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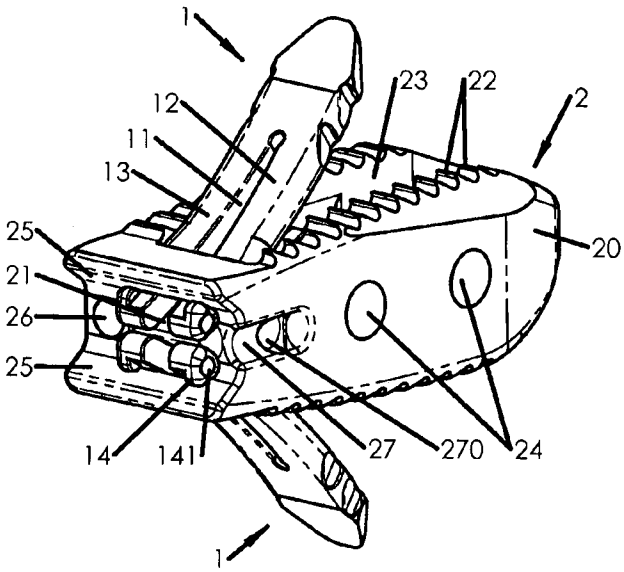
(54) Title: ANCHORING DEVICE AND SYSTEM FOR AN INTERVERTEBRAL IMPLANT, INTERVERTEBRAL IMPLANT AND IMPLANTATION INSTRUMENT

Figure 1B



(57) **Abstract**: The present invention relates to various embodiments of anchoring devices for intervertebral implants, intervertebral implant and implantation of instrumentation, sharing the characteristic to cooperate with the anchoring device (1) comprising a body comprising at least one curve, rigid plate (10) elongated along a longitudinal axis (L) so that its front end enters at least one vertebra while its rear end remains in the passage (21) of the implant (2) by pressing said implant (2) against said vertebra with at least one retaining stop (14), the device (1) being characterized in that the plate (10) comprises at least one longitudinal slot (11) separating at least one posterior portion of the plate (10) into two branches (12, 13) which at least one comprises at least one withdrawal stop (15) configured to retain the device (1) in the implant (2).

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Anchoring device and system for an intervertebral implant, intervertebral implant and implantation instrument

The present invention concerns orthopedic implants, including in particular spinal implants such as intersomatic (or interbody) cages, for example. Intersomatic cages may be implanted between two adjacent vertebrae for placement and growth of bone tissue grafts (or a substitute) in the disc space and to obtain an arthrodesis (the fusion of the two vertebrae). For example, after the cage is positioned, the intervertebral space may be filled with autologous spongy bone or suitable bone substitutes, which may also (or in the alternative) be placed in a cavity in the cage, prior to its positioning in the intervertebral space. In particular, the invention concerns intervertebral implants, implant anchors, the fixation of implants to vertebrae by anchors, and implantation of implants in the disc space by an implantation instrument.

One problem in this field concerns the stability of spinal implants in the disc space once they have been implanted, particularly when an arthrodesis is desired, for example using intersomatic cages or other implants allowing an arthrodesis (which may, for example, be deployed with auxiliary stabilizing structures such as osteosynthesis bars). For example, there is a risk that the implant will shift in the intervertebral space due to forces imposed when the patient moves, even when the implant is provided with notches or teeth on its vertebral contact surfaces. Therefore it is often necessary to affix the spinal implant to the adjacent vertebrae between which it is implanted. Osteosynthesis bars also are often provided for immobilizing the vertebrae, preferably with a lordosis, to prevent the cage from moving from the intervertebral space. Solutions are known in the prior art that provide the spinal implant with a bone anchoring device that allows solidly attaching the implant into the vertebral endplates of the vertebrae between which the implant is designed to be implanted.

Another problem in the field concerns the invasiveness and in particular the access to the intervertebral spaces (disc spaces) which is often particularly delicate due to the dimensions involved, particularly due to the presence of blood vessels and nerves in the approach to the intervertebral space. Bone anchoring devices must penetrate into the vertebrae with sufficient depth to ensure a good fixation, and must also have a small size and allow affixing the implant without endangering the surrounding blood vessels and nerves (for example, by not requiring more space in the approach to the intervertebral space than necessary for implantation of the spinal implant itself). In particular, some interbody cages are designed to be implanted with a posterior (from behind the patient) or transforaminal (through the foramen) approach (i.e., pathway). The posterior approach usually requires partial resection of the articular processes (joints) and passes between the dura and the articular processes (two cages disposed substantially parallel to the sagittal plane are generally provided). This approach thus uses a pathway which is very close to the spinal cord and requires cages of smaller size. The transforaminal approach use a pathway which is oblique to the sagittal plane and requires cages with dimensions that are reduced but with a sufficient length to be disposed obliquely or perpendicularly to the sagittal plane. The smallest possible access pathways are generally sought so as to limit the invasiveness of the surgical implantation. Moreover, in this spirit of limiting the invasiveness, one eventually tries to avoid having to install posterior material such as osteosynthesis bars (generally with pedicle screws). The use of anchoring means for attaching the cages could solve this problem if the anchoring means are reliable. The cages are usually placed between the vertebrae in an anterior position on the endplates, for allowing to impose a lordosis. Osteosynthesis bars can be used to maintain the lordosis which prevents the cage from sliding back, but anchoring means will be preferred instead if the fixation and stability of the implant obtained are reliable. Such anchoring means preferably also address the problem of limited invasiveness. Moreover, it is generally desired to be able to remove the bone anchoring

means and the implant. This requires that the anchoring means be retained in bone implant stably but that they can also be removed as easily as possible with as little as possible invasiveness.

In the prior art, notably from published applications WO 2008/149223 and WO2011/080535 filed by the assignee of the present application, which are incorporated herein by reference and to which the reader can refer to examine various problems resolved and various advantages provided by this type of solution, an anchoring device is known, suitable to be implanted solidly and with sufficient depth in the vertebral endplates to ensure that the implant is held tight against these vertebrae, but along an axis of approach for insertion generally in the plane of the intervertebral space. This type of solution typically comprises at least one anchor formed of a curved and rigid plate, arranged so as to penetrate into the endplate of a vertebra through an implant and provided with at least one stop to hold this implant against this vertebra. The rigidity of this type of anchor is an important feature to allow effective fixation, notably more effective than staples or other thin and/or relatively flexible and often fragile devices. These types of anchoring devices (or "anchors") comprising a curved plate may pose a problem of the risk of splitting the vertebra during the impaction of the anchors into the vertebra, or due to forces imposed on the implant and/or the anchor once it is implanted in the vertebra. These types of anchors also may present a risk of making a cut that is too large during the impaction of the anchors into the vertebra, allowing the possibility of undesirable play of the anchor, which makes the implant fixation weak and/or unreliable. Application WO2011/080535 aims at solving to this type of problem. It should be noted that the term impaction is used here to designate the fact that the anchoring device is driven into the vertebra. It will also be noted that the present application describes an impactor, which is a device for impaction of the anchor because it is arranged to help driving an anchoring device into a vertebra. Furthermore, another potential problem of these types of anchors having a curved plate concerns its rigidity. In some circumstances, it is important that the anchor is rigid

enough that it will not deform and/or have much play under the effects of the forces that are exerted on it, so that it will not gradually come out of the vertebra in which it is embedded. In addition, passage of the anchor through the implant and maintenance of the stability of such anchor within the implant (subject to an eventual desired play, for instance minimum play) is also an aspect that is important to ensure reliable mounting in some circumstances. The application WO2011/080535 also aims at solving this type of stability problem. These anchoring devices provide a good anchoring solution with limited invasiveness, but they still require a substantial size to ensure a good stability in some cases and thus can be improved to limit the invasiveness even more, in particular for implantations through the posterior and/or transforaminal pathways. In addition, the withdrawal of this type of anchoring device is often problematic, in particular if an easy withdrawal is desired while preserving a limited invasiveness.

Certain embodiments incorporating various technical features described in the present application therefore aim to alleviate one or more of these and/or other disadvantages of the prior art by proposing an anchoring device for intervertebral implants that can be (more) compact (with lesser encumbrance) and (more) easily implantable, especially along an axis substantially perpendicular to the axis of the spine, and that can be rigid and allow (more) reliable fixation with reduced risk of damaging the vertebrae, in particular for implantations through the posterior and/or transforaminal pathways.

This goal is attained, for example, by a device for anchoring at least one intervertebral implant into at least one vertebra, said device being intended to be inserted, from the periphery of the spine, through a passage passing through at least a portion of the implant, the device having a body comprising at least one curved and rigid plate, elongated along a longitudinal axis extending between a front end and a rear end, the plate being configured so that its front end enters at least one vertebra while its rear end remains in the passage of the implant, pressing said implant against said

vertebra thanks to at least one stop, called retaining stop, oriented not parallel to the longitudinal axis of the plate and pressing against a complementary surface of the implant, the device being characterized in that the plate comprises at least one slot, oriented substantially parallel to its longitudinal axis and separating at least a rear portion of the plate into two branches.

According to an advantageous feature, at least one of said branches comprises at least one withdrawal stop, oriented non-parallel to the longitudinal axis of the plate and configured to cooperate with a complementary surface of the implant and retain the device in the implant.

According to another advantageous feature, said slot is configured, relative to said rear portion of the plate, to allow approximation of the two branches together, when pressure is exerted thereon, for example thanks to its length and/or width and/or shape.

According to another advantageous feature, said plate defines, by its curvature, a mean arc between its two ends and the two branches are offset with respect to each other around the mean arc, such that one branch is closer to a first vertebra while the other branch is closer to a second vertebra adjacent the first vertebra, when the device is in place.

Other features and advantages are presented in the present application.

Another goal of certain embodiments incorporating various technical features described in the present application is to alleviate one or more of said (and/or other) disadvantages of the prior art by proposing an intervertebral implant that can be implanted substantially in the plane of the intervertebral space, which can be attached solidly to the vertebrae by means of an anchoring device that can be implanted substantially in the plane of the intervertebral space.

This goal is attained, for example, by an Intervertebral implant comprising a body in which at least one part, referred to as posterior, comprises at least one passage configured to accommodate at least one anchoring device according to the invention, so as to allow the passage of this rigid anchoring device without deformation despite its curvature, this passage passing through the implant from the periphery to a top or bottom surface, along an oblique rectilinear path adapted to the curvature of the anchoring device, inserted substantially in the plane of the implant, so as to orient the anchoring device in the direction of the endplate of one of the vertebrae between which the implant is intended to be implanted, characterized in that the passage comprises at least one surface complementary to at least one withdrawal stop of the anchoring device.

Other features and advantages of the implant are presented in the present application.

Another goal of certain embodiments incorporating various technical features described in the present application is to alleviate one or more of said (and/or other) disadvantages of the prior art by proposing an instrument for implanting intervertebral implants between vertebrae and implanting an anchoring device in at least one of these vertebrae, which allows implanting the implants substantially in the plane of the intervertebral space and implanting an anchoring device along an axis of approach substantially in the plane of the intervertebral space.

This goal is attained, for example, by an instrumentation for implantation, between adjacent vertebrae, of an intervertebral implant according to the invention, and for implantation, in at least one of these vertebrae, of at least one anchoring device according to the invention, called anchor, said instrumentation being characterized in that it comprises:

- At least one holder comprising a body having a width smaller than the width of said anchor and comprising at least one guiding surface having at least one radius of curvature substantially identical to at least one radius of

curvature of the plate of said anchor, to accommodate and guide the latter during the implantation;

- At least one impactor comprising a head adapted to receive the holder, with two arms of length greater than the length of the body of the holder and spaced by a distance greater than or equal to the width of the body of the holder, so as to allow to push, by sliding the impactor along the holder, the anchor held on the holder;

- At least one guide of elongate shape along a longitudinal axis extending between a first end, called gripping end, for gripping the implant, and a second end, called pushing end, the gripping end having a head provided, at its end, with at least one gripping arrangement intended to cooperate with at least one holding arrangement of the implant, the head being traversed by a longitudinal passage leading to the implant and having a shape and dimensions configured to accommodate, at least partially, the body of the holder and the arms of the impactor, the passage of the head comprising at least one surface for guiding said anchoring device, complementary to the guiding surface of the holder, so as to guide said anchoring device between these two guide surfaces of the guide and the holder, during sliding of the impactor along the holder into the head of the guide.

Other features and advantages of the instrumentation are presented in the present application.

Other features and advantages of various embodiments of the present invention will appear more clearly upon reading the description below, made in reference to the attached drawings, in which:

- Figures 1A and 1B are respectively a rear view and a perspective view of some embodiments of a cage that has two means of anchors and Figures 1C, 1D and 1E represent, respectively, for a above, a profile view and a perspective view of an anchoring device according to these embodiments;

- Figure 2A shows a perspective view of some embodiments of a cage that has two means of anchors, 2B and 2C are respectively a top view and a perspective view of a device anchor according to these embodiments, Figures 2D and 2E representing respectively a perspective view and a side view of other embodiments of the anchor;
- Figures 3A and 3B show perspective views of various embodiments of interbody cages equipped with two anchoring devices and Figures 3C, 3D, 3E and 3F are respectively a perspective view, a side view, a perspective view and a side view of various embodiments of anchoring devices;
- Figures 4A and 4C are views back to different embodiments of interbody cages equipped with two anchoring devices and 4B and 4D are perspective views of various embodiments of anchoring devices;
- Figure 5A shows a rear view of some embodiments of a cage that has two means of anchors and 5B and 5C show sectional views along the planes, respectively, 5B and 5C-5B-5C Figure 5A and Figure 5D shows a cross-section in the plane-5D 5D 5B;
- Figures 6A and 6B are respectively a side view and a perspective view of some embodiments of an anchoring device and Figures 6C and 6D show respectively a side view and a perspective view other embodiments of the anchor;
- Figures 7A and 7B are respectively a side view and a perspective view of some embodiments of a holder for an anchoring device and Figure 7C shows a side view of a holder with a device anchor according to some embodiments;
- Figures 8A and 8B are perspective views, respectively, exploded and assembled, certain embodiments of instrumentation for implantation of interbody cages and anchoring devices, equipped with one embodiment of the cage, holder for anchoring device and an anchoring device, Figure 8C representing an enlargement of the portion 8C of FIG 8A;

- Figures 9A and 9B show respectively a top view and a sectional view along plane 9B-9B of Figure 9A, an end to some embodiments of instrumentation for implantation of interbody cages and anchoring devices, provided with an embodiment of cage, a holder for anchoring device and an anchoring device.

Various embodiments of the invention will now be described in reference to the figures of the present application. The invention simultaneously concerns three groups of objects:

- anchoring devices (1) (or "anchors"), and/or anchoring systems comprising plural anchoring devices (1) that may be identical, different, or complementary;

- intervertebral implants (2) configured for receiving one or more of such anchoring devices (1) or systems, including but not limited to interbody cages configured for an implantation through the posterior or transforaminal pathway; and

- instruments (3, 4, 5) for implanting implants (2) between the vertebrae and fixing implants with one or more anchoring devices (1) or anchoring systems.

Each group of objects may comprise various possible embodiments, relating to a given object. Each object comprises various elements (generally constituent of the object) characterized by at least one technical feature. Each object (of a given group) concerned by at least one technical feature might be associated with at least one other object (of the same or another group), for example with respect to at least one complementary technical feature, such that the groups of objects share a common inventive concept. The invention may thus also concern an ensemble comprising at least two of these objects, as well as each object individually. The elements (for example a plate, a stop, a slit, a chamfer or bevel, etc.) and their technical features (for example a curvature, an orientation, a length, width, height, etc.) are described in more detail hereafter in the present application. At least one technical feature corresponding to an element of a given object solves at

least one technical problem, in particular among those mentioned in the preamble of the present application. The present application thus describes various embodiments and configurations for each object or group of objects, by specifying at least one technical feature of at least one element. It will be understood from reading the present application that the various technical features of each element described in at least one embodiment or configuration may be isolated from other technical features of the object concerned by (or the objects concerned by and/or associated with) said embodiment or configuration (and thus concerning the same or another element) and/or may be combined with any other technical feature described herein, in various embodiments or configurations, unless explicitly stated otherwise, or unless these features are incompatible and/or their combination is not functional, in particular because the structural adaptations that may be required by such isolation or combination of features are directly derivable from the appreciation of the functional considerations provided by the present disclosure. Similarly, although some technical features are discussed herein in reference to the anchor device, they may be incorporated in various embodiments of the anchoring systems. Generally speaking, the specific technical feature(s) concerning a given element shouldn't be considered as exclusive from those concerning another element, nor from other technical features concerning the same element, except if it clearly appears that the combination of these technical features is impossible or nonfunctional. Although the present application details various embodiments or configurations of the invention (including preferred embodiments), its spirit and scope shouldn't be restricted to the examples given.

