-sections, such as be arranged with two longitudinal edges along their axes with a cross-section of a square, a rectangle or trapezoidal shaped.

The cage 12.3 of the assembly has the shape of a crescent along its longitudinal axis, but any other shapes of cages, including cages 12, 12.1 and 12.2 of the first, second and third embodiments, would also be suitable for the assembly of the fourth embodiment. The cage has grooves 27.3a, 27.3b arranged on the anterior side 23.3 of the cage 12.3 and grooves 27.3a', 27.3b' arranged on the posterior side 22.3 of the cage 12.3. The rectangular cross-sectioned portion of the insertion rods 14.3a, 14.3b is marginally smaller that the rectangular cross-section of the grooves 27.3a, 27.3a', 27.3b, 27.3b' such that the insertion rods 14.3a, 14.3b fit within said grooves without leaving any interstice when the delivery system 1.3 and the cage 12.3 are fully assembled as described in Figures 11 and 13.

The method of insertion of the delivery system 1.3 and cage 12.3 of the fourth embodiment is essentially similar than the methods described for the first embodiment in Figures 5a to 5f, and for the third embodiment in Figures 10a to 10e. According to Figure 13, the benefit of the curved ridges 29a, 29b is to slightly carve into the adjoining vertebrae 13a, 13b, and as the assembly is pushed forward through one directional force F into the intervertebral space, to cause the assembly to follow the curve of the rims and follow a different trajectory T than that of the directional force F. The cannulated rod 7.3 is preferably articulated towards its distal end near the connecting member 24.3, such that a portion of said cannulated rod 7.3 between said articulation and the posterior side of the connecting member 24.3 may, together with the connecting member 24.3 and the insertion rods 14.3a, 14.3b carrying the cage 12.3, change trajectory from the first trajectory imposed by force F to a trajectory closer to trajectory T. The articulation on the cannulated rod 7.3 may be any type of articulation such as a cannulated ball-and-socket articulation to allow the motion of a flexible mobile rod 9.3. The articulation of that portion of the

cannulated rod 7.3 may also be arranged as a flexible section of the cannulated rod 7.3 itself.

In variations of the fourth embodiment, the rims 28a', 28b' may also be straight, instead of curved, in order to stabilize a straight trajectory of the delivery system 1.3'. In additional variations the shapes, lengths and profiles of the rims 28a, 28b may also be differently arranged on the insertion rods 14.3a than on the insertion rod 14.3b.

In variations of the third and fourth embodiments, the grooves 27a, 27b, 27a', 27b', 27.3a, 27.3a', 27.3b, 27.3b' may also be arranged on the superior and inferior surfaces 21a, 21b of the cages 12.2, 12.3 in a plane that does not cross the medial longitudinal axis of the cages.

According to other variations of the third and fourth embodiments, the distance between the inner sides of the insertion rods 14.2a, 14.2b, 14.3a, 14.3b, may be increased or decreased in the connecting member 24, 24.3 to adjust to different heights of the cages. This is advantageous as one single delivery system 1.2, 1.3 may be used for different heights of cages 12.2, 12.3. The adjustment may be achieved through any technical means, such as a rack-and-pinion system or a sliding-and-lock mechanism.

In variations of the first to fourth embodiments, the assembly may be arranged so that only the inner-posterior side 3 of the shell, or the connecting member 24, 24.3 engages the cage 22, 22.1, 22.2, 22.3, with none of the other inner-sides of the shell 2, or none of the sides of the insertion rods 14.2a, 14.2b, 14.3a, 14.3b engaging the superior or inferior surfaces 21a, 21b or lateral sides 20a, 20b, or grooves 27a, 27b of the cage 1, 1.1, 1.2, 1.3. In variations of the four embodiments, the insertion rods 14a, 14b may be arranged with cross-sections in the shape of a circle, and elongated half-moon, a race-track or be square, rectangular, triangular, oblong, oval, trapezoidal, rhombic or polygonal. The cross-sections of the insertion rods of any of the embodiments may be non-constant between their distal ends and their connection to the shell 2 or to the connecting member 24.

In additional variations of all embodiments, the insertion rods 14a, 14b, 14.2a, 14.2b, 14.3a, 14.3b may be connected to the shell 2 or connecting member 24 defining a plane that is not vertical but oblique, which enables a rotation of less than 90° of the delivery system 1, 1.1, 1.2, 1.3 to distract the vertebrae 13a, 13b of a dimension D that is greater than height H of the cage 12, 12.2, 12.3. The required rotation may range between 45° and 85° for a delivery system where the anterior parts of the superior and inferior surfaces 4a, 4b of the shell 2 define the shape of a square, and may range between 10° and 85° where these surfaces define a rectangular shape.

All embodiments of the invention may combine assemblies of delivery systems and cages which are not made in one single bloc, such as expandable cages wherein two essentially flat-surfaced components, reflecting the features of the superior and inferior surfaces of the cages of the four embodiments of the invention, are arranged to engage the vertebrae, such essentially flat-surfaced components being connected, between their posterior and anterior parts, through a hinge or other connecting means.

All assemblies of the embodiments of the invention may also combine a delivery system with any other interbody implant which is not designed to promote bony fusion, but to remain articulate, such as disc prostheses.

CLAIMS

1. Assembly comprising a delivery system (1) for the insertion of an interbody cage (12) and an interbody cage (12), which delivery system (1) comprises one superior insertion member (14a) capable of engaging a superior vertebra (13a) and one inferior insertion member (14b) capable of engaging an inferior vertebra (13b), wherein said superior and inferior insertion members (14a, 14b) are connected to an elongated hollow member (2) or to a connecting member (24) capable of engaging the interbody cage (12) through the interbody cage's posterior side (22) and/or lateral sides 20a, 20b).

2. System of claim 1, wherein the superior and inferior insertion members (14a, 14.1a, 14b, 14.1b) are connected to an elongated hollow member (2, 2.1) of the delivery system (1, 1.1) covering at least partially five sides (20a, 20b, 21a, 21b, 22) of the interbody cage (12, 12.1).

3. System of claim 1, wherein the superior and inferior insertion members (14a, 14b) are connected to an elongated hollow member (2, 2.1) of the delivery system (1, 1.1) covering at least partially three of five sides (20a, 20b, 21a, 21b, 22) of the interbody cage (12, 12.2)

4. System of claim 1, wherein the elongated hollow member (2, 2.1) of the delivery system (1, 1.1) has connecting means to at least one portion of one of five sides (20a, 20b, 21a, 21b, 22) of the interbody cage (12, 12.1).