Various embodiments of anchoring devices (1) in accordance with the present invention are usable with intervertebral implants (2), such as, for example, intersomatic cages or intervertebral disc prostheses. Intervertebral implants are designed to be implanted between two adjacent vertebrae of the vertebral column (spine) or to provide a junction between two vertebrae, at their periphery in the case of osteosynthesis plates (which can be used alone

or in combination with an intersomatic cage). Anchoring device (1) is designed to be anchored in one of the vertebrae so as to attach the implant to this vertebra. Various embodiments of anchoring devices (1) according to the invention comprise at least one curved and rigid plate, configured for penetration into a vertebra through an implant and comprising at least one stop to hold this implant against this vertebra. The technical features of "curvature" and "rigidity" concerning the "plate" element of the "anchor" object are described in detail below. Device (1) for anchoring intervertebral implant (2) in the vertebrae will also be referred to in the present application by the term "anchor" (1), without introducing any limitation whatsoever. This type of anchor has been described in publications WO 2008/149223 and WO2011/080535 of applications filed by the assignee of the present application, herein incorporated by reference in their entirety, but the present application concerns improvements in various structures and methods that may be used in various deployments to reduce the invasiveness of the surgical procedures necessary for the implantation of the implant and anchor. In various embodiments, anchor (1) comprises a body including at least one rigid curved plate (10) elongated along a longitudinal axis (L, Figures 1C and 2B). This longitudinal axis (L) of anchor (1) extends between a first end, which will be referred to as the anterior end, designed to penetrate into a vertebra, and a second end, which will be referred to as the posterior end. Note that the designations of the "posterior" and "anterior" ends of anchor (1), implant (2), and instrument (3, 4, 5) are used in the present application in reference to the direction in which anchor (1) will be inserted. Thus for anchor (1), the first end (referred to as the anterior end) is the one designed to be inserted first and designed to penetrate into a vertebra to affix an implant. Concerning the implant, its wall or end denoted as "posterior" is the one comprising an opening of a passage for the insertion of the anchor, whether this wall is really posterior to the implant or not during deployment. In the case of the interbody cages (2) described in the present application, this posterior end is generally disposed indeed at the rear of the patient since these cages are essentially intended for an implantation through the posterior

or transforaminal pathway. Concerning the instrument, the anterior end is the one intended to be abutted on (or at least the closest to) the implant during implantation. Certain embodiments of implants (2), including some described in detail in this disclosure and concerning an intersomatic cage, are made for transforaminal insertion into the disc space, and accordingly the posterior end will be positioned on a lateral and rear side of the vertebrae, while the anterior end will be positioned near the front and opposite lateral slide. Nevertheless, the terms "anterior" and "posterior" will still be used since they are easier to understand from the point of view of implantation and may be commonly and conveniently used with reference to anchor (1), implant (2), and instrument (3, 4, 5) regardless of the implantation approach (implantation path) chosen. Accordingly, the terms “anterior” and posterior” are not intended to refer simply with respect to a patient or an anatomical feature of a patient. Furthermore, the terms “height” and “thickness” are used here to designate the dimensions of elements according to an orientation parallel to the axis of the spine (when implanted therein) and the terms “superior” and “inferior” are generally also defined according to this orientation (vertical when the patient is standing upright). Furthermore, the terms “width” and “length” here designate dimensions along a plane perpendicular to the axis of the spine (a transverse plane), with the width being generally in the medio-lateral direction while the length is in the anteroposterior direction. It will be noted as well that reference is made herein to a longitudinal axis (L) between these two ends and that this longitudinal axis (L) therefore corresponds to a anteroposterior axis of anchor (1) but that this definition is here extended to the implant (2) and instrument (3, 4, 5), still in reference to the direction of insertion of the anchor (1). It will also be noted that the term “substantially” is used several times in the present description, in particular concerning a technical feature such as an orientation or a direction, so as to indicate that the feature concerned may in fact be slightly different and not exactly as stated (for example, the expression “substantially perpendicular” should be interpreted as “at least approximately perpendicular” because it may be possible to choose an orientation which is not exactly perpendicular for

allowing however to serve substantially the same function). Furthermore, the term "substantially" used in the present application may also be interpreted as defining that the technical feature may "in general" ("generally"), and often "preferably", as stated, but that other embodiments or configurations may be within the scope of the present invention.

In various embodiments, a bone anchoring device (1) for an intervertebral implant (2) is intended to be inserted, from the periphery of the spine, through a passage (21) passing through at least a portion of the implant (2). The device (1) in some embodiments comprises a body comprising at least one curved, rigid plate (10) elongated along a longitudinal axis (L) extending between a front end and a rear end. The anchoring device (1) (i.e., an anchor) may generally be formed by the plate (10), without comprising other structures extending beyond the plate and the elements that the latter comprises. Thus, the anchor may be constituted by at least one plate or may consist of at least one plate in some embodiments. The plate (10) in some embodiments is configured so that its front end enters at least one vertebra while its rear end remains in the passage (21) of the implant (2) or against the edge of the implant (2), thus pressing said implant (2) against said vertebra with at least one stop (e.g., retaining stops 14, 140) oriented angularly (i.e., not parallel) to the longitudinal axis (L) of the plate (10) and pressing against a complementary surface (25) of the implant (2) (e.g., on an edge or in the passage (21) of the implant). The plate (10) of the anchor (1) of various embodiments generally comprises at least one slot, (slit, gap, cutout, trim, etc.) (11), oriented substantially parallel to its longitudinal axis (L) and separating at least a rear portion of the plate (10) into two branches (12, 13) or legs or arms (the term being non limitative). Thus, an anchor is obtained in some embodiments which can remain rigid, at least in some directions, but the slot allows the two branches (12, 13) to be moved bringing the two branches (12, 13) closer together. Such movement can be obtained by using a material for the branches (12, 13) having suitable deformation characteristics (e.g., compromise between rigidity and elasticity), or by use of

structures of the plate such as a hinge, for example a specific region of each branch (12, 13) having suitable deformation characteristics. Generally, the length and/or width and/or shape of said slot (11) is (or are) configured to allow approximation of the two branches (12, 13) from each other, when a pressure is exerted thereon. Preferably, the plate will generally be metallic (biocompatible) to provide sufficient rigidity while allowing the elastic effect aimed by the slot. However, other materials are possible, such as PEEK or other materials suitable for implantation in the body and for the characteristics necessary for the implementation of the present invention.

Generally, the anchor (1) comprises, preferably on at least one of these branches (12, 13), at least one stop configured for retaining or locking the anchor (1) in the implant (2). Such retaining or locking of the anchor (1) in the implant (2) may be obtained in various embodiments by different types of latch, lock, stop, etc. In various advantageous embodiments, this retaining or locking is obtained by at least one withdrawal stop (15, 150), which can be oriented at an angle (i.e., not parallel) to the longitudinal axis (L) of the plate (10) and configured to cooperate with a complementary surface of the implant (2) and to retain the anchor (1) in the implant (2). Some embodiments of such withdrawal stop (15, 150) take advantage of the slot (11), as detailed below. In some embodiments, at least one withdrawal stop (15, 150) protrudes or projects from at least one of the branches (12, 13) of the device (1), on the side of the branch opposite the side adjacent to the slot (11). In some embodiments, at least one withdrawal stop (15) or at least one of the withdrawal stops (15, 150), disposed on one branch (12, 13) on the side opposite the slot, comprises at least one beveled surface, oriented generally facing the anterior end of the device (1), so as to form a slope facilitating insertion of the device (1) in the implant (2) and allowing the branches (12, 13) of the device (1) to be gradually brought closer to each other by the contact of this beveled or tapered surface with a wall of the passage (21) in the implant (2). Thus, with at least one withdrawal stop (e.g., 15, 150) on at least one of the branches (12, 13), the anchor will be retained from

spontaneous and unexpected extraction from the implant. In some embodiments with a beveled or tapered surface, the slot (11) can allow the branches to squeeze together when inserting the anchor into the implant, with the branches restoring to their rest configuration when the device reaches a position within the implant where at least one withdrawal stop cooperates with a complementary surface of the implant, such as a housing in the passage receiving a protruding withdrawal stop for example (note that these stops are preferably positioned to be within the passage or near the passage, rather than the outside of the passage, after its outlet, where this spontaneous deployment of the withdrawal stop may be impeded by osseous tissue). In addition, the slit or slot facilitates voluntary withdrawal of the anchor by allowing the two branches to be brought closer to each other and, therefore, the withdrawal stop (15, 150) to disengage from its complementary locking surface of the implant. This arrangement has the advantage that the withdrawal stop (15, 150) may be smaller than alternative arrangements of flexible tabs or other structures, and may avoid the use of highly flexible structures that can be fragile. Moreover, locking configurations can be deployed that do not require too much room around the anchor to permit its removal (e.g., by disengaging the withdrawal stops). Indeed, these types of arrangements may avoid the need for channels in the implant (2) to access the withdrawal stops (15, 150) of the anchor (1) and therefore may permit reducing the size of the implant (2) (in addition to avoiding weakening that may result from using additional channels). It is therefore understood that these advantages of such arrangements generally address the problem of stability of fixation of the anchor and, therefore of the implant, and also address the problem of invasiveness due to reduced dimensional constraints.

In some embodiments, the anchor (1) comprises at least one grip resource (141) on at least one of the branches (12, 13), configured to engage a tool for removing the anchoring device by squeezing the two branches (12, 13) closer to each other to disengage one or more withdrawal stops (15, 150). Engagement of a grip resource with a tool allows, while bringing the

branches closer to each other for releasing the withdrawal stop(s) (15, 150), to pull the anchor and extract it from the implant (for example by pulling on the grip resource). A grip resource can thus enhance removal of the device (1) made possible by the slot (11). Such a grip resource may be formed simply by a housing in the rear end of the anchor, such as at a retaining stop as shown for example in FIGS 1D and 1E. Other grip resources may be used, however, such as a lug or tab (141) projecting from the anchor or a portion of a retaining stop which is arranged to not be in contact with the implant and thus provide a housing for the insertion of a tool for pulling on the anchor. For example, Figures 2B and 2C show an anchor having a projecting tab (141) on the side edges of each branch or leg (12, 13) of the anchor. As shown for example in Figure 2A, this tab (141) does not form a retaining stop as it is not in contact with the surface (25) around the passage (21) of the implant, but another lug or tab (14) is forming a retaining stop. Note that, in other embodiments, such a tab (141) forming a grip resource can also form a retaining stop if it has a contact surface with the surface (25) around the passage (21) of the implant (while maintaining a surface without contact with the implant and substantially facing the implant to allow pulling on the anchor and thus form a grip resource).

In some embodiments, the curvature of the plate (10) extends along the thickness of the plate, that is to say that the curvature of the plate (10) defines a concave face (with the inside of the bend extending along the upper or lower face of the plate) and a convex face (with the outside of the bend extending along the opposite face of the plate) of the anchor (1), with the two sides (or edges) side of the anchor (1) joining the concave face and the convex face.

In some embodiments, at least one retaining stop (14, 140) comprises at least one stop surface oriented substantially facing the front end, intended to cooperate with at least one stop surface (25) on the implant (2) that the device (1) is intended to fix, so as to retain and press the implant (2) against

the vertebra wherein the device (1) is designed to be anchored. For example, the retaining stop (14, 140) may comprise at least one projecting tab on at least one side and/or at least one edge of the plate (10). Note that the orientations of stops are often defined in this application as "angular to" and/or "not parallel to" the longitudinal axes as it is possible to provide for different orientations and because the least functional orientation would be parallel to the longitudinal axis as it would not form an abutment sufficiently effective to restrain movement along the longitudinal axis of the anchor. All other orientations are thus possible but it is generally preferred an orientation approximately perpendicular to the longitudinal axis for greater efficiency. In some embodiments, a single stop (14 or 140) for retaining may be provided, for example at the rear end of one branch (12, 13) of the plate (10). The retaining stops (14, 140) may be disposed anywhere on the plate in a position that results in contact with a surface (not parallel to the longitudinal axis of the anchor) of the implant (2) so as to press the implant (2) against the vertebra (i.e., anywhere along passage (21) before its outlet on the upper or lower surface of the implant). Figures 1A, 1B, 1C, 1D and 1E show illustrative and non-restrictive examples in which each branch has a retaining stop (14). Preferably, at least one stop is disposed at the rear end of the anchor so as to avoid the need for providing a complementary surface for receiving the stop that is within the passage of the implant. These stops can be formed, for example, by lugs, tabs, studs or other forms of projections extending from a face or edge of the plate. In these examples of Figures 1, these stops are formed by a small projecting lug (14) on the concave face of the anchor, but it could be the convex face although the concave face is generally preferred so as not to hinder the impaction of a second anchor and/or so as to leave room for the stops of a second anchor fixing the implant to the other vertebra. In addition, provision may be made for at least one retaining stop (140) on at least one (or more) lateral edge(s) of the anchor rather than on one (or more) face(s). Both layouts or arrangements can also be provided at the same time. For example, in FIGS 2B and 2C, a first type of retaining stop (14) is arranged on one side of the anchor (on each of two

branches in these non-limiting examples) and a second type of retaining stop (140) is obtained by a structure projecting on at least one lateral edge of the plate (on a side edge of each of the two branches in these non-limiting examples).

In some embodiments, illustrative and not limiting examples of which are shown in Figures 6A, 6B, 6C and 6D, a slot (11) separates the plate (10) in its thickness. This produces a slotted plate (10) with a branch (12) on the concave face and a branch (13) on the convex face. In some of these embodiments, one of the two branches (12, 13) comprises at least one withdrawal stop (15, 150) while in other embodiments each of the two branches may comprise at least one withdrawal stop (15). In some embodiments having a withdrawal stop (15) on a single face, it is the branch (13) of the convex face which comprises at least one withdrawal stop (15), such as shown in FIGS 6A and 6B, while in other embodiments it is the branch (12) of the concave face which comprises at least one withdrawal stop (15), such as shown in Figures 6C and 6D.

In some embodiments, at least one slot (11) separates a plate (10) in its width. This gives a branch (12, 13) on each of two lateral faces of the plate (10). In some embodiments, there is provided a combination of these two possible orientations of the slot. In such embodiments, a longitudinal slot separates the plate in its width, but not over its entire thickness and a longitudinal slot separates a rear portion of the plate in its thickness. One thus obtains a portion of the anchor split in its width where one plate (19) stiffens the rear of the anchor, for example as shown in Figures 2D and 2E. Preferably, in these embodiments with at least one slot splitting the plate in its width, each of the two branches comprises at least one withdrawal stop (15, 150), such as shown in most of the figures showing anchors with two lateral branches. In some embodiments, each branch may comprise several withdrawal stops (15, 150), preferably with at least one beveled surface on the one (or those) which is (are) the closest to the front end. For example,

Figures 2B and 2C show a non-limiting illustrative example of such an anchor that includes a first withdrawal stop (15) and a second withdrawal stop (150) disposed a little more posterior than the first. The implant then preferably has a second surface complementary to this second stop and oriented to prevent the backing out of the anchor from the implant (i.e., with an orientation angular (not parallel) to the longitudinal axis of the anchor and preferably perpendicular), for example as shown in figure 5D. Note that the second withdrawal stop (150) may be obtained by a structure (a bulge for example) which may also form a retaining stop (140), as defined in this application by reference to the retaining stops (14, 140) since its anterior surface (according to naming convention defined in the this application) has a surface angular (not parallel) to the longitudinal axis and located on the side towards the front end (preferably substantially facing the front end) of the plate and adapted to oppose the advance of the anchor in the implant if it has a complementary surface to receive or abut it, for example as shown in figure 5D. This second withdrawal stop (150), cooperating with such a complementary surface of the implant is able to hold the implant in the same way (achieve substantially the same function) as the retaining stops (14, 140) defined in this application. However, some embodiments of the retaining stops (14, 140) defined in this application are disposed closer to the posterior end of the anchor and thus have the advantage of providing a retaining stop without the need for complementary surface within the passage (21) of the implant (2) (i.e., without the need for housing along the walls of the passage to allow accommodation of a bearing surface for the stop, which is relatively difficult to manufacture). Also, some embodiments of the retaining stops (14, 140) defined in this application are disposed on the face rather than the edge of the anchor and thus have the advantage of providing a retaining stop (14) which stops the anchor even though its branches are close to each other. It is therefore generally preferred to provide at least one retaining stop (14, 140) for the anchor, although it may contain several withdrawal stops (15, 150) with at least one (150) being capable of forming a retaining stop by the fact that it comprises an abutment surface towards the front end. Note that

providing retaining stops (14) on the concave and/or convex face of the anchor split in its width (or conversely a stop on an edge of an anchor split in its thickness) allow to stop the anchor even if its branches (12, 13) are moved towards one another, which would not necessarily be the case for withdrawal stops (140) on the side edges that are eventually, depending on their length, capable of forming a retaining stop only if the branches are in the rest position, that is to say at a distance from each other (and pose a risk that the anchor penetrates too far into the implant and is stuck with its branches close to each other and their side stops inside the passage). However, the implantation generally uses an instrumentation preventing the anchor from penetrating too deep in the implant (and preventing the retaining stop to be inserted in the passage in various configurations). Indeed, the impactor described hereafter is generally configured with a stop surface preventing from pushing the anchor too deep and adjusted or adjustable as a function of the shape and/or dimensions of the anchor and/or implant. Furthermore, preference may also be for the lateral retaining stops (140) because they may reduce the space needed above and below the anchors unlike the stops (14) arranged on at least one face (concave and/or convex), in particular because it is sometimes possible to provide lateral retaining stops (140) which are long enough to function even when the branches are moved towards each other (to prevent the anchor from penetrating too far into the implant). In other configurations, for example those of the interbody cages intended for implantation through the posterior or transforaminal pathway, the approach imposes constraints on the width of the implant and therefore the retaining stops (e.g. 14, 140) are preferably protruding from the faces (convex and/or concave) of the anchor, so as not to require enlarging the width, in particular when at least one grip resource (26, 27) is provided near the passage (in the vicinity or on the lateral faces of the implant). Depending on the configuration and direction in which congestion is the most troublesome, it is possible to choose the most suitable locations and/or shapes stops to minimize the size (in height and/or in width) of the elements

(components) and the objects (and thus the invasiveness), while ensuring a reliable device.

Using at least one plate (10) allows anchor (1) to ensure a good hold, at least in a direction substantially perpendicular to the plate, since the width of the plate offers a surface opposing movement of the anchor and thus of the implant (perpendicularly to this surface) in the bone tissue in which it is implanted. It will be noted that when the plate is curved, this hold is created along at least one direction substantially radial to the radius of curvature of the plate. In fact, various embodiments of the present invention, like various embodiments of the one described in the applications cited above, have the advantage of a having curvature that allows it to be implanted in the vertebral endplate of a vertebra along an approach axis substantially perpendicular to the axis of the spine at the level of the vertebrae between which the implant is implanted (or in the plane of the intervertebral space), which may facilitate implantation and allow avoiding some of the disadvantages linked to the encumbrance (dimensions) of the approach to the vertebrae by minimizing the invasiveness of the surgical approach to the intervertebral space needed to implant the anchor. Thus, the curved plate (10) of the body preferably describes at least one circular or elliptic arc having dimensions and at least one radius of curvature arranged such that the anchoring device (1) can be implanted in an endplate along an approach axis forming an angle of approximately 90° with the axis of the spine, by presenting the anchor's longitudinal axis (L) substantially in the plane of the intervertebral space. It is understood that various embodiments of the anchor are designed to penetrate from the periphery of the disc space into the vertebrae, preferably into the inferior vertebral endplate of the upper vertebra or into the superior vertebral endplate of the lower vertebra, in particular in the case of implants such as intersomatic cages or intervertebral disc prosthesis. Also, other embodiments of the anchor may be configured for implantation preferably into the periphery of the vertebral body near the intervertebral space, especially in the case of intervertebral implants such as osteosynthesis

plates. When an anchor is intended for implantation into the vertebral plate, for example through implants such as intersomatic cages or intervertebral disc prosthesis, the curvature of the anchor is preferably configured so that, once embedded in a vertebra, the axis of the spine is substantially tangential to a substantial part of its anterior extremity, or at least that this part of the anterior end forms a small (or slight) angle with the vertical axis of the spine.

In various embodiments the anchor advantageously has the shape of a plate which may be relatively thin, facilitating the penetration of anchor (1) into the bone tissue. This thinness of plate (10) may pose a problem of stability of anchor (1) in the vertebra, to the extent that the plate might form a sort of blade that can split the vertebra in a direction along the width of the plate (transversely to longitudinal axis (L) of various embodiments), notably during its impaction in the vertebra, or later, due to the significant stress applied thereon when the patient moves, for example. Furthermore, this thinness may diminish the rigidity of the plate. In some applications rigidity may be an important feature for effective fixation, resulting in embodiments particularly more effective than staples or other thin and/or relatively flexible, often fragile, devices, which do not allow a good hold due to their flexibility and/or thinness and/or their fragility. Therefore, rigid anchors are preferred for many embodiments (curved anchors being also preferred, but for facilitating the approach to vertebrae), instead of deformable anchors. Rigid anchors penetrate into the vertebrae through a passage (21) crossing at least a part of the implant without being deformed in this passage (21). For these rigid embodiments, inner walls of this passage (21) in the implant preferably have shapes and dimensions that allow the anchor to pass: either by a curvature complementary to that of the anchor, or by an uncurved (straight) shape with a height slightly greater than that of the anchor to permit its passage despite its curvature and rigidity (thus avoiding machining a curved passage in the implant, which may be complex and costly).

Various embodiments of the present invention resolve problems of stability and rigidity of anchor (1) by using at least one longitudinal rib over at

least one part of at least one of the faces of the body of anchor (1). This longitudinal rib preferably is orientated in the direction of the length of plate (10), substantially parallel to longitudinal axis (L) in various embodiments, for example such as described in application WO2011/080535 owned by the assignee of the present application. However, as the anchor is provided with a slot (11) on at least a rear portion, the rib will be preferably on a portion of the anchor which is not split, thus on a front portion of the anchor.

Moreover, it is generally preferred to solve, in various embodiments of the present invention, any eventual stability problems by means, resources, arrangements or configurations other than a rib, because a rib generally will impose size constraints on the implant (which typically will have a groove to accommodate the rib), while many of the present embodiments generally aim to minimize the invasiveness and thus the size of elements (items) and objects of the invention. Some of these other configurations to solve the problem of potential instability of the anchor may for example include a bone growth through the anchor to stabilize it (although it requires time for growth to take place) and/or provide an anchor of sufficient thickness and with lateral edges soft enough (i.e., not sharp) to avoid splitting the vertebrae. In addition, using a sufficiently rigid material may provide good stability despite the absence of rib and the presence of a slot, while maintaining a size which still limits the invasiveness. Indeed, using appropriate configurations of a slot can allow making the posterior portion of the anchor flexible enough for the release of the withdrawal stops, but allow keeping the anchor very rigid overall, because the stops can be configured very small in size relative to the rest of the anchor. In addition, the compromise between the flexibility of the two branches and the overall rigidity of the anchor may be controlled with appropriate configurations of the shapes and dimensions of the slot and/or the branches.

In some embodiments, the plate (10) defines, by its curvature, an average arc (AM, Figures 3D and 3E) between its front and rear ends, and has two branches or legs (12, 13) which are offset with respect to each other

on opposite sides of the average arc (AM) or mean arc (AM). In fact, the two branches are preferably offset with respect to each other around the mean arc, such that one branch is closer to a first vertebra while the other branch is closer to a second vertebra adjacent the first vertebra, when the device is in place. Figures 3A, 3B, 3C, 3D, 3E and 3F show illustrative and not limiting examples of such a configuration of the branches of the anchors (and associated examples of embodiments of implants in Figures 3A and 3B). In these embodiments, the two arms are offset and can be brought closer to each other so that one comes one above the other. This arrangement reduces the width of the slot required for the approximation of the branches and may limit the overall width of the anchor. On the other hand, this arrangement, by providing branches which are offset, provides a larger contact surface of the anchor, laterally to the plate, with the bone of the vertebra, and therefore a greater resistance allowing to reduce the risk of cutting the bone by a lateral movement of the anchor in the bone. Thus, such plate (10) with offset branches or legs (12, 13) may be configured for stabilizing the anchoring device in the vertebrae, independently of any configuration for allowing approximation of the branches (i.e., may the slot be configured for approximation of the branches or not). Indeed, such offset branches are advantageous as such for the stability of the anchoring device. However, anchoring devices without approximation of their offset branches may comprise another type of removal mechanism, for example such as flexible tabs, for example as described in application WO2011080535, so as to enable a locking of the plate within the implant, while preserving the possibility of removing the anchoring device from the implant. This type of arrangement of anchor (1) with offset branches usually requires adapting the shape and dimensions of the passage (21) in the implant, as detailed below. Indeed, such anchors with offset branches often require that the passage is enlarged. However, in some embodiments, which figures 3A, 3B, 3C, 3D, 3E and 3F illustrate non-limiting examples, the anchor (1) is arranged so that it is not necessary to enlarge passage (21) of the implant (2) too much to allow the insertion of the anchor (1). Indeed, in these embodiments, the anterior

portion of the anchor which is not split comprises two portions, each in the extension of one of the branches, which are also offset with respect to each other (in the same direction as the branches). This offset provides the anterior part of the anchor (1) a form adapted to the shape of the passage (21) of the implant (2) which is necessary to retain the posterior part of the anchor (1). Thus, the passage (21) may be adjusted to the posterior part of the anchor (1) and the front part adapted to the passage (21). Note that the passage preferably still has a central portion adapted to pass the part forming the offset between the two anterior sections. Other simpler solutions are possible even if they do not usually allow obtaining a passage as well adjusted (and retaining the anchor as best as possible). For example, it is possible to thin-down an anterior portion of the anchor for it to pass more easily through the passage without enlarging the passage too much, but the passage should then still contain a portion adapted to pass an anterior portion of the anchor shaped as a plate substantially tangent (or parallel) to the average arc (AM), while the branches are offset with respect to this average arc. Note that the offset of the branches and of the anterior portions is more important toward their posterior end than toward the anterior end. Therefore, in such embodiments, at least one of the branches preferably comprises, on the edge adjacent the slot, preferably at least near the front end of the slot, at least one bevel surface or chamfer to avoid an eventual friction of the two branches when they are brought closer together. Alternatively or additionally, it is possible to widen the slot at its front end to prevent contact between the branches.

In some embodiments, the two branches or arms (12, 13) have shapes that are complementary to one another, configured so that at least one rear portion of one of the branches (e.g., 12, 13) can cover at least one rear portion of another of the branches (e.g., 12, 13), at least partially, without increasing the total thickness of the device, when the two branches are brought close to each other. Figures 4A and 4B show illustrative and not limiting examples of such a configuration of the branches of the anchors (and associated exemplary embodiments of implants in Figure 4A). This

arrangement reduces the width of the slot required for the approximation of the branches and may limit the overall width of the anchor. In some embodiments the branches may actually at least partially overlap at rest, which allows to reduce the overall width of the anchor. Furthermore, some of these arrangement, by providing for branches that are not symmetrical but complementary, may provide for bone ingrowth, for example thanks to housing provided by the complementarity of shape of the branches, and which may quickly provide a way to limit the risk of cutting the bone by a lateral displacement of the anchor in the bone.

In some embodiments, at least one slot (11) may be formed in the thickness of the plate (10) but not in a plane perpendicular to the width of the plate (10). In some embodiments, a slot (11) may deviate partially or totally from the longitudinal axis describing a curvature. Figures 4C and 4D show illustrative and not limiting examples of a combination of these independently deployable aspects of embodiments of slots (11) of an anchor (and an exemplary embodiment of an associated implant in Figure 4C). Indeed, in these figures, the slot has an oblique orientation in the thickness of the plate (it does not cross perpendicularly). Furthermore, the slot is curved in the length of the plate. Although presented in combination in this figure, it will be understood that one can separate these two features and provide an anchor such as in figure 4B, but with an oblique slot facilitating the approximation of two branches in an extreme position. In addition, in these examples, the curvature of the slot deviates from the longitudinal axis (L) towards a lateral edge of the anchor. In other examples, the slot may describe a curvature substantially centered on the longitudinal axis (L). Using a curvature deviating toward an edge of the anchor, one obtains an anchor with a branch (13) more flexible than the other branch (12), which may be advantageous in some configurations. For example, the withdrawal stop(s) (15) may then be provided only on this branch (13) more flexible than the other, so as to facilitate the disengagement of the withdrawal stop(s) (15) when the anchor

is desired to be removed. Furthermore, the branch (12) which is less flexible than the other may provide for a better overall rigidity of the anchor.

Various embodiments of anchors with regard to the length of the anchor itself and/or the length of the slot (11) are possible. Indeed, anchors of different lengths (and different curvatures) may be provided for a more or less deep anchoring depending on the application. In addition, as mentioned above, the length and/or width and/or shape of said slot (11) is (or are) configured to allow approximation of the two branches (12, 13) together, when pressure is exerted thereon. In some embodiments, the length of slot (11) is preferably at least greater than the width (or to a quarter of the length) of the device (1). It is even generally preferred that the length of the slot (11) is greater than the third of the length, or even half of the plate (10) to facilitate the approximation of two branches. However, a compromise is generally reached between the various parameters which may impact on the risks of weakening the anchor or making it too flexible, such as for example the length of the slot (which may not depend on the length of the plate), the width of the slot, the section of the plate (dimensions in height and/or thickness), the size of the anterior end not split, etc. Also, the width of the slot may vary depending on the application, and embodiments may be used where the width of said slot (11) varies along the longitudinal axis (L) of the plate (10). For example, Figure 1C shows a slot whose width is greater at the rear end than at the front end. It is not necessary, indeed, that the slot is very wide at its front end as the approximation of the branches typically is desired mostly at the posterior end of the anchor. In some embodiments, for example if the plate has a width such that it is not possible (or too difficult) to obtain an approximation of the branches with a single longitudinal slot, the slot may have a more complex shape, adapted to allow the approximation of the branches (for example a T-shape or any other suitable configuration). It is also possible to arrange a plurality of slots (11), of various shapes, in the plate (10) if necessary. In addition, the slot can optionally allow bone growth through the plate (10), which stabilizes the anchor (and therefore the implant). Embodiments are therefore provided for where the slot is wide or

flared (e.g., portion 17) at its front end, to facilitate bone growth through the anchor. One can also provide, in addition to the slot, at least one hole passing through the thickness of the plate (10) to allow bone growth through the device (1) once implanted.

In various embodiments, the front end of the slot (11) is provided with a portion (17) configured to prevent the plate from splitting in the extension of the slot under the effect of stress on the anchor. Such a portion (17) may for example be rounded such as shown in FIG 1C, but it is sufficient to provide a surface may not parallel to the longitudinal axis (preferably perpendicular) to reduce the possibility of shear or splitting.

The present invention is not limited regarding the number or positions of the anchors deployed, although certain configurations are particularly advantageous, notably in terms of resistance or size of the implant, for example, in the case of the cervical implant, where the small size places strong constraints on the size and where the strength of the materials requires that the implants not be made excessively fragile by passages (21), especially in the case of intersomatic cages made of PEEK (polyether ether ketone).

In various anchor and anchor system embodiments of the invention, plate (10) can be substantially rectangular, as is shown in many of the figures, but can, of course, have various other shapes without departing from the spirit of the invention. Preferably, whatever the shape of the periphery of the plate, it presents at least one surface of sufficient dimension for efficiently opposing its movements in the vertebra, contrarily to staples, nails or other known devices. For example, most of the plates shown in the figures have a substantially rectangular periphery, but have variations in shape described in detail in the present application. Moreover, anchor (1) can comprise several plates, and/or a single plate of the body can have various shapes without departing from the spirit of the invention. In fact, to the extent that the desired hold can be obtained by at least one plate offering at least one surface sufficient in the dimension described here as the width of the plate, the anchor can comprise plates having a substantially trapezoidal or triangular

periphery or having diverse shape variations. For example, in certain variants of anchor (1) (not shown), the body of anchoring device (1) may have two plates substantially parallel to one another (and/or with substantially the same curvature) and connected together at the posterior end, for example, such as described in publications FR 2,827,156 (and WO 03/005939 and US 2004/0199254) and FR 2,879,436 (and WO 2006/120505 and US 2006/0136063), each of which is incorporated herein by reference, which may form a stop holding anchor (1) on the implant and thus holding the implant against the vertebra. In addition, various embodiments of anchors (1) may comprise at least one straight plate, for example such as described in these publications, or comprise 2 straight plates connected by a link able to, or configured to, form a stop allowing to affix the implant. Generally, various anchor embodiments of the invention may use a slot (11) to allow bringing the branches close to each other and this slot may achieve its function even if the branches in fact form the rear end of double plate.

Various embodiments of the invention strive to reduce the size of the devices and associated instruments, so as to allow implanting the anchoring device along an axis substantially in the plane of the intervertebral space (disc space). As described in publications of applications WO 2008/149223 and WO2011/080535 cited above and incorporated herein by reference, curved plate (10) describes, along the longitudinal axis, at least one arc of a circle and/or at least one arc of an ellipse whose dimensions and radii of curvature are created so that anchoring device (1) can be implanted in the vertebral endplate of a vertebra by having its perpendicular axis substantially in the plane of the intervertebral space, i.e., along an axis of approach substantially perpendicular to the axis of the spine (i.e., said plane or said approach axis being substantially tangential to at least part of the anterior end when the anchor approaches the vertebrae). Similarly to the above cited applications, various embodiments of the various objects of the present invention concern the technical feature of the radius (or radii) of curvature of anchoring device (1). Various embodiments of anchoring device (1) in fact have a different radius of curvature from one anchor to another, and/or

several different radii of curvature on different portions of the body of a given anchor (1). Thus, for example, the body of anchor (1) may have an arc of a circle or arc of an ellipse shape, but it may also describe a more complex curvature, as if several arc(s) of a circle, having a same radius of curvature or different radii of curvature, were placed end to end or if several arc(s) of an ellipse, having a same radius of curvature or different radii of curvature, were placed end to end, or any combination of arcs of a circle or ellipse or even a radius of curvature that varies along the body. In the present description, the terms "arc of a circle" or "radius of curvature" encompass all these different possibilities. Thus, various embodiments of the present invention provide different variants concerning the radius of curvature and certain related aspects of anchoring device (1), as well as implants (2) and instruments (3, 4) that may be associated with it. In fact, for example, depending on the use of device (1) and in particular its intended implantation location along the spine, it may be preferable to have a larger or smaller radius of curvature. Depending on the radius of curvature of anchoring device (1), the axes passing, respectively, through the penetration end and the stop end of device (1) form an angle, typically comprised between approximately 90° and 180°, although it may also be chosen to be less than 90°. Preferably, this angle will be comprised between 110° and 160°, which, in many circumstances, will facilitate implanting the device better than an angle outside these values. According to the fixation that one wishes to obtain by means of anchoring device (1), the angle will be selected to be more or less open. If one wishes, for example, to promote tight affixation of the cage or the prosthesis against the vertebral endplate, an angle comprised between 120° and 180° may be preferred, while if one wishes rather to prevent the implant from moving in the plane of the disc space, an angle comprised between 90° and 150° may be preferred. Although these angle variations are not shown in the figures, different angles for anchoring device (1) permit covering the different desirable types of anchoring in order to assure a fixation of the implants that is adapted to the case. A device (1) whose angle is at an optimal value, for example near 135°, can also be provided in one of the preferred

embodiments for fixation of the device both by pressing the implant tight against the vertebral endplates and preventing it from moving in the plane of the disc space. Moreover, according to the various embodiments of implant (2), different angles can be chosen for the device, particularly to permit a good fixation despite possible lordosis, kyphosis, or even scoliosis, whether it be natural, pathological, or imposed by the implant. Thus, various embodiments of anchoring device (1) and of implant (2), by means of its radius of curvature and the orientation of passage (21) into which it will be inserted, can be implanted along an axis of approach substantially in the plane of the intervertebral space, i.e., the plane in which implant (2) is implanted, which facilitates the approach of all the elements of the implant and the device to the intervertebral space. In one embodiment, the arc (or arcs) described by the body of anchor (1) has (or have) dimensions and at least one radius of curvature so that anchoring device (1) can be implanted in a vertebral endplate along an axis of approach forming an angle comprised between 40° and 140° with the vertical axis of the spine and, preferably, an approximately 90° angle. This angle can vary for a same anchoring device (1) depending on the dimensions of the approaches to the vertebra and can also vary from one anchoring device (1) to the other depending on the radius of curvature of device (1) used (and therefore the angle formed between its anterior and posterior ends). Furthermore, various embodiments provide for an anchor (1) comprising at least one straight (uncurved) plate (10). Note that in the case of straight anchors (1) (i.e., comprising at least one straight plate), the approach axis may preferably not be substantially in the plane of the disc space but may be oblique. This type of oblique axis is not generally preferred because of the encumbrance of the access to vertebrae but it is still possible to use in some circumstances. The implants (2) used with such straight anchors (1) preferably comprise at least one straight passage (21), oriented toward at least one vertebra, along an oblique path (not perpendicular to the axis of the spine) between the periphery of the spine and the vertebrae. The instrumentation used with such implants (2) with straight passages and such straight anchors (1) preferably will have a contact surface with the implant, at

the anterior end, inclined with respect to its longitudinal axis (antero-posterior according to the convention used in the present application), so as to allow an oblique approach axis relative to the vertebrae. Furthermore, various embodiments of anchor (1) may also have a body comprising at least two straight plates (10) (or plate portions) forming an angle between each other. These straight plates (10) (or plate portions) may for example be linked by at least one connective portion forming such angle (for example thanks to a curvature of this connective portion). These various embodiments may for example be used in association with implants (2) comprising a curved passage (21), for example so as to facilitate the passage of anchor (1) and/or assure a minimum play of anchor (1) within the implant (2), thanks to contact of various parts or portions of the anchor (1) with various parts or portions of inner walls of the passage (21). Various embodiments of anchor (1) may also have a body comprising at least one straight plate (10) (or plate portion) and at least one curved plate (10) (or plate portion). These various configurations of the body of anchor (1) allow providing various embodiments of potential objects of the invention, concerning anchors comprising various portions. These particular objects can be configured to solve the problem(s) of facilitating the passage of anchor (1) through the implant (2) and/or to improve the stability of anchor (1) within the implant (2) and/or limit the invasiveness. Anchoring systems (and associated implants and instrument) are also provided for, in which various embodiments of the anchors and features described herein and in applications WO2008/19223 and WO2011/080535 may be combined. These particular objects (e.g., any of these embodiments comprising at least one straight and/or curved plate (or plate portion) in their body) may also comprise or not, according to various embodiments, any technical feature (or combination of technical features) described for any element (or combination of elements) of any object (or combination of objects) disclosed in this application, as long as they are not incompatible, in particular because the structural adaptations that may be required by such isolation or combination of features are directly derivable from the appreciation of the present disclosure.