5. System of claim 1, wherein the superior and inferior insertion members (14.2a, 14.2b) are connected to a connecting member (24) which has connecting means (25a, 25b) to at least one of five sides (20a, 20b, 21a, 21b, 22) of the interbody cage (12.2).

6. System of claim 5, wherein the connecting means (25a, 25b) engage with the posterior side (22.2) of the interbody cage (12.2).

7. System of claim 6, wherein the connecting means (25a, 25b) engage with indentations (26a, 26b) on the posterior side (22.2) of the interbody cage (12.2).

8. System of claim 6, wherein the connecting means (25a, 25b) engage with one lateral side (20a, 20b, 20.2a, 20.2b) of the interbody cage (12, 12.1, 12.2).

9. System of claim 8, wherein the connecting means (25a, 25b) engage with indentations (26a, 26b) on one lateral side (20.2a, 20.2b) of the interbody cage (12.2).

10. System of claims 1, and 5 to 9 wherein the superior and inferior insertion members (14.2a, 14.2b) do not engage the interbody cage (12.2).

11. System of claim 1, wherein the superior and inferior insertion members (14.2a, 14.2b) engage a portion of one superior (20.2a) or inferior (20.2b) surface of the interbody cage (12.2).

12. System of claim 1 and 5, wherein the cross-sections of the superior and inferior insertion members (14.2a, 14.2b) fit a corresponding width of the grooves 27a, 27b of the interbody cage (12.12.2) on at least one portion of their length.

13. System of claims 1 to 10 wherein the cross-section of the superior and inferior insertion members (14a, 14b, 14.1a, 14.1b, 14.2a, 14.2b) may be circular, square, rectangular, triangular, oblong, oval, trapezoidal, rhombic, polygonal or have the shape of a half-moon, an elongated half-moon or race-track

14. System of claims 1 to 11 wherein the rotation of the system (1, 1.1, 1.2) to distract the intervertebral space between two vertebra (13a, 13b) is 90°.

15. System of claims 1 to 12 wherein one of the superior and inferior insertion members (14a, 14b, 14.1a, 14.1b, 14.2a, 14.2b) and/or the elongated hollow member (2, 2.1) has a rim with a ridge profile arranged on its outer side.