Anchoring device (1) generally cooperates with at least one passage (21) crossing through a portion of the implant that it is intended to affix. Such a passage can be a conduit or a channel, for example, of shapes and sizes arranged for the passage of the anchoring device, particularly in cross-section (for example, a substantially rectangular cross-section with rounded angles). Preferably, passage (21) is straight, so as to facilitate its machining, and its dimensions are arranged for the passage of a curved and rigid anchoring device (1) without requiring deformation of this device regardless of its radius of curvature. In various embodiments in which anchor (1) is curved, the height (of the opening) of the passage is therefore preferably slightly greater than the thickness of anchoring device (1), sufficiently to allow the passage of this device inside passage (21), without deformation regardless of its curvature and its rigidity, but sufficiently small to assure a good retention of implant (2) by anchoring device (1), without too much play of the device inside passage (21). In certain embodiments of the invention, the width of passage (21) can be substantially equal to the width of device (1) so that this device has little or no lateral play once it is inserted into passage (21). The length of anchoring device (1) may be adapted to the length of passage (21) to be crossed and the depth to which it must penetrate in the vertebral endplates.

In some configurations, the anterior end of anchor (1) is designed to penetrate into a vertebra adjacent to the implantation's location of the implant (2) to be affixed. In certain embodiments of anchor (1), for example as shown in Figure 1, the anterior end has at least one chamfer (18) or a bevel facilitating the penetration of anchor (1) into the vertebra. In some embodiments, this anterior end can comprise a cutout, for example in the form of a notch, facilitating the penetration of the anterior end into the vertebral endplates. Also note that the inner edges of the notch may or may not be sharpened. Generally, since the anterior end is the one designed to penetrate into the vertebral endplate and may guide the rest of anchor (1), it is preferred that it be made so as to facilitate penetration into the bone tissue. In certain embodiments, this anterior end may thus comprise at least one

point. Thus, the figures of the present application show an anterior end configured substantially into the shape of a point (as further explained elsewhere in this disclosure). It is understood that this end can be sharpened (or ground), but that since bone tissue can be relatively resistant, it is preferable to preserve the integrity of this anterior end. Thus, as can be particularly seen in Figure 1, for example, the anterior end preferably has a chamfer on each of the faces of plate (10) and the lateral sides of the plate are beveled so as to reduce the width of the anterior end. Preferably, these bevels terminate at a distance from one another and the anterior end is therefore terminated by a plane or curved surface which is relatively sharp. On the other hand, as previously mentioned, it is preferable for anchor (1) to penetrate easily into the vertebrae without risking splitting them beyond the dimensions of anchor (1). Thus the lateral sides (or edges) of plate (10) (of the body in general) will preferably be flat, as shown in most of the figures. Hence, in general, the lateral sides of the plate (10) of the anchor (1) preferably are flat, so as to avoid splitting the vertebrae.

As mentioned above, so as to enhance an anchor's ability to hold an implant (2) against a vertebra, various embodiments provide for it to be stopped against at least one surface of the implant that it is intended to affix, so as to hold the implant against the vertebral endplate, preferably firmly pressed against it. In various embodiment of anchoring device (1), the body accordingly comprises at least one retaining stop (14). Retaining stop (14) preferably has at least one stop surface oriented facing the anterior end. Preferably, this surface is oriented approximately perpendicular to the longitudinal axis and is facing the anterior end, whether it is positioned at the posterior end or further towards the front. This retaining stop (14) is designed to cooperate with at least one stop surface of a complementary stop (25) provided on implant (2) that device (1) is designed to affix, in order to hold implant (2) against the vertebra in which anchoring device (1) is designed to be anchored. In various embodiments, stop (25) preferably comprises at least one stop surface oriented facing the posterior end (i.e., toward the periphery of the implant), in order to cooperate optimally with retaining stop

(14). These cooperating stop surfaces can have various configurations, for example, flat, curved, prismatic, and so on. Note that retaining stop (14) is preferably at the posterior end, as most of the figures of the present application show. In many configurations, retaining stop (14) is positioned at the level of (i.e., at or in the vicinity of) the posterior end so that it is located at, or near to, the entrance to passage (21) in the implant, abutting the complementary surface of stop (25) of the implant. This surface of the complementary stop (25) may, for example, be a surface of the peripheral wall of the implant, but it may preferably be formed by a recess, so that stop (14) doesn't protrude from (or extend beyond) the implant when anchor (1) is fully inserted therein. Furthermore, it is understood that stop (14) can be further toward the front of the anchor, so that it can be found inside passage (21), for example, as long as a complementary stop surface (25) of the implant is suitably positioned. The position of retaining stop (14) at the level of the posterior end, however, in many embodiments has the advantage of offering a good hold of the implant, particularly when the anchor is configured to contact the implant from the entrance of the passage up to the outlet. In addition, this posterior position may be preferred when configuring the implant (2) and the anchor (1) to facilitate an intentional withdrawal of the anchor, as discussed for various configurations elsewhere in this disclosure.

In certain embodiments of anchor (1), retaining stop (14) comprises at least one part protruding from at least one of the faces and/or sides (or edges) of the anchor (1). For example, the retaining stop (14) may comprise at least one projecting lug. For example, retaining stop (14) comprises two projecting lugs on a same face of anchoring device (1), in particular the convex face. In other configurations, at least one projecting lug can be provided on any face and/or sides (or edges), or at least one lug can be provided on each face and/or sides (or edges), or there can be any other variant in the same spirit. In certain embodiments of anchor (1), retaining stop (14) comprises at least one projecting lug on at least one lateral side or edge of the body of anchoring device (1). Preferably, at least one lug will be positioned on each of the 2 lateral sides, so as to improve the hold, As these

example configurations of retaining stop (14) show, the term "projecting lug" used here should not be interpreted in a limiting manner, and the precise form of the lug can vary, for example between a small plate offering planar stop surfaces and a small stud offering curved stop surfaces, or any other variant, although some particular shapes may have various advantages, for example in terms of an efficient hold or of a voluntary withdrawal of the anchor. In addition, retaining stop (14) can have various orientations, so as to hold anchor (1) in the implant and hold the implant tight against the vertebra in an optimal manner. Several different retaining stops (14) can also be provided, positioned at different places on anchor (1). In some embodiments of anchor (1) and implant (2), the shapes of retaining stop (14) and complementary stop (25) can be arranged so that stop (14) of the anchor is mated with or locked to stop (25) of the implant, for example by locking lugs engaging a recess. In the case of anchors (1) with two curved plates connected by an uncurved portion or in the case of a single plate with a curved portion (hook-shaped, such as in publications FR 2,879,436, WO 2006/120505 and US 2006/0136063, each of which is incorporated herein by reference, particularly in the case of fixation of prostheses), this portion can serve as a retaining stop, cooperating with a shaft or at least one surface situated at the entrance of passage (21), for example. Anchoring device (1) is removable in numerous embodiments and can be implanted in the vertebrae and mated with the implant after it is installed between the vertebrae, which allows possible adjustment of the position of the implant between the vertebrae before definitive fixation by anchor (1). In some embodiments, the retaining stop can be used to pull the anchor (1) to remove it from the vertebrae, and the implant if necessary (e.g., in the case of a curved hook or a grip resource (141) providing a way to pull on the anchor as mentioned above).

It should be noted that the withdrawal stops may be positioned at various locations on the plate (10) (at least on one side and/or at least one edge and at various positions along the longitudinal axis).Preferably, these withdrawal stops (15) will not be disposed so close to the posterior end that a

deep recess realized (spared) from the outlet of passage (21) to form complementary surfaces receiving these stops (15) is required. Depending on the position of the withdrawal stops (15), these complementary surfaces may be formed in various places on the implant. For example, in the case of withdrawal stops (15) close to the posterior end, the complementary surfaces may be formed by recesses, created in a wall of passage (21), for example near the lateral sides of the passage. Withdrawal stops (15) disposed further from the posterior end can engage a surface outside the passage (at its outlet), but more posterior stops are preferred because bringing the branches close to each other will allow a disengagement more easily with such stops than with stops further away from the posterior end.

In certain embodiments of anchor (1), the body may be configured with notches (16) oriented to oppose the withdrawal of device (1) once it is implanted in a vertebra. Preferably, these notches will be present only along the portion of the body of anchor (1) that is designed to emerge from the passage when the anchor is fully inserted in the implant. As can be particularly seen from the non-limiting examples shown in Figures 1C, 2C and 6B, these notches (16) can vary in number, size and shape. Such notches serve to stabilize the anchor into the bone and prevent the anchor from withdrawing from the bone, especially when bone growth has filled the space between the notches. In some embodiments of the anchor (1), it can be provided, near the rear end of the plate (10), for at least one portion of thickness greater than the thickness of the rest of the plate (10), limiting the clearance of the device in the passage (21) of the implant (2).

In certain embodiments, the ability to readily withdraw the anchor is preferred, and in those embodiments notches (16) or structures allowing growth of bone through the anchors, such as holes or enlarged slots would be generally undesirable. Certain embodiments described herein comprise at least one mechanism allowing removal of anchor (1) and in those embodiments the size of these openings and/or slot may be limited so that they can play their role of holding anchor (1), with bone growth, without impeding withdrawal of anchor (1) by means described herein. Likewise, the

shapes and sizes of notches (16) can also be adapted so as to oppose spontaneous withdrawal of anchor (1) while permitting intentional withdrawal by means of the mechanisms described herein. These embodiments are thus not necessarily exclusive, and depend on the sizes of openings and/or of the slot (11) and/or the shapes and sizes of notches (16).

In certain embodiments, anchor (1) (and/or implant) comprise(s) a withdrawal mechanism, such as at least one grip resource (141) for example, facilitating the intentional withdrawal of the anchor from the implant and the vertebra using an anchor extraction tool, if necessary. The tool for extracting anchoring device (1) can have various forms and can for example, comprise at least one a shaft curved at its end (like a hook) so as to penetrate into a recess and allow the withdrawal of the anchor by pulling on a shaft. For example, in certain embodiments, retaining stop (14) may be configured with a catch to facilitate withdrawal of anchor (1). In some of these embodiments, such a catch can be obtained by making at least one retaining stop (14, 140), in contact with a complementary stop (25) of implant (2) provides for a free space (141) accessible by a tool. Complementary stop (25) or a nearby area of implant (2) may be configured with a space or gap that allows inserting an anchor extraction tool to pull on retaining stop (14). The withdrawal stops (15) are intended to be disengagable from their mating surface of the implant through a pressure exerted on at least one of the branches to bring them closer to each other, thanks to the presence of the slot (11). It can therefore be provided, for example, as a withdrawal mechanism, a grip resource (141), for example such as housing on each of the branches, to allow a tool configured as a clamp, for example with bent ends to penetrate the housings, enabling to pinch the two branches and pull on the anchor. It is therefore understood that various embodiments of the present invention have the advantage of easy removal of the anchor (and therefore the implant), with a small congestion, while securing a good stability of the anchor.

In certain embodiments, anchoring device (1) comprises a mechanism that will assist stabilizing it in passage (21) in the implant. In certain embodiments, for example, a curved anchor is provided to pass through a

straight passage of the implant, without deformation of the anchor (1) in spite of its curvature. These embodiments of implants (2) with straight passage (21) are easier and less expensive to make than the embodiments of implant (2) with curved passage (21). However, for a curved anchor to pass through the straight passage, the height of passage (21) must be at least slightly greater than the thickness of plate (10) in the embodiments of anchors with horizontal orientation (curved in the direction of the plate depth), or greater than the width of plate (10) in the embodiments of anchors with vertical orientation (curved in the direction of the plate width). It is preferable, though, that the anchor has little or no play in passage (21) of implant (2), at least to prevent movements of the anchor (and/or the implant) that will tend to make the anchor come out of the vertebrae. As noted elsewhere in this disclosure, the body of the anchor in some configurations can have various radii of curvature between the two ends (anterior and posterior). In certain embodiments, the curvature of anchoring device (1) at the posterior end can be configured to engage wall of passage (21) sufficiently to improve the hold of anchoring device (1) on implant (2). In certain embodiments, the curved plate (10) of the body comprises a portion near the posterior end which surfaces, preferably substantially planar, limit the play of the device in passage (21) of implant (2) by being slightly thicker than the rest of plate (10). It is understood that the thickened portions close to the posterior end generally correspond at most to the entire length of passage (21), but they are preferably shorter, since the insertion of the anchor through passage (21) could be inhibited if they were too long. An instrument (e.g., 3, 4, 5) (described elsewhere in the disclosure) for inserting anchors (1) into the vertebrae through an implant is a potential object of the invention, and therefore it is preferable for anchors (1) to be configured to pass through this instrument (3, 4). Thus, preferably a thickened portion, possibly planar, on a part of the length of the anchor, will not impede guidance of the anchor into and through the instrument. Thus, in various embodiments, the anchor may be stabilized in the passage by means of at least one thickened stabilization portion, typically disposed on both branches (12, 13) of the anchor and

preferably close to the lateral edges of plate (10), with a thickness greater than that of the rest of plate (10). Stabilization portion should not prevent retaining stops (14) from being stopped on their complementary stop (25) in the implant, so when these retaining stops are created on one of the faces of the plate, the stabilization portion preferably will thus be positioned on the face opposite the one comprising retaining stops (14), which will improve their function of stop. During insertion of various configurations of anchor (1), the stabilization portion may impede passage of the anchor if the increase in thickness is too abrupt. Thus, stabilization portion may comprise at least one chamfer or beveled surface, for example where it meets the plate, substantially toward the anterior end, forming a slope so as to provide a progressive increase in thickness up to the optimal thickness that presses anchor (1) in passage (21) and thus limits its play. Note also that the thickness of thickened portion(s), called stabilizing portions, preferably will still be slightly less than the height of passage (21), so as to limit play without completely eliminating it. Nevertheless, in certain variants, this thickness (and/or height) will be equal to or even somewhat greater than the height of passage (21) (and/or depth of the groove, respectively), notably in the case of intersomatic cages whose material (such as PEEK, for example) allows a slight deformation.

A single anchoring device (1) may be used to anchor an implant (2) in a vertebra, but in most applications at least two devices preferably will be used to affix an implant (2) in the 2 adjacent vertebrae between which it is implanted (at least one anchor for each vertebra). As previously mentioned, another potential object of the invention is an anchoring system for the implant comprising two anchoring devices (1), either identical to each other, or different, or complementary to each other, at least one of which being configured according to one of the embodiments described in the present application. Thus, any of the various combinations of any of the embodiments of anchors and features described herein whatsoever are within the scope of the invention, as well as any combination (for example for two different vertebrae) of one anchor according to one of these embodiments with an

osseous anchoring device of another type, such as for example the type of one of the embodiments described in the above cited prior applications of the assignee of the present application (as long as the circumstances of the implantation allow such combination).

IMPLANTS

Intervertebral implants (2) comprising at least one passage (21) designed to receive anchoring device (1), such as a slit crossing a portion of the implant, a conduit, or another type of channel arranged to receive anchoring device (1), are also within the scope of the invention. Preferably, such implants are configured to receive at least one anchoring device (1) comprising at least one curved and rigid plate, so as to allow the passage of this anchoring device (1) through the passage (21) without deformation despite the curvature of the device (1). In most configurations, passage (21) crosses implant (2) from the periphery of the implant (2) to an upper or lower surface of implant (2), along a preferably rectilinear and oblique trajectory suited to the curvature of anchoring device (1) and the desired fixation of the implant, as discussed in detail elsewhere in this disclosure. The present application does not describe intervertebral discs in detail, but rather only describes various embodiments of intersomatic cages designed for an arthrodesis. The person skilled in the art will nevertheless understand after appreciating this disclosure that anchoring device (1) configured with various features and various combinations of features according to the invention may be used with a prosthesis comprising at least one posterior part configured to receive anchor (1) as described herein, it being understood the designation as posterior is relative to the context of the specific circumstances of the implantation (e.g., the approach taken in the implantation and/or the design of the prosthesis). For example, intervertebral prostheses are known whose vertebral contact plates have a sufficient height to offer a peripheral wall in which it is possible to create a passage such as described herein for the insertion of the anchoring device. Likewise, intervertebral prostheses are known comprising two plates and a mobile core between the plates and in which a peripheral wall of one of the plates limits the movements of the core.

Therefore, the invention can be adapted to this type of prosthesis, by making at least one passage (21) in the wall, crossing said wall from a peripheral surface to a vertebral contact surface (lower or upper) of the plate without hindering the movements of the various parts of the prostheses, such as the core, for example. In various embodiments, the passage (21) in the plate need not cross the plate from a peripheral wall of the plate, but instead may cross the plate from one side to the other side (i.e., the upper surface to the lower surface, or vice versa), according an oblique axis (straight or curved) extending from a peripheral area of the prosthesis itself to a vertebral endplate, and the retaining stops (e.g., 14, 140) and/or withdrawal stops (e.g., 15, 150) of anchor (1) can be adapted to make contact with the upper or lower surfaces of the plates (directly or via stop surfaces arranged within the plate). For example, publications FR 2,879,436, WO 2006/120505 and US 2006/0136063, each of which is incorporated herein by reference (filed by the assignee of this application), show a straight anchor with a retaining stop formed by a curved portion (hook-shaped) at the posterior end of the anchor configured to engage a stem near the edges of plates, and this general approach can be adapted to the embodiments disclosed herein after fully appreciating this disclosure. The anchor (1) of the present invention may, for example, be curved and/or comprise at least one slot (11) and/or one or more retaining stops (e.g., 14, 140) and/or one or more withdrawal stops (e.g., 15, 150), for use with such prostheses, and additional features and/or combinations of features described herein may be adapted to such use. In cases where the anchor is designed to cross through a plate of a prosthesis, the term “posterior” “part” or “portion”, or the term "peripheral wall" may be used to designate a portion near the periphery of the plate and accessible from a peripheral area of the prosthesis.

Accordingly, certain embodiments of the present invention also concern an intervertebral disc prosthesis created with the means described generally for implant (2). Various types of intervertebral disc prostheses are known and no detail will be given here, except that it may for example comprises at least two plates articulated together (for example via articulation

surfaces of the plates and/or an intermediate core) and at least one of which comprises at least one passage (21). Intersomatic cages configured in accordance with the present invention also can have various forms, including configurations notably different from the illustrative examples represented in the figures of the present application. However, the present application also concerns intersomatic (interbody) cages for example as described in the present application, because they are particularly adapted to the problems of invasiveness and stability, and the use of anchors described in the present application can be particularly advantageous in combination with such cages. The description herein gives several non-limiting variants of embodiment in reference to the attached figures, but after fully appreciating this disclosure it will be understood that various implants devised in accordance with the present invention, at least when it concerns a combination of an implant with at least one anchor, may have other forms without departing from the spirit and scope of the invention. Thus, in the present application, reference is made generally to an intervertebral implant to designate both cages and prostheses, and also osteosynthesis plates. When particular embodiments of intersomatic cages require reference to specific technical features of cages, however, reference may be made to an intersomatic cage rather than to an intervertebral implant.

Various intervertebral implants (2) described herein comprise a body (20), generally with at least one peripheral wall, a posterior portion of which (in accordance with the conventions adopted in this description) comprises at least one passage (21) of suitable dimensions to receive at least one anchoring device (1) configured according to the invention. As explained elsewhere herein, the passage is may be straight to avoid the complex and expensive machining of a curved passage. However, with an implant separable into two parts at the passage joinable together, it is easier to create a curved passage. Moreover, it is possible to manufacture implants, such as intersomatic cages, by moulding. It is then possible to more easily produce implants having a curved passage, for example by using a mold with a curved insert. In addition, certain recent techniques allow curved

machining, especially in solid materials (for example metals). Therefore it is possible, particularly in the case of intervertebral disc prostheses whose plates are made of metal, to create a curved passage designed to receive the curved anchor without much additional expense and burden over machining a straight passage. If passage (21) in the implant is curved, its height can be generally equal to (or very slightly greater than) the thickness of anchor plate (10). If passage (21) is rectilinear (straight), its height preferably will be at least slightly greater than the thickness of the curved anchor to permit it to pass without deformation of anchor (1) despite its curvature and its rigidity, as discussed elsewhere in the present application. This technical feature of a curved passage (21) within the implant allows many embodiments of objects such as implants and anchoring devices and/or systems in which the implant comprise a curved passage and in which the anchor is curved and comprises at least one slot (11). These particular objects (i.e., any of these embodiments comprising or associated with a curved passage in the implant) may be configured to solve the problems of stability of the fixation of implant and/or of invasiveness.

In some embodiments (not shown), passage (21) may have an entrance with an oblique orientation, in which the width of the passage is neither oriented parallel to the plane of the disc space, nor oriented parallel to the axis of the spine, but intermediate and forming an angle with these reference orientations (which are shown in most of the figures). In these embodiments, it is preferable to have two anchors (1) implanted in the same vertebra, and these anchors (1) preferably have a curvature in the thickness of the plate and one or more radius (or radii) of curvature shorter than generally used for anchors which may be associated with implants having an entrance of the passage oriented horizontally (in the plane of the disc space), so that the anchor has a curvature sufficient to provide a good hold despite its oblique orientation. This oblique orientation may be useful in various circumstances to address the problem of the stability of the anchor and the implant when faced with various constraints of the implantation. Some embodiments may provide, for example, two such anchors associated with

an implant comprising at least two passages with such oblique orientation directed toward the same vertebra, but with opposite orientation one in relation to other (for example, one entrance inclined 45° to the right, and the other inclined 45° to the left). However, horizontal orientations of the passage are generally preferred, in particular for an easier use, notably with an instrumentation such as described in the present application.

The use of an anchor comprising a curved plate can be particularly advantageous with an osteosynthesis plate, in particular in the case of the disc space between vertebrae L5 and S1, because the orientation of the sacrum toward the back of the spine makes it generally difficult to access this area, even by an anterior approach. In general, even with a curved anchor (1), it is preferable to use an approach axis of the instrumentation that is oblique (not perpendicular to the vertebrae) at the level of the sacrum, because of the orientation of the latter toward the back of the spine. The contact surface with the implant at the anterior end of the instrumentation may be inclined with respect to its longitudinal axis (antero-posterior according to the convention used in the present application) for allowing an optimal contact with the osteosynthesis plate. Nevertheless, the approach axis may be substantially perpendicular to the osteosynthesis plate in some circumstances and the instrumentation will then be adapted to this approach axis. Furthermore, it is also possible to use an anchor comprising a straight plate, so as to allow this implantation in various circumstances (e.g., oblique path or path perpendicular to the vertebrae). The instrumentation will thus be adapted according to the shape of the anchor and the approach axis chosen. Implants devised with various features according to the invention may include osteosynthesis plates comprising a passage (21). The posterior part or peripheral wall may then correspond to an osteosynthesis plate itself, forming a wall between the exterior and interior of the disc space. An anchor according to one of the embodiments described herein is then inserted into the passage along an approach axis substantially perpendicular to the osteosynthesis plate (and the axis of the spine at the level of the disc space concerned). The passages (21) in the plate can be arranged to be placed at

the disc space or vertebral body level and lead to the endplates or directly in the periphery of the vertebral bodies. The orientation of the entrances of the passages (21) may be oblique as explained above. These fixation plates can be further fixed against the vertebrae with conventional screws, in addition to at least one anchor as described herein.

It is noted that, in a general manner, passages, holes, notches, stops, recesses, lugs, and other elements of the various objects of the invention (anchors, anchor systems, implants, and instruments) may be formed by various methods, such as machining, drilling, casting, welding, etc., and the examples given herein are not to be construed restrictively.

As noted elsewhere herein, the anchor (1) preferably comprises at least one slot (11) on at least one posterior portion of the plate (10). An implant can be fixed by means of several anchors, and it will therefore comprise several passages (21). Preferably, there will be two passages (21) each oriented toward a different one of the vertebrae between which the implant must be implanted. Thus, in certain embodiments, peripheral wall comprises two passages (21) each oriented toward one of the upper and lower surfaces of implant (2) (vertebral contact surfaces of the implant), so as to anchor anchoring device (1) in each of the vertebrae between which implant (2) is designed to be implanted. Passage (21) of an anchor (1) is created in wall of the implant so as to emerge on the vertebrae contact surface of the implant.

Various embodiments of the invention concern an intervertebral implant (2) comprising a body (20) having at least one part, called posterior, and at least one passage (21) configured to accommodate at least one device (1) for anchoring according to the invention, so as to allow the passage of this rigid anchoring device (1) without distortion despite its curvature. The passage (21) in these embodiments passes through the implant (2) from the periphery to a top or bottom surface, typically along a rectilinear and oblique path adapted to the curvature of the anchoring device (1), which is intended to be inserted substantially in the plane of the implant (2), so as to orient the anchoring device (1) during insertion in the direction of

the endplate of one of the vertebrae between which the implant (2) is intended to be implanted. To retain the anchor (1) but allow the withdrawal of the anchor, which is facilitated by the presence of the slot (11) thereon, the passage (21) has at least one surface complementary to at least one withdrawal stop (e.g., 15, 150) of the anchoring device (1). Note that this complementary surface of the implant which receives the withdrawal stop (e.g., 15, 150) is generally formed in the passage (21) of the implant, preferably in the vicinity of its entry (or in the posterior peripheral wall) or its outlet (to a vertebral contact surface) or close to this outlet. This surface will be provided depending on the position of the withdrawal stop (e.g., 15, 150) on the anchoring device (1). Several surfaces may be provided for receiving a plurality of withdrawal stops (e.g., 15, 150) of the anchoring device (1). Preferably, there is at least one withdrawal stop (e.g., 15, 150) on each of the branches (e.g., 12, 13) of the anchoring device (1), but several withdrawal stops can be provided on each branch. The stops are generally provided near the posterior end of the plate (10) since these are the rear ends of the branches that can approach each other most easily thanks to the slot. The invention also relates to a combination of various embodiments of the implants described in this application with various embodiments of the anchors described in this application. Such a combination makes it possible to respond in particular to the problem(s) of invasiveness and/or stability in various circumstances attendant to a particular implantation. The invention may also involve an implant system with two or more implants, with or without anchoring devices. In particular, in the case of an implementation of cage by a posterior approach, two intersomatic cages are generally arranged parallel to each other on either side of the sagittal plane. During a transforaminal implantation, it is expected in general only one cage, preferably of larger dimensions, will be implanted obliquely or perpendicularly to the sagittal plane.

In certain embodiments, the peripheral wall of implant (2) comprises two superposed passages (21) or offset passages if the encumbrance constraints allow it, each oriented toward one of the upper and lower

surfaces, so as to anchor anchoring device (1) in each of the vertebrae between which implant (2) is designed to be implanted. In other embodiments, implant (2) comprises only one passage (21). Embodiments of prostheses similarly may have only one plate that comprises a passage (21), and the other plate does not.

According to various embodiments of the anchor (1) or anchors (1) for use with the implant, the passage for the implant may have various forms, including at its entrance in the posterior part. In the case of anchors whose branches (12, 13) are symmetrical, for example such as those of embodiments corresponding to the examples shown in Figures 1A, 2A and 5A, the entrance of the passage preferably is substantially rectangular (possibly with rounded corners) for the plate to pass through it. Such a rectangular passage also may be suitable for some anchors whose branches are not symmetrical, for example like those of the embodiments corresponding to the examples shown in Figures 4A and 4C. However, for some anchor embodiments with asymmetrical branches, for example such as those of embodiments corresponding to examples shown in Figures 3A and 3B, the passage preferably will be adapted to the fact that the branches are shifted (offset) relative to the other. In some of these embodiments, the anterior end of the anchor, at least to the point where the branches will diverge, may be thinner (less thick) than the anchors of other embodiments, as mentioned above. However this solution is not necessarily completely sufficient. Alternatively or additionally, it is possible to adapt the passage to the anchor and vice versa, as detailed above. Figure 3B shows a non-limiting and illustrative example of certain embodiments where the mutual adaptation of the anchor to the implant minimizes the overall invasiveness. Instead of enlarging the passage to allow insertion of the anchor, some embodiments of the anchor are provided with an offset at its front end so as to pass more easily and the passage (21) has only a central portion (for example as shown in the lower passage of FIG 3B which is not equipped with an anchor) suited for the passage of the part of the anchor forming the junction between the offset portions (at the front of the anchor), while the rest of the passage is

adjusted to the shapes and dimensions of the anchor (for example as shown on the upper passage of figure 3B which equipped with an anchor). Note also that Figures 3A and 3B represent examples of two different alternatives. Indeed, the example in Figure 3A, the implant comprises an upper passage and a lower passage. The upper passage is configured to receive an anchor of the type shown in Figure 3E for example (whose right branch is lower than the left branch). Similarly, the lower passage of the implant of FIG 3A is configured to receive an anchor of the type shown in Figure 3E for example (whose right branch is lower than the left branch). Thus, the implant is arranged so that the branches of its anchors are offset, which implies less design constraints on the implant, in its height. However, the example in Figure 3B, the upper passage is configured to receive an anchor of the type shown in Figure 3E for example (whose right branch is lower than the left arm) while the lower passage is configured to receive an anchor of the type shown in FIG 3C for example (the right branch of which is higher than the branch on the left). This configuration imposes more constraints on the design of the height of the implant, but less in its width, including the possibility of providing a grip resource (26) closer to the passages. Note that the positions and/or orientations and/or dimensions of the stops is (are) still fit to minimize the invasiveness of the examples in Figures 3A and 3B. It is generally provided a retaining stop on the longest branch which is the offset towards the middle of the implant (taken in its height) than on the branch shifted to the upper or lower surface of the implant. Various stops on the sides or edges can also be arranged, as explained above. Note also that, in all cases, the portion of the center of the passage (in width) is preferably arranged to allow a sufficient approximation of the two arms to allow the release of withdrawal stops (15).Before anchoring device (1) is implanted to hold implant (2) in position, there is sometimes a risk that the implant (2) will move in the disc space. In certain embodiments, therefore, at least one of the (upper and/or lower) vertebral contact surfaces of implant (2) may comprises notches (22) avoiding or limiting movement of implant (2) between the vertebrae (e.g., opposing sliding of the implant (2) between the vertebrae). In

the case of an intervertebral disc prosthesis, it is also possible to provide stabilization means on the surfaces designed to be in contact with the vertebrae, such as notches or fins or any type of structure preventing it from moving between vertebrae, so as to ensure (or improve) the stability of the prostheses before its fixation by anchoring device (1). According to different embodiments, these notches (22) or other stabilization means can have different orientations. For example, notches (22) can be substantially parallel to one another and all oriented perpendicular to the implant insertion axis, or notches (22) can, on the contrary, have different orientations on different portions of implant (2), so as to prevent movement in various directions, for example such as a chevron pattern, relatively optimal for opposing movements in most directions, and, in particular, movements perpendicular to the anteroposterior axis in these examples of cages with lateral insertion (i.e., movements along an axis in a sagittal or para-sagittal plane of the spine).

It is noted that in various figures of this application, examples of cages represented include notches on their entire or almost entire vertebral contact surfaces, but not on the peripheral wall of the cage. The posterior part of the vertebral contact surfaces of the cage has no notches in these examples. However, it is possible in various embodiments to provide notches on this and other peripheral parts, provided they do not interfere with the various stops, ribs, and/or other elements and features that may be configured on these implants and/or the anchors that may be associated with them.

In some embodiments, the intervertebral implant (2) comprises an interbody cage. Typically, the cage comprises a body (2) which may be traversed by at least one hole (23, 24). For such a cage, the peripheral wall can thus define a cavity, opened on the upper and lower surfaces of the implant (those in contact with the vertebrae) designed to receive a bone tissue graft or a substitute. Although an intersomatic cage can comprise a cavity in its center defined by its wall, as shown in the figures of the present application, a cage may also consist of a solid piece without an inner cavity in other configurations within the scope of the invention. This type of cage can

be designed to be used at least in pairs, for example, so as to define a cavity between the cages such as is known in the prior art. Moreover, in the case of cages with at least one cavity, and as particularly visible in certain examples shown in Figures 1, 2C, and 2, openings (24) can be created in wall of the implant (the lateral walls in the examples shown), so as to also permit the growth of bone tissue transversely through the disc space (i.e., through the cage, parallel to the vertebral endplates). The holes (23, 24) preferably traverse through the body and pass through not only between the upper and lower faces, but also the lateral faces. For example, the illustrative and not limiting examples of Figures 1B, 2A, 3A and 3B, the body (20) is traversed not only by vertical holes (23) (between the upper and lower surfaces) but also by horizontal holes (24) (between the side surfaces). The interbody cage (2) may therefore be with or without a central recess, especially if several interbody cages (2) must be located in the same intervertebral space. Such cages are typically used to contain bone (graft) that will grow within the intervertebral space and allow a fusion (arthrodesis) of two vertebrae between which it is implanted. It is also known to use a substitute instead of a bone graft. In all cases, the purpose of the cage (2) is to restore or maintain a space between the vertebrae. Before the growth of the graft and spinal fusion, the cage (2) should remain in place in the disc space and various embodiments of the present invention facilitate its immobilization. Similarly, a prosthesis should typically be fixed to the vertebral endplates in all cases. In certain embodiments, the intersomatic cage may comprise a reinforcement (28) crossing its cavity from side to side to reinforce the walls of cage (2), for example as shown in figures 5B, 5C and 9B. The cavity is preferably equipped with a reinforcement (28) to solidify the implant. This reinforcement can have different shapes and orientations and can be oriented along the axis of insertion of cage (2) between the vertebrae (e.g., the longitudinal axis of the body), but it will preferably be transverse, thus connecting the inner walls of the cavity between the lateral faces (substantially perpendicular to the longitudinal axis of the body of the implant). This transverse orientation allows reinforcing the cage in the direction which might be the most fragile

and generally allows it not to interfere with the passage of anchors. In various embodiments, the reinforcement can have a lower height than the rest of the cage. This lower height of the reinforcement with respect to the rest of the cage permits the cage to take on various possible irregularities in the shapes of the vertebral endplates and to avoid completely dividing the graft or substitute contained in the cavity of the cage. The reinforcement may or may not be provided with notches. On the other hand, in certain embodiments, a part of passage (21) emerges into cavity. Generally, the wall can be dimensioned as a function of passage (21), and passage (21) will be dimensioned and oriented as a function of anchoring device (1) in order to orientate and hold this device in the direction of the vertebra into which the anchoring device must be affixed. Moreover, the orientation can be chosen as a function of the desired fixation, as mentioned elsewhere herein (for example, by means of the curves selected for the anchors). Note, however, that the implant dimensions vary as a function of the vertebrae between which they are designed to be implanted and that the dimensions of the anchoring device can also be adapted to those of the implant as a function of those vertebrae.

The form of the implant, even at the level of passage (21), is not limiting, as long as it allows at least one anchor (1) to be introduced. For example, cage (2) represented in the figures of the present application and particularly visible in Figures 5B and 5C, has a substantially oblong periphery. The shape of the body, in particular with its anterior end, may have a shape such as, for example, the shape of a bull-nose (bullet or mortar). Generally, the posterior end of the cage, which comprises the passage (21), may have a wall substantially straight and near which the cage will be held by an instrument (3, 4, 5). Even in these examples, however, it is not necessary that the wall be generally planar in this area. In particular, the present invention preferably provides that the entrance of the passage is equipped with surfaces (25) complementary to the retaining stops (14), which may involve non-planar forms. Thus, in some embodiments, the posterior part of the implant (2) which comprises the passage (21) for the anchoring device

(1) includes, around the passage (21), at least one housing which surfaces (25) are configured to accommodate at least one retaining stop (14) of the anchoring device (1) without the latter protruding from the body (20) of the implant (2). The anchor (1) is provide for not protruding from the spine (at least), but even not to protrude too much from the implant (because this could injure the tissues, providing hanging or gripping structures tending to move the anchor out of the implant or interfere with insertion of a second anchor). Thus, the anchor (1) is preferably set to not protrude at all from the implant, as shown in Figure 5B for example. On the other hand, in some embodiments, the posterior part which includes the passage (21) for the anchoring device (1) comprises, around the passage (21), at least one housing whose surfaces (25) are configured to provide access to grip means (141) of the anchoring device (1), for grasping with the end of a tool for the withdrawal of the anchor by moving the two branches or legs (12, 13) towards each other to disengage one or more withdrawal stops (e.g., 15, 150). Note that in various illustrated intersomatic cages, the substantially oblong shape has a slight curve (especially visible in the top views), but again, this shape is not restrictive with respect to the scope of the invention even if it's preferred for any applications. Various figures of the present application show that various shapes of intersomatic cages may have a peripheral wall including a planar side face (or surface), and a slightly convex superior and inferior side faces (or surfaces), a substantially flat posterior face (or surface), and a curved front face (or surface), but again, this shape is not restrictive with respect to the scope of the invention. However, the shape such as a bull-nose (bullet or mortar), visible in Figures 5B and 5C, for example, is particularly adapted to an implantation of the cage through a posterior or transforaminal pathway. A convex shape of the superior and/or inferior surface(s) is advantageous for matching the shape of the vertebral endplates. It is indeed preferable that the shape of the implant be selected according to the shape of vertebrae between which it will be implanted and to the axis of the anatomical pathway foreseen for its implantation. In certain embodiments, at least one portion, for example situated around the center of

the implant, along the longitudinal axis (L) (which may correspond to anteroposterior or oblique axis of the spine), is thicker than the rest of the implant, so as to take on the shape of the vertebrae. Preferably, the surfaces of the implant are adapted to the anatomy of the vertebrae. However, a symmetric shape is generally preferred for the implant to allow turning it upside down (i.e., the superior face disposed at the bottom and the inferior face disposed at the top) and/or use it according to different implantation types.