16. System of claim 13 wherein the rim is curved.

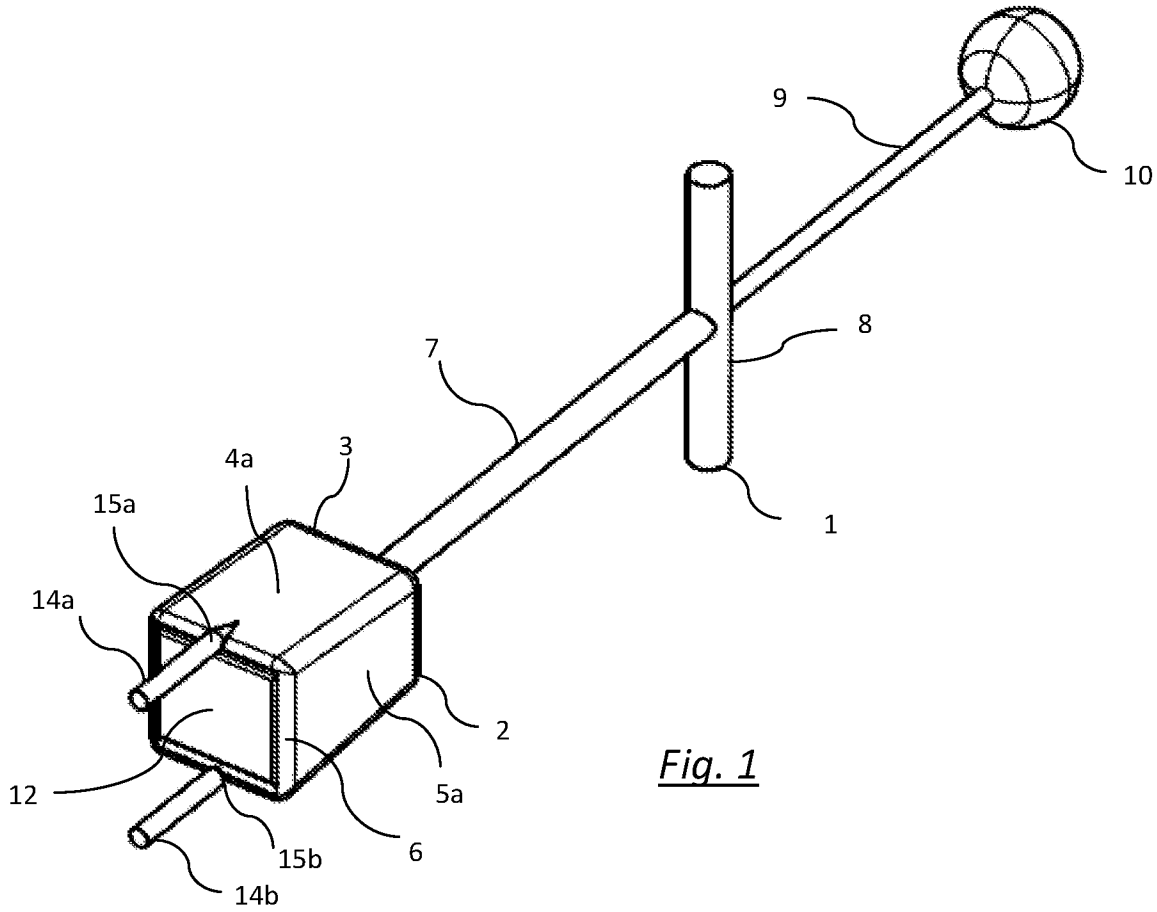

Fig. 1

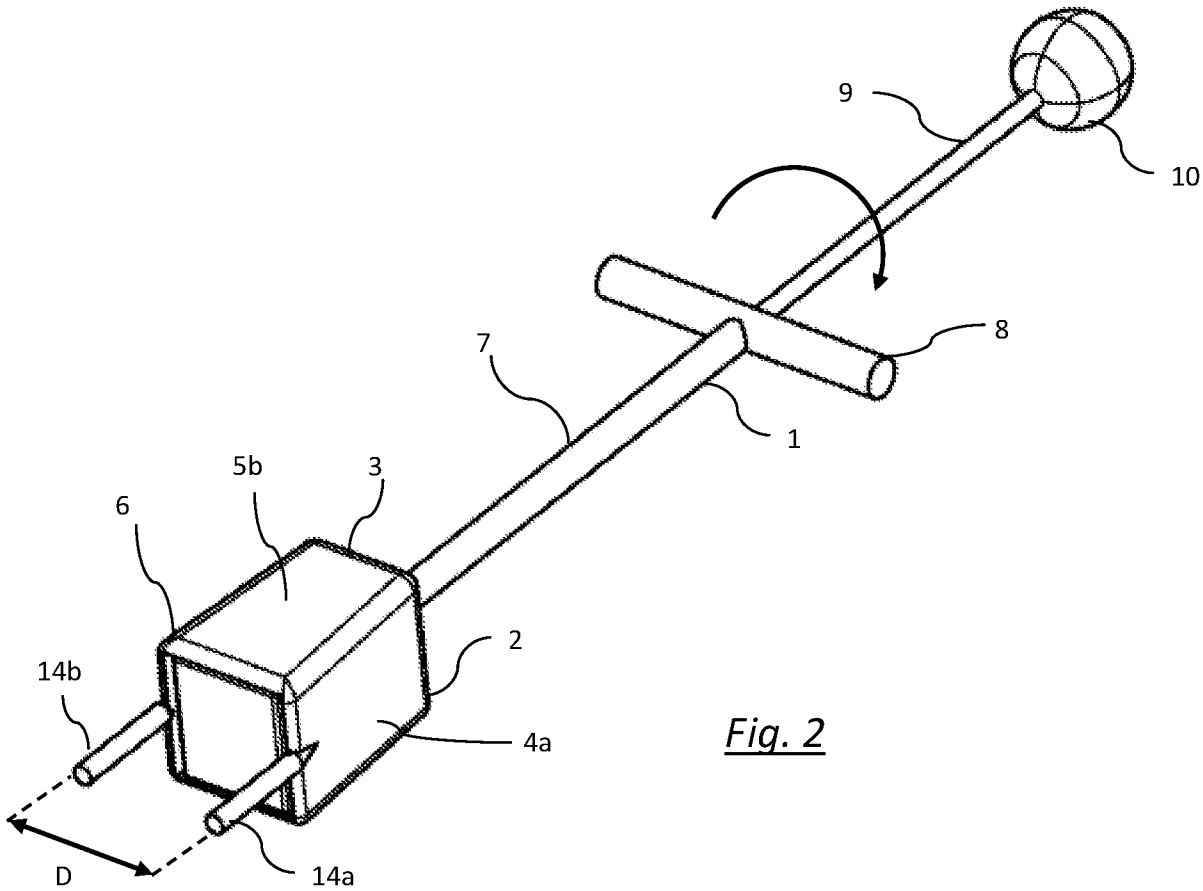

Fig. 2

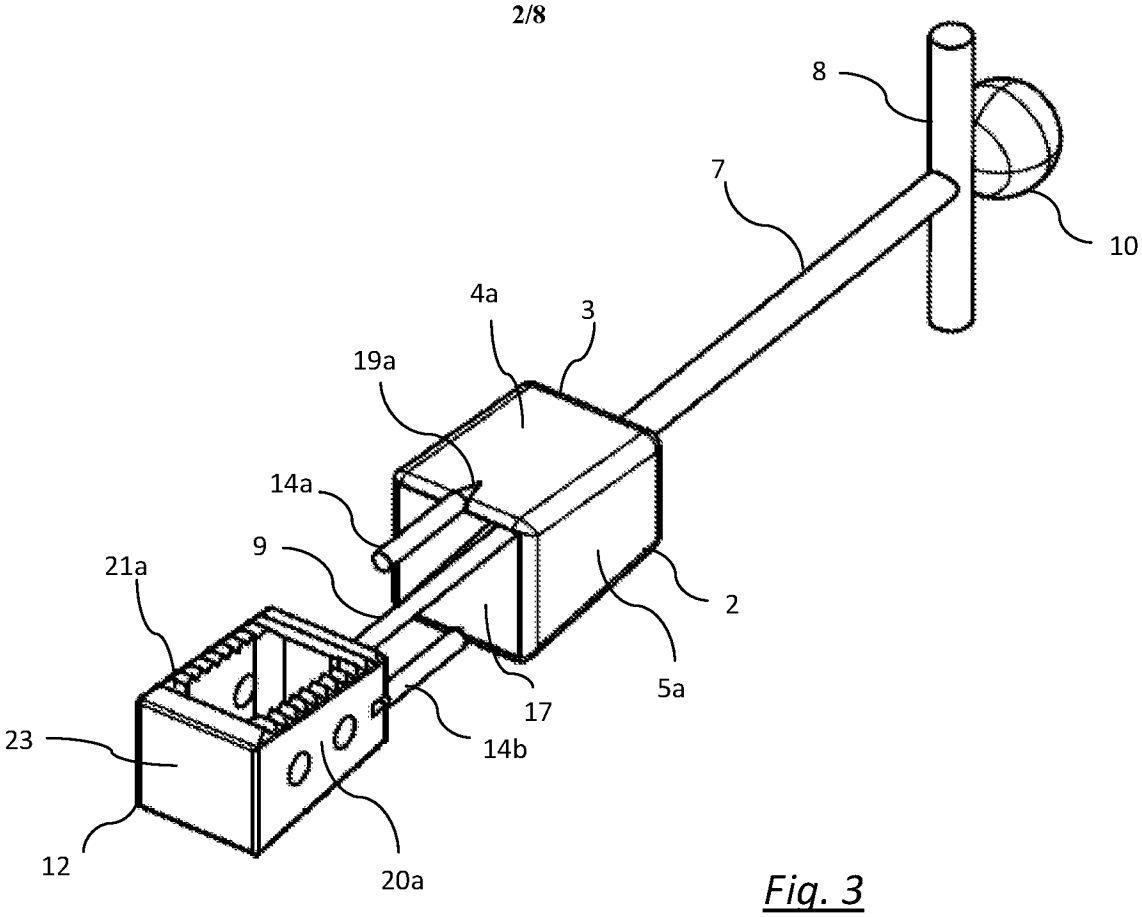
8
7
10
4a
3
19a
14a
9
21a
2
5a
17
14b
23
12
20a