As mentioned above, some embodiments relate to an intervertebral implant (2) which is actually a cage. Such a cage preferably has a body (20) elongated along a longitudinal axis. It is preferably traversed by at least one hole (23, 24) and comprises at least two side faces, an upper surface, a bottom surface, a rear part and a front part. The shapes and dimensions of the body (20) are preferably configured for implantation by a posterior or transforaminal of the implant (2). The dimensions identified here as being configured for or adapted to implantations through posterior and transforaminal approaches have implications which are relatively clear for the skilled person. However, for clarity and in a purely illustrative and not limiting manner, the following size ranges can be cited: For a cage for a posterior implementation, a shorter body (20) is generally provided than for transforaminal implantation since the latter often implies that the cage is positioned obliquely between the vertebrae and should cover a longer area. Thus, for a cage for a posterior implementation, a range of lengths of about 22 to 26 mm is provided while a range of lengths of about 32 to 34 mm is provided for a cage intended for a transforaminal implantation. Conversely, for problems of invasiveness of the operation, the dimensions in height and width are critical. Cages whose width is only of the order of 10 or 11 mm are particularly advantageous, in particular with anchors as described in the present application. Moreover, according to the intervertebral height desired to be restored or maintained by the cage, one can choose one (or more) cage (s) from a range of height (or thickness), for example from as small as 7.5 mm to 14 mm for the minimum height (e.g., located at the posterior face).

Since the cage has often its upper and lower surfaces not parallel to impose an angle to the vertebrae, 14mm minimum height gives such a height of 17mm maximum.

Generally, the shape of implant (2) can vary and the shape of the end of instrument (3, 4, 5) that will be in contact with implant (2) can consequently vary in various embodiments. Preferably, the body (20) comprises, in the vicinity of the posterior part, at least one fastener or grip resource (26, 27) for an implantation instrument. The grip resource (26, 27) can be on the posterior part and/or a lateral face, preferably both for offering leverage between these two locations, which facilitates the manipulation of the implant (notably for a pivotal motion as detailed hereafter). Implant (2) of various embodiments can in fact have different shapes consistent with the implant having at least one passage (21) suitable for insertion of anchoring device (1) and preferably a fastener (or grip resource or attachment resources) (26, 27) designed to cooperate with one end of an implantation instrument. Fastener (26, 27) can, depending on the various particular embodiments, be associated with a particular shape of the implant near this fastener (26, 27) to provide good cooperation with the instrument, or even have a particular shape cooperating with a complementary shape of the instrument. For example, the instrument can comprise a contact surface following the shape of the implant. Indeed, the posterior portion of the implant is preferably configured for allowing the use of instrumentation. It can be seen for example on figures 1B, 2A, 3A and 3B that the surfaces (25) around the entrance of passage are flat surfaces inclined towards the entrance of passage (21). This shape allows the retaining stops (14) not to protrude from the implant, but also allows that an instrument (5) with a complementary shape offers a contact which is well distributed on the posterior portion of the implant, which facilitates the manipulation of the implant (notably for a pivotal motion as detailed hereafter).

In certain situations, notably depending on the vertebrae between which implant (2) must be implanted, it is desirable for implant (2) to impose, accommodate, or correct lordosis, kyphosis, or even scoliosis, in addition to

maintaining the space between the vertebrae. Certain embodiments therefore provide that the mean planes passing through the upper and lower surfaces of implant (2) (e.g., of the cage or at least one of the plates of the prosthesis) form an angle in at least one direction imposing, accommodating, or correcting lordosis, kyphosis, or scoliosis with respect to the vertebrae between which implant (2) is implanted. This general approach is described, for example, in applications FR 2,869,528 (and WO 2005/104996 and US 2005/0246024) and FR 2,879,436 (and WO 2006/120505 and US 2006/0136063), each of which is incorporated herein by reference, in particular concerning the technical features allowing such inclination of the mean planes of the implants (i.e., thanks to an angle between the mean planes of at least one plate or between the contact vertebral surfaces of a cage, and/or thanks to an asymmetric nucleus and/or to an offset position of the nucleus). Reference to the mean plane reflects herein that the (upper and lower) vertebral contact surfaces are not necessarily planar, since they can be provided with notches or can be convex or even concave; therefore a mean plane is intended to reflect the general orientation that a vertebra resting on the surface will take. For example, several of the intersomatic cages (2) shown in the figures of the present application are lordosis-inducing cages—they are designed to be inserted laterally and their portion intended to be positioned on the anterior side of the vertebrae is thicker than the opposite portion. The upper and lower surfaces (whether convex or flat, and whether or not fitted with notches) are not parallel but are inclined and diverge from each other in the direction of the front end. Thus, the dimensions of the body, between the upper and lower surfaces are larger near the front end than near the rear end of the implant and used to impose a lordosis when implanted through a posterior or transforaminal. Surfaces can also diverge laterally so that the dimensions are more important on one side face than another. Thus, a lordosis adapted to a transforaminal implantation can be obtained and/or a scoliosis may be imposed or corrected.

Although certain embodiments have the mean planes passing through the upper and lower surfaces of implant (2) forming an angle, straight cages

can be provided, which typically would thus be symmetrical and have the medial planes passing through the upper and lower surfaces of implant (2) configured substantially parallel to one another. Depending on the desired implantation route for the implant, an angle may be imposed in various directions. For kyphosis and lordosis, this direction is anteroposterior with regard to the spine, with either a thinning of the implant toward the front of the spine to impose kyphosis, or a thinning of the implant toward the rear of the spine to impose lordosis. To impose scoliosis, the mean planes passing through the upper and lower surfaces must form an angle along the other direction of the plane of the disc space (along a frontal or coronal direction, i.e., along an axis oriented mediolaterally with respect to the spine) with a thinning of the implant toward the right or the left, depending on the desired effect. In general, concerning the interbody cages of the present invention which are intended for a posterior or transforaminal implantation, cages imposing a lordosis are preferred because this configuration avoids that the cage moves towards the part of the spine from which it has been implanted.

In certain embodiments, an example of which is shown on figure 5B, at least one part of at least one of the superior and inferior surfaces comprises at least one bevel. For example, the body (20) of implant (2) comprises, at the level of an anterior part (using the direction conventions noted elsewhere herein, thus opposite the posterior part comprising the passage (21) for the anchor), at least one beveled portion (29), for example such as at least one chamfer on at least one peripheral portion of at least one of its upper and lower surfaces, so as to facilitate the insertion of implant (2) between the vertebrae. Note that the beveled portion (29) on at least one of the superior and inferior surfaces should not be too large compared to the dimensions of the body (for example having a length less than one third the length of the implant) for leaving a sufficiently large contact surface of the superior and inferior surfaces with the vertebral endplates. For example, one may have only a portion of the junction between, on the one hand, at least one of the superior and inferior surfaces and, on the other hand, the anterior

part of the cage, which is beveled (for example the anterior third in the case of an interbody cage).

As is particularly visible in the example of the intersomatic cage of Figures 5B and 5C, the anterior end of the cage has substantially the shape of the point of a shell (bull-nose, mortar), to optimize the penetration of the cage between the vertebrae, especially when the space between said vertebrae is insufficient. Chamfer or bevel (29) may be present on both the lower and upper surfaces of implant (2). This chamfer (29) or beveled profile facilitates implanting implant (2) by conferring to it a somewhat lower height on its attack side (the one designed to be inserted first) than on the rest of the cage. In addition, it is also possible to bevel the side faces at the front end of the implant such that it has a bull-nose shape facilitating its penetration between the vertebrae. On the other hand, it is possible to bevel at least a portion of the junctions of at least some of the side faces with the top and bottom surfaces. In particular, it is sometimes desired to insert the implant in an orientation rotated 90° about its longitudinal axis relative to the final position (that in which the upper and lower surfaces are in contact with adjacent vertebrae). Indeed, as explained above, the dimensions of the cage for implantation through a posterior or transforaminal approach may be such that the dimensions of the cage in height are greater than the width of the cage. It may therefore be desirable to first insert the cage with its lateral faces disposed towards the top and bottom of the spine (the upper and lower faces find themselves arranged laterally of the spine), and then rotate the cage to restore the height of the intervertebral space to the desired value (obtained by the fact that the height of the cage has the selected value). One thus inserts the implant in an orientation rotated 90° about its longitudinal axis relative to the final position, then pivots it to place it in its final position in the disc space. In this type of implantation, it may be desirable that at least a portion of at least some of the junctions between the side faces and upper and lower surfaces is beveled to facilitate rotation of the implant between the vertebrae. Bevels or rounded shapes or forms for the cage may thus be provided, even if it is not this type of implantation which is planned, but it is

generally preferred that a cage provides a maximum contact area for a given size and therefore has selected junctions that are not too rounded. It is then preferable to provide such bevels when this rotation is intended during the implantation, for an insertion of the implant (2) in a position rotated 90° about its longitudinal axis relative to the final position, where the upper and lower surfaces are in contact with the adjacent vertebrae between which the implant (2) is designed to be implanted. In general, it is sufficient that only some of the junctions are tapered (beveled), such as a single junction of the two junctions between the side faces and the upper surface and a single junction of the two junctions between the side faces and the bottom surface. One preferably chooses the junctions that are opposite each other (the left-bottom junction opposite the right-top junction, for example), such as seen in Figure 1B for example. In addition, it is sufficient, in general, and particularly when the upper and lower surfaces are inclined with respect to each other (e.g., when the implant is thinner at its rear end to its front end), that only a portion of these junctions is beveled. Indeed, it is sufficient to bevel only the portion at the level of which the cage is the thickest, such as seen in Figure 1B for example.

As explained in this disclosure, the various configurations or embodiments of implants (2) preferably will be adapted to the configurations or embodiments of anchors (1), in particular for the retaining stops (14) and/or the withdrawal stops (15). Thus, in certain embodiments, the implant comprises, preferably near the passage (21), at least one surface (25) generally facing the outside of implant (2) and forming a stop arranged for cooperating with at least one retaining stop (14) of anchoring device (1), such that once anchoring device (1) is fully anchored in a vertebra through passage (21), the implant (2) is pressed against said vertebra. This arrangement allows that the anchoring device impacted in a vertebra presses the implant (2) against the vertebra, without protruding from the periphery of the spine. As mentioned elsewhere herein, for various configurations of the anchor, the surface(s) (25) may be situated above and/or below the passage, to receive lugs projecting above and/or below the anchor, or on the lateral

sides of passage (21) so as to receive two projecting lugs on the sides of the body of anchoring device (1), or any combination of these possibilities. These surfaces (25) are preferably provided offset compared to the rest of the walls of the implant, that is to say in the thickness of the implant (2) (e.g., in a housing), so that the retaining stop (14) of the anchor (1) does not protrude from the implant (2). Indeed, the anchor (1) should not protrude from at least the periphery of the spine, but it is particularly advantageous not to protrude too much from the implant or not to protrude (project) at all. Thus, a reliable fixation is obtained with a high proportion of the anchor planted in the vertebra while a small proportion remains in the implant and a null or almost null proportion protrudes from the rear of the implant. Preferably, there will be 2 stops in each case. Preferably, stop (25) is a recess, the bottom of which forms the stop surface, with depth sufficient to receive retaining stop (14) without it protruding from peripheral wall (28). In certain embodiments, the implant comprises at least one withdrawal stop (212) having at least one stop surface generally facing the anterior end of the anchoring device inserted in passage (21), this withdrawal stop (212) cooperating with at least one withdrawal stop (e.g., 15, 150) of anchor (1), in order to oppose the withdrawal of anchoring device (1) from implant (2).

INSTRUMENTATION:

In certain embodiments, an instrumentation (3, 4, 5) may be used to insert implant (2) between the vertebrae and to guide anchoring devices (1) into the implant (2) and drive the anchoring devices (1) into the vertebrae. The invention may relate to the combination of elements (3, 4, 5) of the instrumentation and to each instrument individually, such as an impactor (4), an adapter or holder (3) and a guide (5). Such instrumentation (3, 4, 5), illustrative and non-limiting examples of which are shown in Figures 7A, 7B, 7C, 8A, 8B, 8C, 9A and 9B, is intended for the implantation, between the vertebrae, of an intervertebral implant (2) according to the invention and for implantation, in at least one of these vertebrae, of at least one anchoring device (1) according to the invention. The instrumentation preferably includes at least one holder (3) (or adapter or rack or charger) having a body (300)

which width is less than the width of said anchor (1) and comprising at least one guiding surface (30) having at least one radius of curvature substantially identical to at least one radius of curvature of a plate (10) of an anchoring device (1), to accommodate and guide the latter during implantation. In addition, the instrumentation preferably includes at least one impactor (4) comprising a head (40) adapted to receive the holder (3) and having two arms (401, 402) of length greater than the length of the body (300) of the holder (3) and spaced apart by a distance greater than or equal to the width of the body (300) of the holder, so as to allow to push, by sliding the impactor (4) along the holder (3), the anchoring device (1) accommodated on the holder (3). Finally, the instrumentation preferably also comprises at least one guide (5) of elongate shape along a longitudinal axis extending between a first end, called gripping end, for holding the implant (2), and a second end, called pushing end, the gripping end having a head (50) equipped at its end with at least one gripping resource (56, 57) intended to cooperate with at least one grip resource (26, 27) of the implant (2), the head (50) being traversed by a longitudinal passageway leading to the implant and of shape and dimensions adapted to accommodate at least partially the body (300) of the holder (3) and the arms (401, 402) of the impactor (4), the passageway comprising at least one surface (53) for guiding said anchoring device (1), complementary to the guiding surface (30) of the holder (3), for guiding said anchoring device (1) between these two guiding surfaces (30, 53) during sliding of the impactor (4) along the holder (3) into the head (50) of the guide (5). With such arrangement of the holder (3) and the guide (5), in combination with the arrangement of the guide (5) holding the implant (2) around the entrance of the passage (21) in the implant (2), a channel guiding the anchor (1) within the instrumentation and into the implant (2) is formed. Such channel has the advantage of allowing a reliable guiding of the anchor (1) avoiding the risk of an incorrect implantation and/or of damaging the anchor or the implant by the insertion of the anchor. Such channel is preferably uninterrupted and thus avoids griping of the anchor by a protruding structure during the implantation.

The impactor preferably comprises at least one longitudinal body (41), such as a rod for example, which is intended to be disposed parallel to the body (51) of the longitudinal guide (5). The body (51) of the guide (5) is preferably also in the form of a rod or a tube. It preferably comprises a handle for holding it and allows to hold the implant at the level of its head (50). The impactor (4) is arranged so that the arms (401, 402) at its head (40) come into the passageway of the head (50) of the guide (5) for pushing at least one anchor (1) through the passage of an implant mounted on the gripping end of the guide (5). The impactor (4) preferably has, at the opposite end to that provided with arms, a pusher (42) on which one can push or knock so as to make the anchor penetrate into the vertebrae through the implant. Preferably, the impactor (4) has guide means (49) for guiding the sliding of the impactor (4) along the longitudinal axis of the guide (5). These guide means (49) can comprise, for example, at least one tab (preferably two legs) not parallel to the longitudinal axis of the impactor and which extends to the guide (5), for example at its longitudinally extended body (51) and surrounds it at least partially or otherwise tracks it, thereby guiding the sliding of the impactor (4) along the longitudinal axis of the guide (5), for example, as particularly seen in FIGS 8A, 8B and 8C.

In some embodiments, the gripping end for holding the implant that is at the end of the guide (5) comprises at least one gripping resource (56, 57) comprising an end of a rod (56) sliding in the body (51) of the guide (5) when actuated by a handle or knob (52). The body is then generally a tube in which the rod (56) is movable, for moving into and out of a housing (26) of the implant (2) forming a grip resource of the implant. In some embodiments, the rod (56) has a threaded end cooperating with an internal thread of the housing (26) for securing the implant (2) when the rod is actuated by the handle or knob (52).

In some embodiments, the gripping resource (56, 27) of the guide comprises, on the one hand, one end of a rod (56) sliding in the body (51) of the guide (5) when it is actuated by a handle or knob (52) into and out of a housing (26) of the implant (2) forming a grip resource of the implant, and, on

the other hand, a lug (57) arranged to be engaged in a second grip resource (27) on a side face of the body (20) of the implant (2) and allowing to act as a lever arm for positioning the implant (2) between the vertebrae. Preferably, the second grip resource (27) comprises a housing (270) for receiving a stud of the tab (57) of the guide, so as to improve the grip of the implant (2) by the instrumentation. Such a second grip resource (27) may for example comprise a groove (27) receiving the tab (57) and equipped with a housing (270) for the stud, as particularly seen in 1B, 2A, 3A, 3B, 5C, 8A, 8B and 8C. One can provide only the second grip resource (27) formed by the groove and the housing for receiving the lug and tab, but it is generally preferred to combine both resources for ease of manipulation of the implant, particularly if it is desired to do an implantation with 90° rotation around the longitudinal axis of the guide. Note that the rod (56) of the guide may have an orientation which is not parallel to the axis of the guide along the entire length of the rod (such as seen in FIGS 8A and 8C) and that the housing (26) in the implant receiving this rod will have a complementary orientation (such as shown in FIG 5C). Such an orientation may be obtained by a rod (56) provided with flexibility or with an elbow or joint. In some embodiments, the rod and housing are threaded, but preferably not and it is rather preferred to provide a second grip resource (27) for a good grip and lever arm.

In some embodiments, the gripping end of the guide (5) has shapes complementary to the posterior part of the implant (5), with at least one surface oriented in a plane not perpendicular to the longitudinal axis of the guide and passing through two axes perpendicular to the longitudinal axis of the guide (5), to facilitate rotation of the implant around the longitudinal axis. Indeed, as mentioned previously, the surface (25) around the passage of the implant may form a housing in which the retaining stops will not protrude from the implant. This type of arrangement, by providing that the (or each) surface (25) is oriented in a plane not perpendicular to the longitudinal axis of the implant and passing through two axes perpendicular to said longitudinal axis, provides support to facilitate the rotation of the implant by relieving the forces exerted on the gripping means (56, 57).

In some embodiments, the head (40) of the impactor is traverses by a passageway capable of completely accommodating at least one holder (3) and to allow its removal through the end of the head which is opposite to that equipped with the two arms (401, 402). Moreover, in some embodiments, such as seen in Figures 7A, 7B and 7C, the holder (3) has, at its end opposite to that guiding the anchoring device (1), a housing (32) (or notch) arranged to accommodate the front of the guiding end of another holder (3), which may have an inversed orientation. Thus, if one wishes to install two anchors through the passages of an implant, one could mount a first holder (3) holding a first anchor (1) on the arms of the impactor and then impact the anchor through the implant mounted on the guide. Then one moves the impactor backward, with the first holder (3) which will have slid along the arms, and then puts on a second holder (3), in an orientation opposite to that of the first if the implant has two passages with opposite orientations. The second holder, holding a second anchor (1) is then mounted on the arms of the impactor, and pushes the first holder back in the head (40) of the impactor. By impacting the second anchor, the second holder pushes the first holder inside of the impactor's head by itself sliding along the arm. The impactor is then removed and contains the two holders (3) that can be removed, for example by an opening (43) provided at the opposite side of the head of the impactor (the side opposite to that provided arms), such as seen in Figure 9A. The head of the impactor is therefore preferably a passageway capable of completely accommodating at least one holder (3) to allow for removal at the end of the head which is opposite to that equipped with two arms (401, 402). Note that a lateral window can be provided on the head to help remove the holders.