Fig. 3

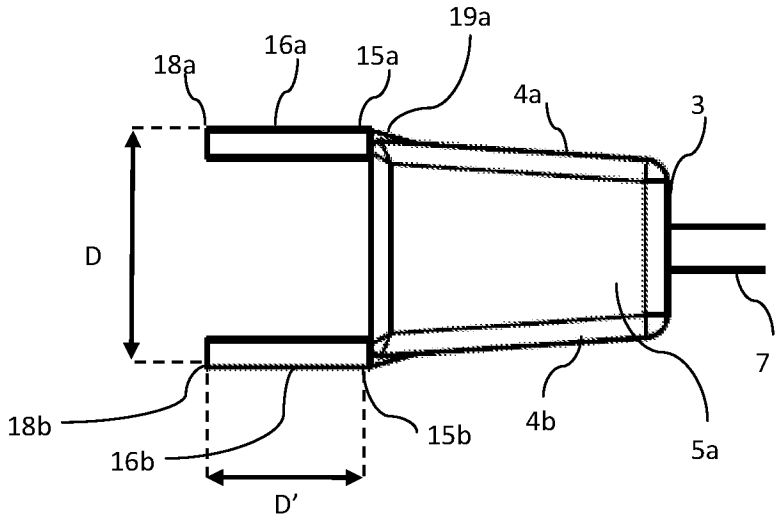
19a
16a
18a
15a
4a
3
D
7
18b
16b
15b
4b
5a
D'