In some embodiments, such as visible for example in Figures 7A, 7B and 7C, the holder comprises, on each of the upper and lower surfaces of its body (300), which are spaced apart by a distance greater than or equal to the height of arms (401, 402) of the impactor (4), a plate (34) of width greater than that of the body (300), to stabilize the holder (3) on the arms (401, 402) of the impactor (4). In some embodiments, the head of the impactor (4) has,

in the passageway that crosses it, two grooves (434) to accommodate the edges of the plate (34), such as particularly shown in FIG 9B. Preferably, the width of the plate is less than that of the anchoring device (1). Preferably, the plates end by flexible tabs (340) provided with a boss to pinch the impactor's arm (4), so as to stabilize the holder on the impactor when preparing instrumentation.

In some embodiments, such as shown in Figures 7A, 7B and 7C, the holder (3) has at least one ridge (31) on which the slot (11) of the anchor (1) can be fitted, so that the anchor is then maintained more reliably, for example waiting to get the holder on the impacteur and the impactor in the head of the guide (5). This ridge is preferably formed by an edge of a front portion between the guide surface (30) and a plate (34) of the holder. The anchor then rests on the guide surface (30) which maintains it horizontally and is retained by the ridge retains it laterally (the plate (340) of the holder may also be capable of maintaining the anchor horizontally). This ridge (31) is preferably disposed between two surfaces oriented with an angle between them which is adapted to the size and shape of the slot (11) of the anchor (1). Preferably, these surfaces are complementary to the slot (11) or form a structure to block the anchor on it, for example in the manner of a Morse taper.

METHODS:

Other potential objects of the present invention relate to various embodiments of methods of preparing for an implantation of, and/or methods for implanting, intervertebral implant (2) into an intervertebral space and for preparing the fixation of, and/or for fixing, the implant to at least one vertebra. These methods may comprise a step of assembling the implant (2) onto a guide (5), a step of mounting the anchor (1) on a holder (3), a step of mounting the holder on the impactor, and a step of placing the impactor (4) relative to the guide, for example up to a penetration, at least partial, of the holder in the head of the guide (5). These various steps can be implemented

in different orders, thanks to the arrangement of various objects of the invention, as described in various embodiments discussed in the present application.

In various embodiments, these methods for preparing the implantation may comprise :

providing an anchoring device (1) in accordance with an embodiment discussed in this present application;

providing a spinal implant (2) in accordance with an embodiment discussed in this present application;

providing an implantation instrument (3, 4, 5) in accordance with an embodiment discussed in this present application;

gripping the spinal implant (2) and/or anchor with the implantation instrument (3, 4, 5);

In various embodiments, these methods for preparing the implantation may further comprise a step of introducing at least one anchoring device (1) within the instrument (3, 4, 5).

In various embodiments, these methods for implanting a spinal implant (i.e., for inserting the implant within a disc space or onto vertebrae) may comprise the steps of the methods for preparing the implantation and may further comprise:

inserting the spinal implant (2) in an intervertebral space between adjacent vertebrae of a spinal column (or onto adjacent vertebrae of a spinal column in the case of an osteosynthesis plate);

presenting the anchoring device (1) along an approach axis that is substantially perpendicular to the axis of the spine (at the level of the adjacent vertebrae);

using the impactor (4) of the implantation instrument (3, 4, 5), inserting the anchoring device (1) through the guide head (53) of the guide (5) of the implantation instrument (3, 4, 5) and through

the passage (21) in the implant (2), with the anchoring device (1) traversing at least a portion of the implant (2); and

using the impactor (4) of the implantation instrument (3, 4, 5), fully inserting the anchoring device (1) through the implant (2) and implanting at least part of the anchoring device (1) in one of the adjacent vertebrae.

Note that, in the case of several anchors for an implant, the step of mounting the anchor on the holder and of implanting the anchor can be repeated, for example with a step of positioning the second holder with an inversed orientation compared to the first holder.

Most technical problems solved by various technical features described in the present application may be related to the problem(s) of stability and/or invasiveness mentioned in the preamble of this present disclosure. After appreciating this disclosure, a person of skill in the art may design various embodiments combining the technical features described in this application.

Each of these technical features or of these elements, described in at least one embodiment or configuration and discussed below, may be isolated from other technical features of the object concerned by (or the objects concerned by and/or associated with) said embodiment or configuration (and thus concerning the same or another element) and/or may be combined with any other technical feature described herein, in various embodiments or configurations, unless explicitly stated otherwise, or unless these features are incompatible and/or their combination is not functional, in particular because the structural adaptations that may be required by such isolation or combination of features are directly derivable from the appreciation of the functional considerations provided by the present disclosure.

After fully appreciating this disclosure, a person skilled in the art will understand that numerous embodiments and/or configurations in various other specific forms are possible and within the scope of the invention. Consequently, the present embodiments and/or configurations should be considered as non-limiting illustrative examples that may be modified and still be within the scope of the attached claims, and the invention should not be limited to the details provided above.

CLAIMS

1. Device (1) for anchoring at least one intervertebral implant (2) into at least one vertebra, said device being intended to be inserted, from the periphery of the spine, through a passage (21) passing through at least a portion of the implant (2), the device (1) having a body comprising at least one curved and rigid plate (10), elongated along a longitudinal axis (L) extending between a front end and a rear end, the plate (10) being configured so that its front end enters at least one vertebra while its rear end remains in the passage (21) of the implant (2), pressing said implant (2) against said vertebra thanks to at least one stop (14, 140), called retaining stop, oriented not parallel to the longitudinal axis (L) of the plate (10) and pressing against a complementary surface (25) of the implant (2), the device (1) being characterized in that the plate (10) comprises at least one slot (11), oriented substantially parallel to its longitudinal axis (L) and separating at least a rear portion of the plate (10) into two branches (12, 13).

2. Device (1) according to claim 1, characterized in that at least one of said branches (12, 13) comprising at least one withdrawal stop (15, 150), oriented non-parallel to the longitudinal axis (L) of the plate (10) and configured to cooperate with a complementary surface of the implant (2) and retain the device (1) in the implant (2).

3. Device (1) according to one of claims 1 or 2, characterized in that said slot (11) separates the plate (10) in its thickness.

4. Device (1) according to one of claims 1 to 3, characterized in that said slot (11) separates the plate (10) in its width.

5. Device (1) according to any preceding claim, characterized in that said slot (11) is configured, relative to said rear portion of the plate (10), to allow approximation of the two branches (12, 13) together, when pressure is exerted thereon.

6. Device (1) according to the preceding claim, characterized in that said slot (11) is configured to allow approximation of the two branches (12, 13) together, when pressure is exerted thereon, thanks to its length and/or its width and/or its shape.

7. Device (1) according to any preceding claim, characterized in that the width of said slot (11) varies along the longitudinal axis (L) of the plate (10).

8. Device (1) according to any preceding claim, characterized in that the front end comprises at least one chamfer (18) or at least one bevel facilitating the penetration of the device (1) in the vertebrae.

9. Device (1) according to any preceding claim, characterized in that the front end comprises at least one notch facilitating the penetration of the device (1) in the vertebrae.

10. Device (1) according to any preceding claim, characterized in that the body (10) is provided with notches (16) oriented so as to oppose the withdrawal of the device (1) when implanted in a vertebra.

11. Device (1) according to one of the preceding claims, characterized in that said retaining stop (14) comprises at least one abutment surface oriented substantially facing the front end face, intended to cooperate with at least one abutment surface (25) on the implant (2) that the device (1) is intended to be fixed, and to retain the implant plate (2) against the vertebra in which the device (1) is intended to be anchored.

12. Device (1) according to one of the preceding claims, characterized in that the retaining stop (14) comprises at least one projecting tab on at least one side and/or at least one edge of the plate (10).

13. Device (1) according to any preceding claim, characterized in that at least one withdrawal stop (15) is projecting from at least one of the branches (12, 13) of the device (1), on the side opposite to said slot (11).

14. Device (1) according to the preceding claim, characterized in that said withdrawal stop (15) projecting from a branch (12, 13) of the device (1), on the side opposite to said slot (11), comprises at least one beveled surface on its front end, so as to form a slope facilitating insertion of the device (1) in the implant (2) and allowing a progressive approach g of the branches (12, 13) the device (1) to each other, by the contact of this beveled surface with a wall of the passage (21) in the implant (2).

15. Device (1) according to any preceding claim, characterized in that it comprises at least one grip arrangement (141) on at least one of the branches (12, 13) configured to hang the end of a tool for the withdrawal of the anchor, allowing to approach the two branches (12, 13) from each other, so as to disengage said at least one withdrawal stop (15).

16. Device (1) according to one of the preceding claims, characterized in that the curved plate (10) of the body describes at least one circular or elliptical arc having dimensions and at least a radius of curvature configured so that the anchoring device (1) is implantable in a vertebral plate along an axis of approach forming an angle of approximately 90° with the vertical axis of the spine, by presenting its longitudinal axis (L) substantially in the plane of the space Intervertebral.

17. Device (1) according to one of claims 3 to 16, characterized in that, on the one hand, said plate (10) defines, by its curvature, a mean arc (AM) between its two ends and, on the other hand, the two branches (12, 13) are offset with respect to each other, each on an opposite side of the mean arc (AM).

18. Device (1) according to one of claims 3 to 16, characterized in that the two branches (12, 13) have shapes complementary to each other, configured such that at least a rear portion of the two branches (12, 13) can cover each other, at least partially, without increasing the total thickness of the device, when the two branches are brought close to each other.

19. Device (1) according to one of claims 3 to 18, characterized in that said slot (11) is formed in the thickness of the plate (10) but in a plane not perpendicular to the width of the plate (10).

20. Device (1) according to one of claims 3 to 19, characterized in that said slot (11) deviates from the longitudinal axis by describing a curvature.

21. An intervertebral implant (2) comprising a body (20) in which at least one part, referred to as rear part, comprises at least one passage (21) configured to accommodate at least one anchoring device (1) according to any preceding claim, so as to allow the passage of the rigid anchoring device (1) without deformation despite its curvature, this passage (21) passing through the implant (2) from the periphery to a top or bottom surface, along a rectilinear and oblique path adapted to the curvature of the anchoring device (1), inserted substantially in the plane of the implant (2), so as to orient the anchoring device (1) in the direction of the endplate of one of the vertebrae between which the implant (2) is designed to be implanted, characterized in that the passage (21) comprises at least one surface complementary to at least one withdrawal stop (15) of the anchoring device (1) according to any of claims 2 to 20 .

22. An implant (2) according to the preceding claim, characterized in that the rear part which includes the passage (21) for the anchoring device (1) comprises, around the passage (21), at least one housing whose surfaces (25) are configured to accommodate at least one retaining stop (14) of the anchoring device (1) without the latter protruding from the body (20) of the implant (2).

23. An implant (2) according to one of claims 21 and 22, characterized in that the rear part which includes the passage (21) for the anchoring device (1) comprises, around the passage (21), at least one housing whose surfaces (25) are configured to provide access to grip arrangement (141) of the anchoring device (1), so as to hang the end of a tool for withdrawing the

anchor, by moving the two branches (12, 13) from each other to disengage said at least one withdrawal stop (15).

24. An implant (2) according to one of claims 21 to 23, characterized in that the body (20) has, close to the rear part, at least one grip arrangement (26, 27) for a tool (5) for implanting the implant (2),

25. An implant (2) according to one of claims 21 to 24, characterized in that the rear part comprises two passages (21) each oriented toward one of the upper and lower surfaces of the implant (2), so as to allow anchoring of an anchoring device (1) in each of the vertebrae between which the implant (2) is intended to be implanted.

26. An implant (2) according to one of claims 21 to 25, characterized in that the body (20) comprises a front part, opposite to the rear part containing the passage (21), which comprises at least a beveled portion (29), so to facilitate insertion of the implant (2) between the vertebrae.

27. An implant (2) according to one of claims 21 to 26, characterized in that it constitutes a cage, with the body (20) elongated along a longitudinal axis, traversed by at least one hole (23, 24) and comprising at least two lateral faces, an upper surface, a bottom surface, a rear part and a front part, the shapes and dimensions of the body (20) being configured for implantation of the implant through a posterior or transforaminal pathway.

28. An implant (2) according to claim 27, characterized in that at least one of the upper and/or lower are provided with notches (22) opposing the sliding of the implant (2) between the vertebrae.

29. An implant (2) according to one of claims 27 and 28, characterized in that at least a portion of at least some of the junctions between the side faces and upper and lower surfaces is beveled to facilitate rotation of the implant between the vertebrae upon insertion of the implant (2) in a position rotated 90°, around its longitudinal axis, relative to the final position in which

the upper and lower surfaces are in contact with the adjacent vertebrae between which the implant (2) is designed to be implanted.

30. Instrumentation (3, 4, 5) for implantation, between adjacent vertebrae, of an intervertebral implant (2) according to one of the preceding claims, and for implantation, in at least one of these vertebrae, of at least one anchoring device (1), called anchor, according to one of the preceding claims, said instrumentation being characterized in that it comprises:

- At least one holder (3) comprising a body (300) having a width smaller than the width of said anchor (1) and comprising at least one guiding surface (30) having at least one radius of curvature substantially identical to at least one radius of curvature of the plate (10) of said anchor (1), to accommodate and guide the latter during the implantation;

- At least one impactor (4) comprising a head (40) adapted to receive the holder (3), with two arms (401, 402) of length greater than the length of the body (300) of the holder (3) and spaced by a distance greater than or equal to the width of the body (300) of the holder, so as to allow to push, by sliding the impactor (4) along the holder (3), the anchor (1) held on the holder (3);

- At least one guide (5) of elongate shape along a longitudinal axis extending between a first end, called gripping end, for gripping the implant (2), and a second end, called pushing end, the gripping end having a head (50) provided, at its end, with at least one gripping arrangement (56, 57) intended to cooperate with at least one holding arrangement (26, 27) of the implant (2), the head (50) being traversed by a longitudinal passage leading to the implant and having a shape and dimensions configured to accommodate, at least partially, the body (300) of the holder (3) and the arms (401, 402) of the impactor (4), the passage of the head comprising at least one surface (53) for guiding said anchoring device (1), complementary to the guiding surface (30) of the holder (3), so as to guide said anchoring device (1) between these two guide surfaces (30, 53) of the guide and the holder,

during sliding of the impactor (4) along the holder (3) into the head (50) of the guide (5).

31. Instrumentation (3, 4, 5) according to the preceding claim, characterized in that the impactor (4) has guide arrangement (49) for guiding the sliding of the impactor (4) along the longitudinal axis of guide (5).

32. Instrumentation (3, 4, 5) according to one of claims 30 and 31, characterized in that the gripping arrangement (56, 57) comprises a gripping end of a rod (56) sliding in a body (51) of the guide (5) when actuated by a handle or knob (52), into and out of a housing (26) of the implant (2) forming an arrangement for attaching the gripping arrangement.

33. Instrumentation (3, 4, 5) according to the preceding claim, characterized in that the rod (56) has a threaded end cooperating with an internal thread of the housing (26) for securing the implant (2) when the rod is actuated by the handle or knob (52).

34. Instrumentation (3, 4, 5) according to one of claims 30 to 33, characterized in that the gripping arrangement (56, 27) comprises, firstly, a gripping end of a rod (56), sliding in a body (51) of the guide (5) when actuated by a handle or knob (52), into and out of a housing (26) of the implant (2) forming an arrangement for attaching the gripping arrangement and, secondly, a tab (57) arranged to be engaged a groove (27) on a side face of the body (20) of the implant (2) and allow to act as a lever arm for positioning the implant (2) between the vertebrae.

35. Instrumentation (3, 4, 5) according to the preceding claim, characterized in that the groove (27) comprises a housing (270) for receiving a stud of the tab (57), so as to improve the grip of the implant (2) by the instrumentation.

36. Instrumentation (3, 4, 5) according to one of claims 30 to 35, characterized in that the head (40) of the impactor is traversed by a passage

capable of completely accommodating at least one holder (3) and to allow its removal from the end of the head which is opposite to that equipped with two arms (401, 402).

37. Instrumentation (3, 4, 5) according to one of claims 30 to 36, characterized in that the holder comprises, on each of the upper and lower surfaces of the body (300) which are spaced apart by a distance greater than or equal to the height arms (401, 402) of the impactor (4), a plate (34) of width greater than that of the body, to stabilize the holder (3) on the arms (401, 402) of the impactor (4).

38. Instrumentation (3, 4, 5) according to one of claims 30 to 37, wherein the gripping end of the guide (5) has shapes complementary to the rear part of the implant, with at least one surface oriented in a plane not perpendicular to the longitudinal axis of the guide (5) but through which pass two axes perpendicular to the longitudinal axis of the guide (5), so as to facilitate a rotation of the implant around the longitudinal axis.