Fig. 4

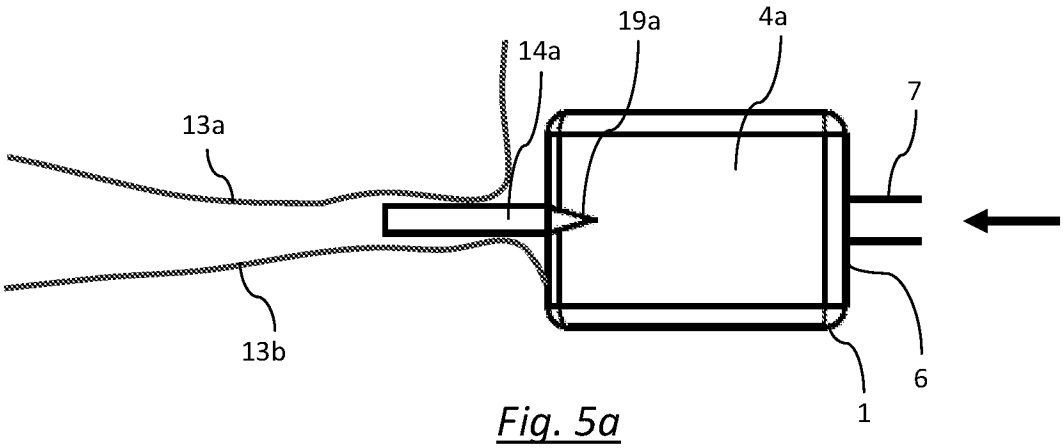

Fig. 5a

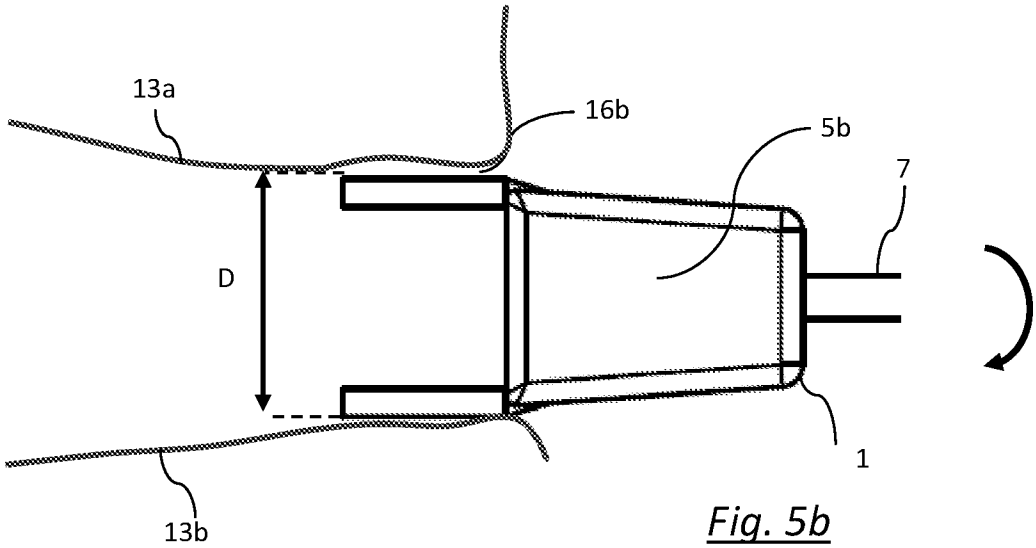

Fig. 5b

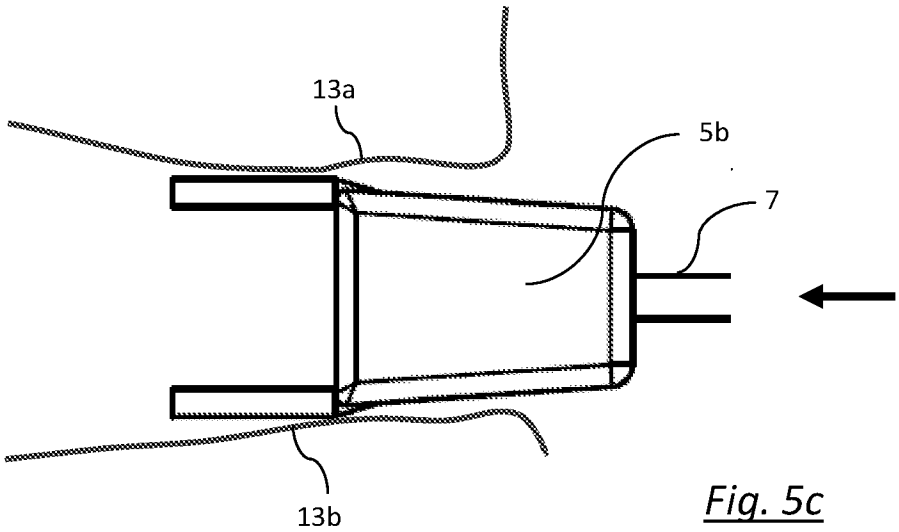

Fig. 5c

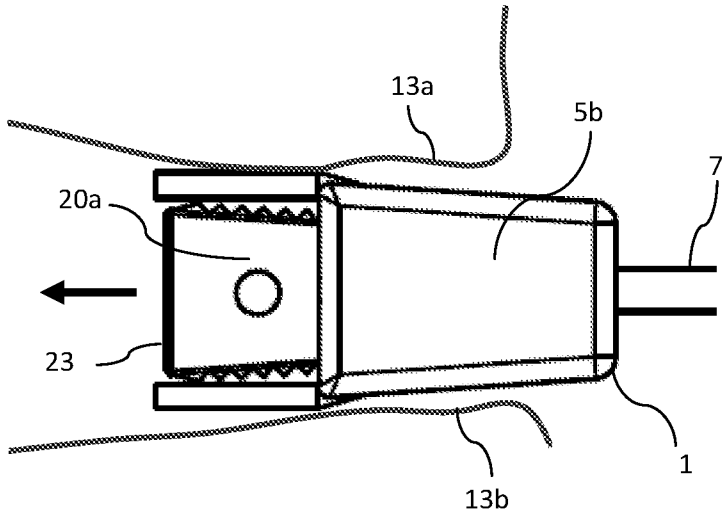

Fig. 5d

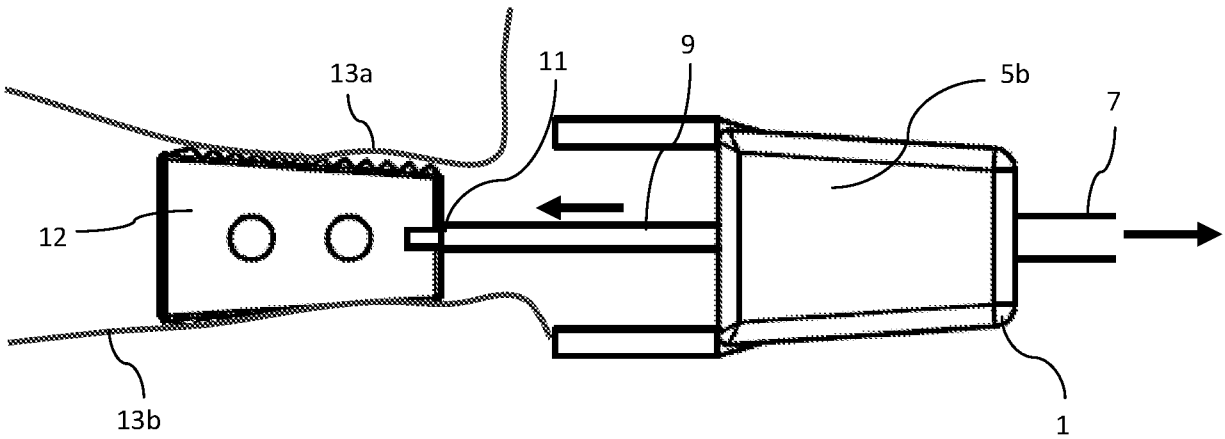

Fig. 5e

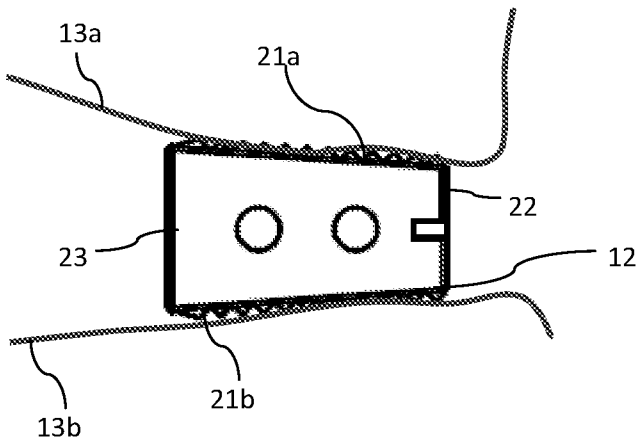

Fig. 5f

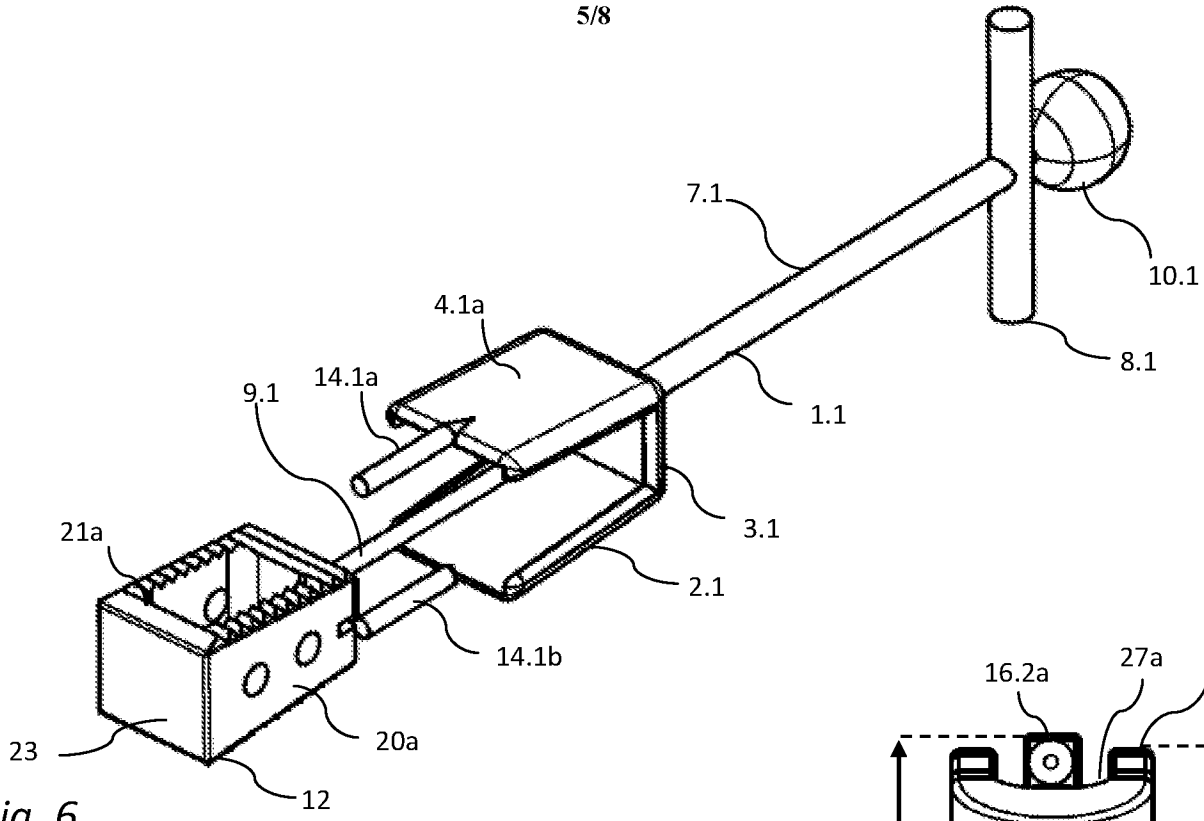

Fig. 6

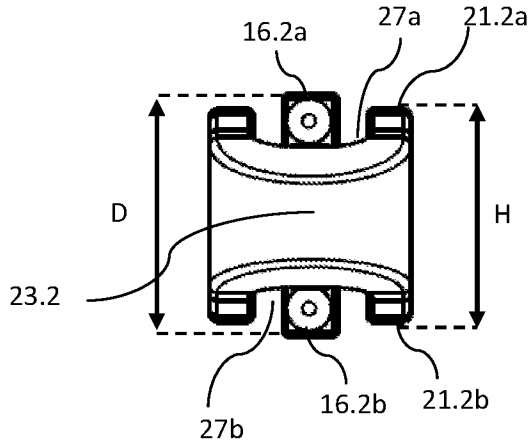

Fig. 9

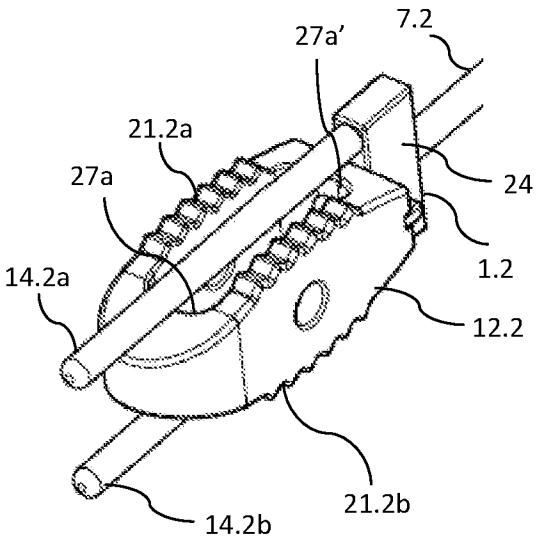

Fig. 7

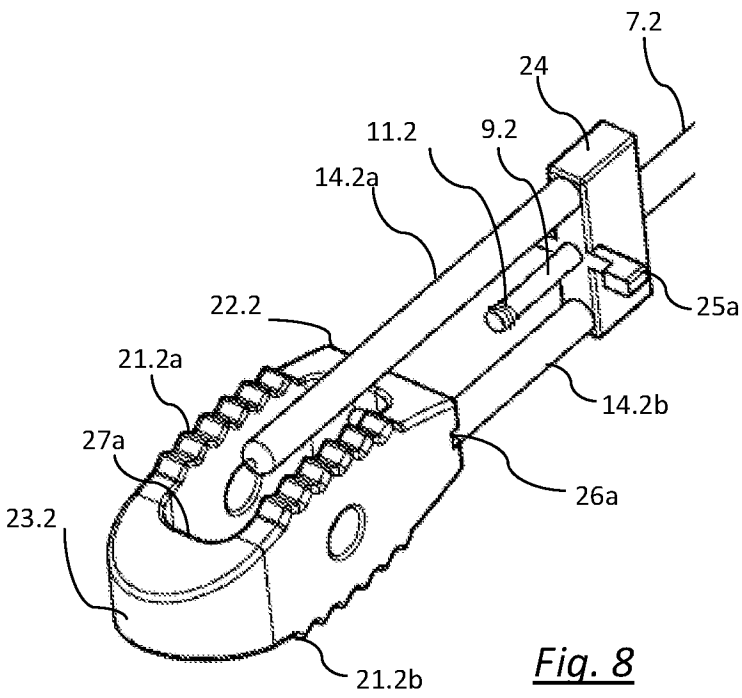

Fig. 8

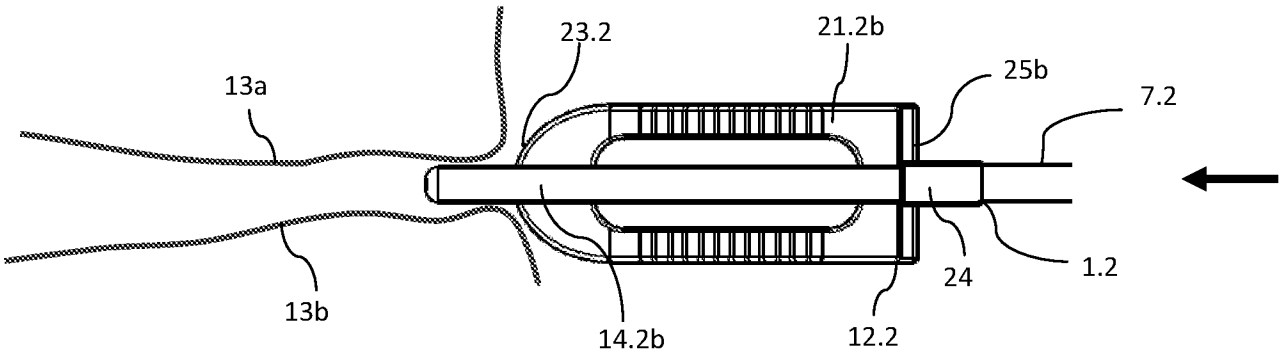

Fig. 10a

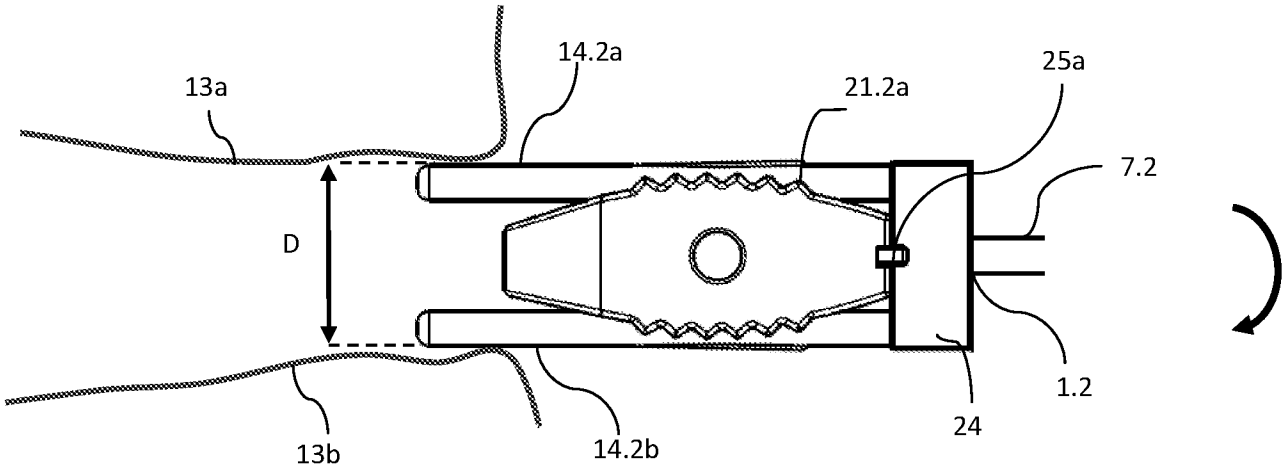

Fig. 10b

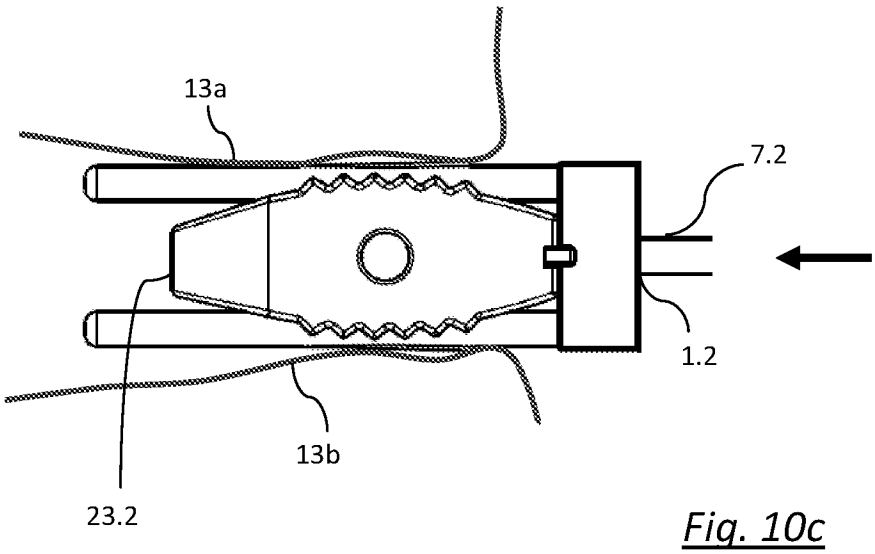

Fig. 10c

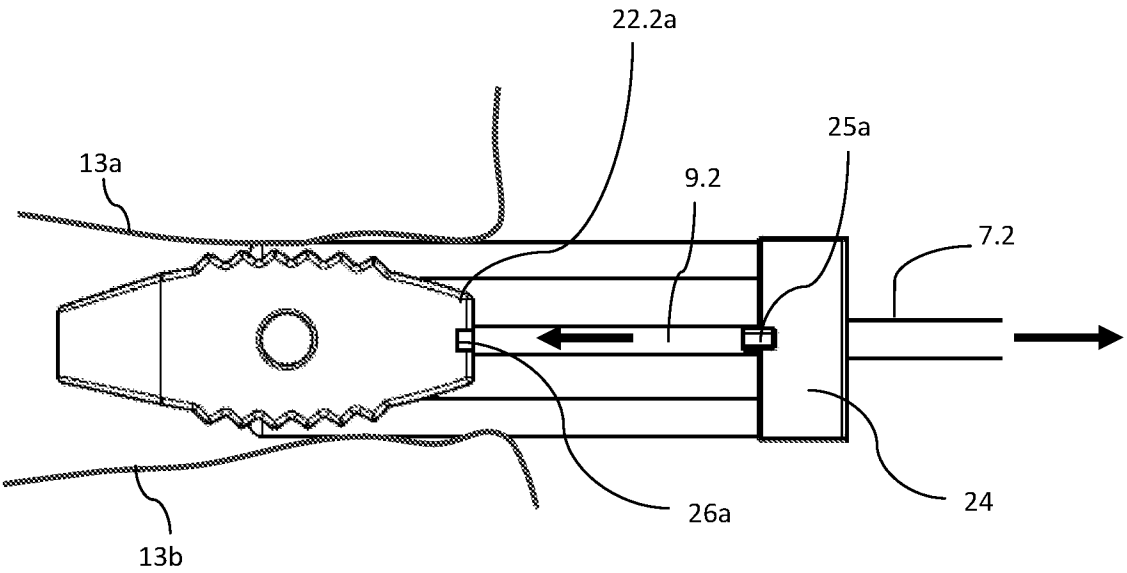

Fig. 10d

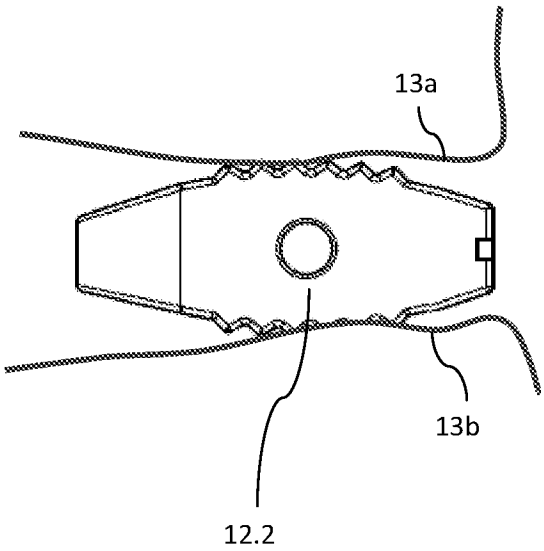

Fig. 10e

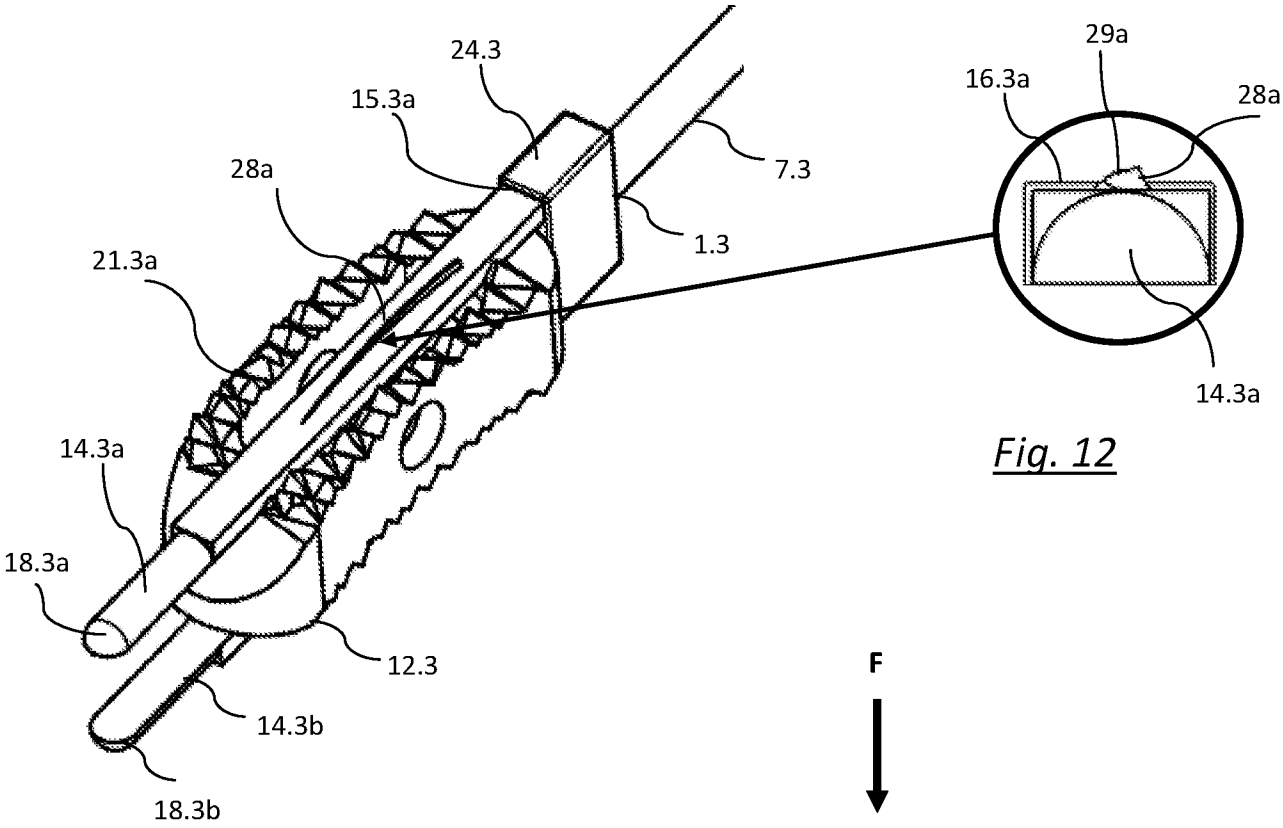

Fig. 12

Fig. 11

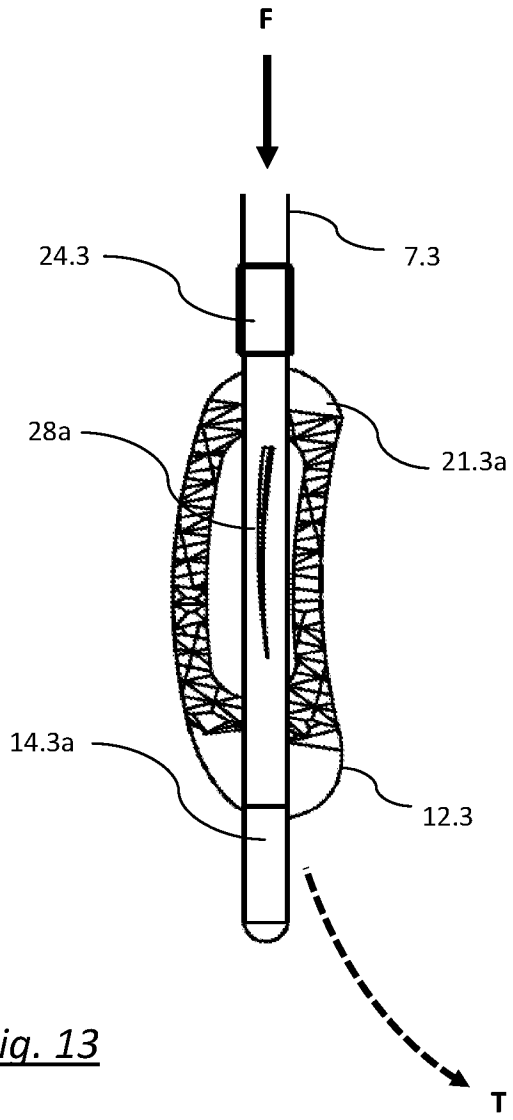

Fig. 13

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/053691

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/076557 A1 (MILLER PETER THOMAS [US]) 25 March 2010 (2010-03-25) paragraphs [0041] - [0045]; figures 7,8A,10B,10D	1-16
X	US 2008/269758 A1 (BAYNHAM BRET O [US] ET AL) 30 October 2008 (2008-10-30) paragraphs [0018] - [0027]; figures 1-3	1-16
X	US 5 893 890 A (PISHARODI MADHAVAN [US]) 13 April 1999 (1999-04-13) column 2, line 19 - line 45; figures 1-4	1-16
X	US 2006/129238 A1 (PALTZER ADAM [US]) 15 June 2006 (2006-06-15) paragraphs [0079] - [0083]; figures 3,9,11,14	1-16

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 October 2016	25/10/2016

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2016/053691

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010076557 A1	25-03-2010	NONE	
US 2008269758 A1	30-10-2008	NONE	
US 5893890 A	13-04-1999	NONE	
US 2006129238 A1	15-06-2006	NONE	