Figure 1A

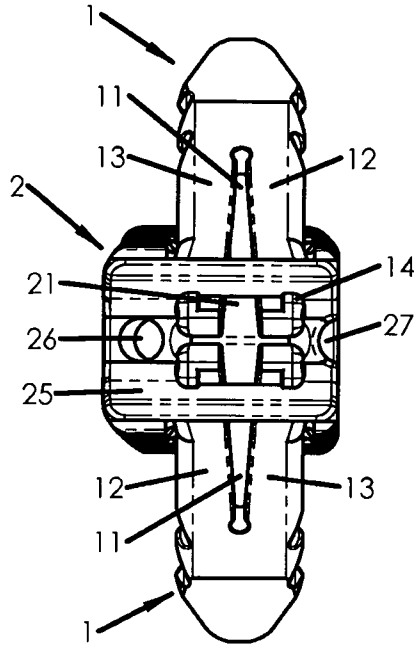


Figure 1B

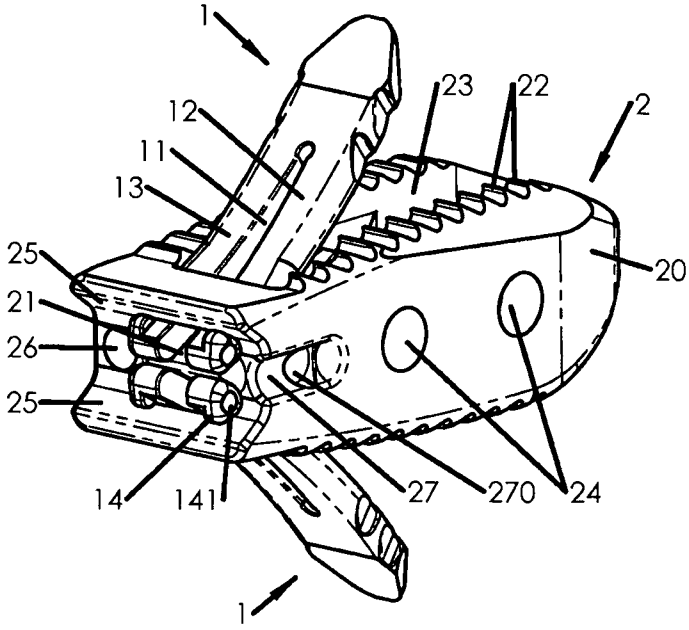


Figure 1C

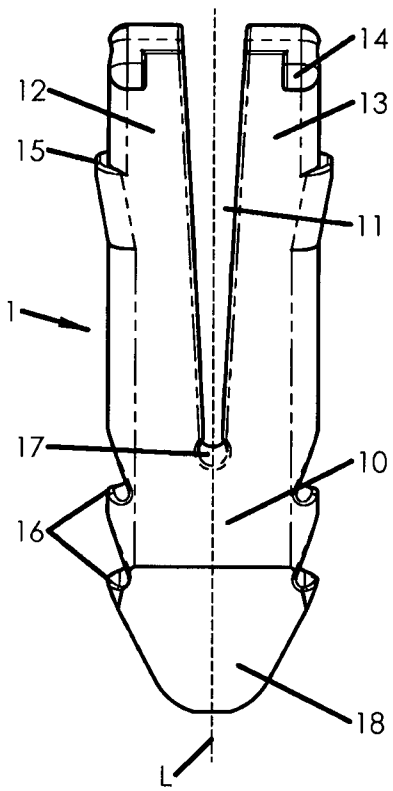


Figure 1D

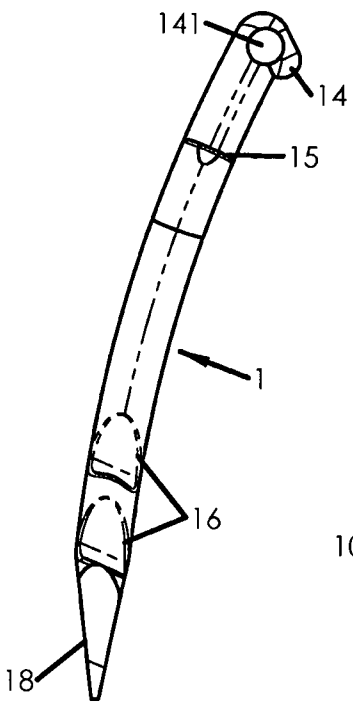


Figure 1E

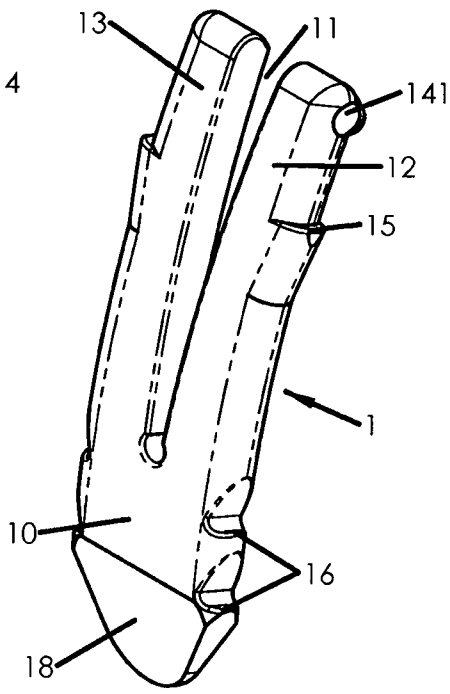


Figure 2A

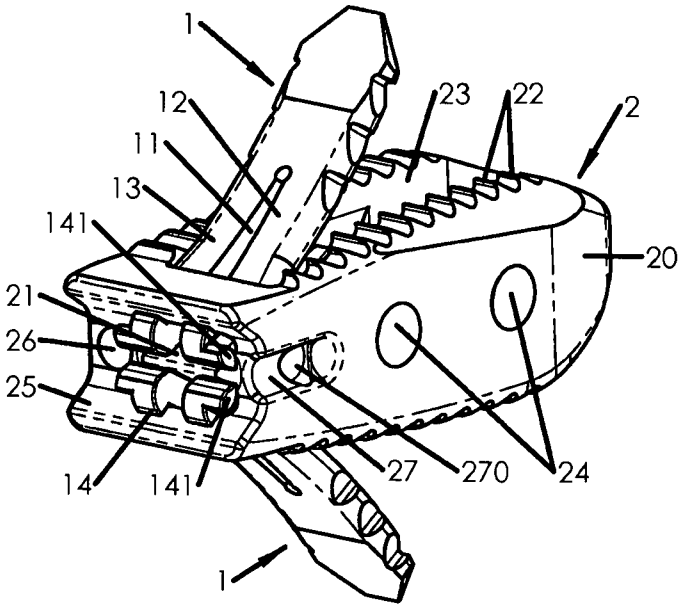


Figure 2B

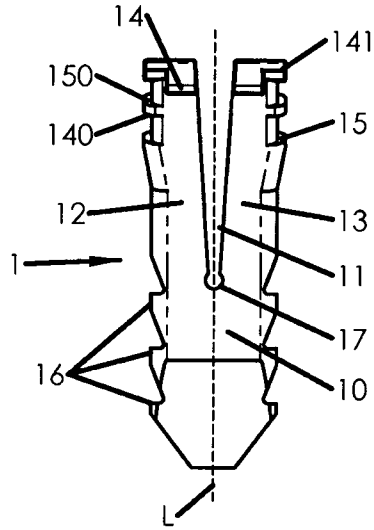


Figure 2C

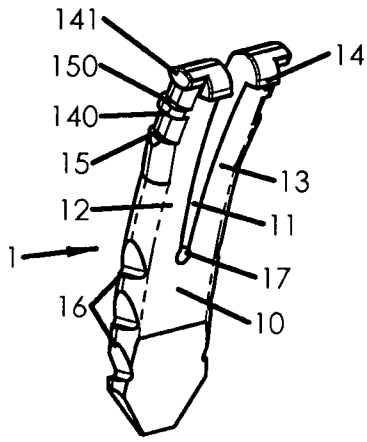


Figure 2D

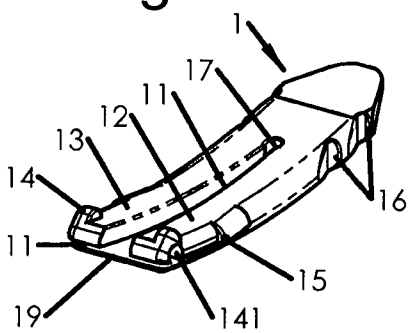


Figure 2E

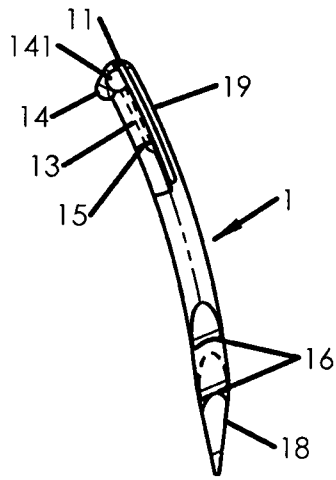


Figure 3A

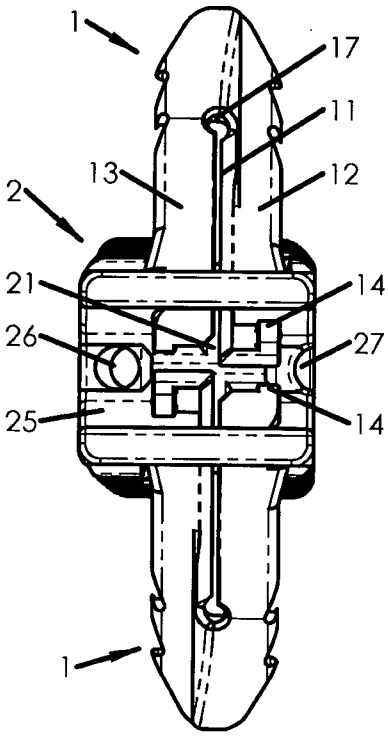


Figure 3B

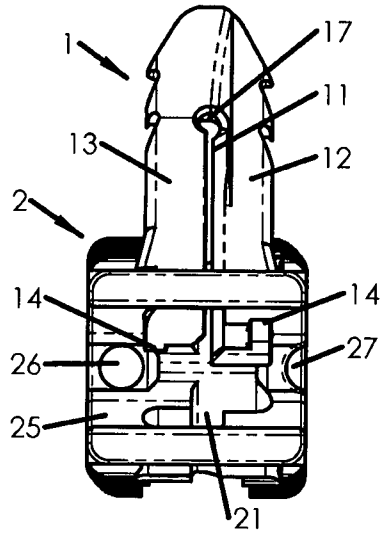
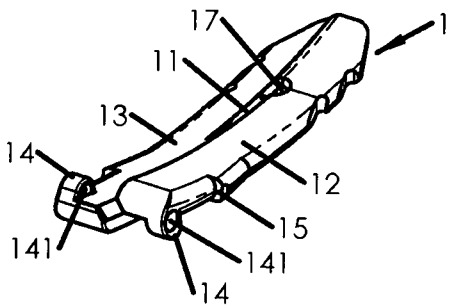


Figure 3C



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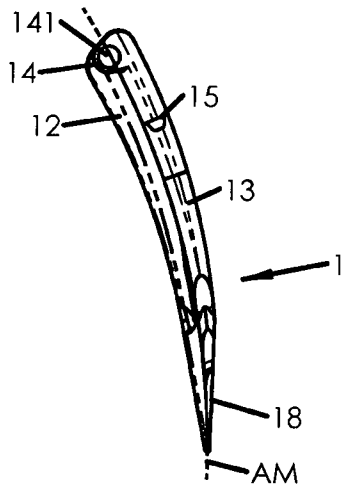

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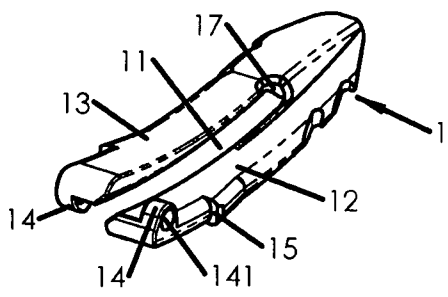

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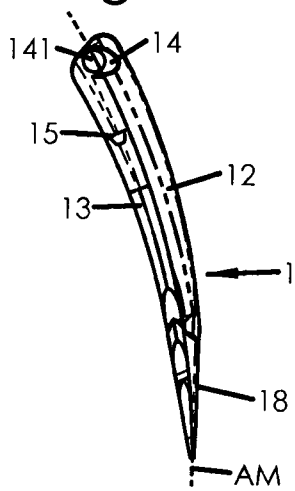


Figure 4A

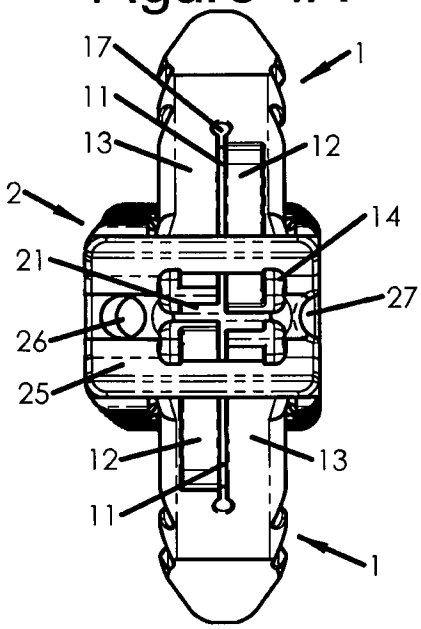


Figure 4B

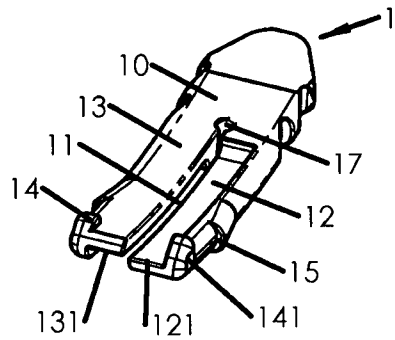


Figure 4C

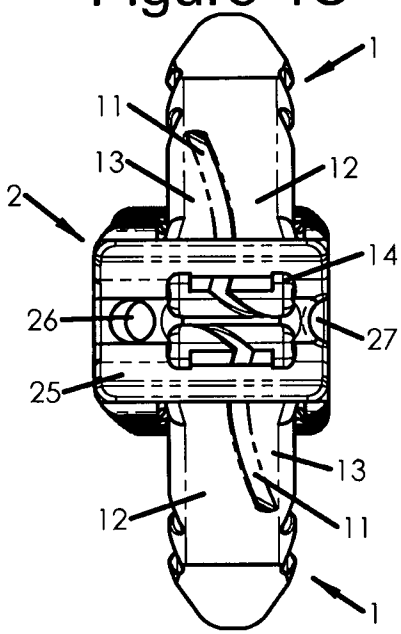


Figure 4D

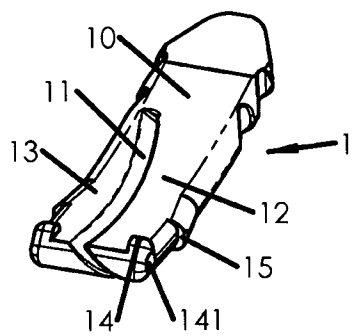


Figure 5A

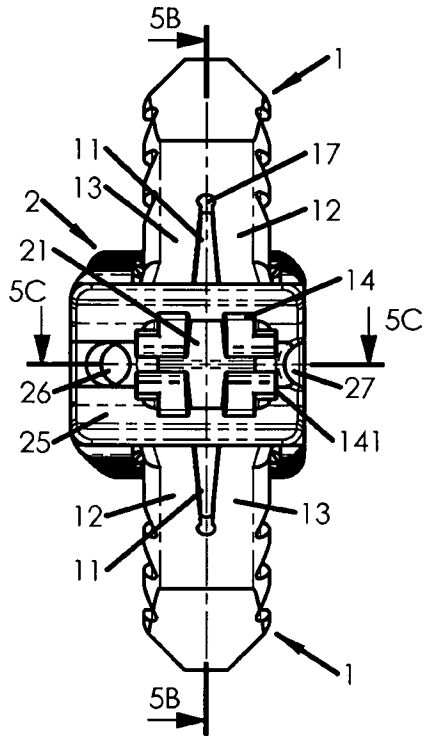
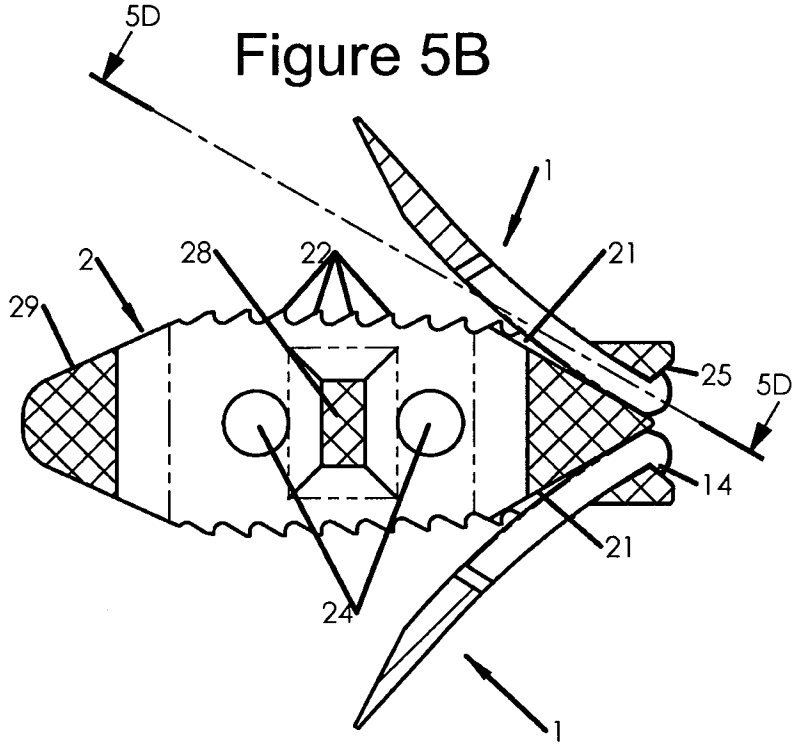


Figure 5B



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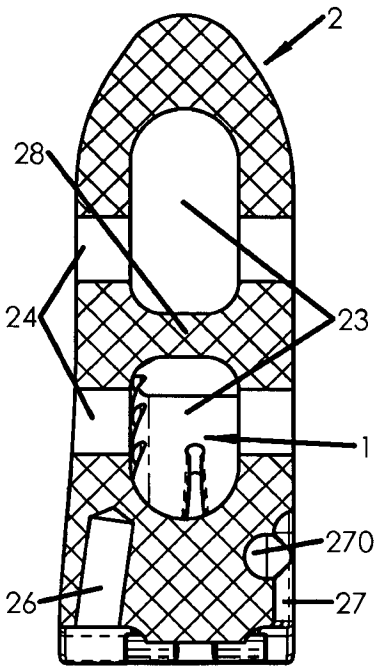

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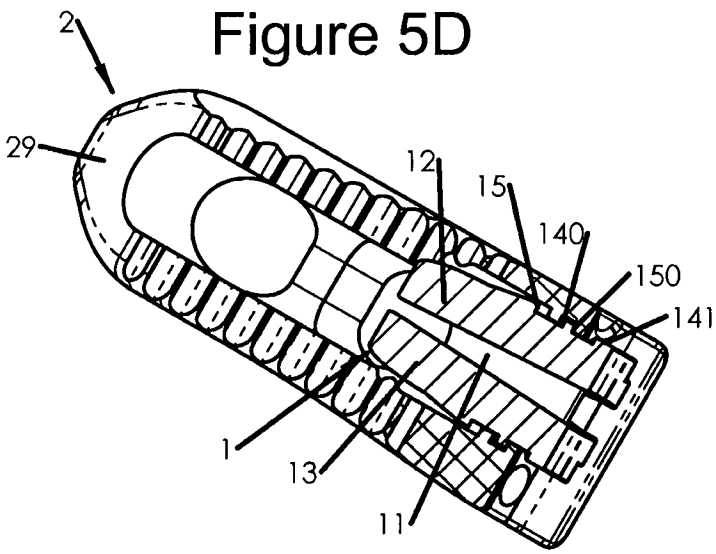


Figure 6A

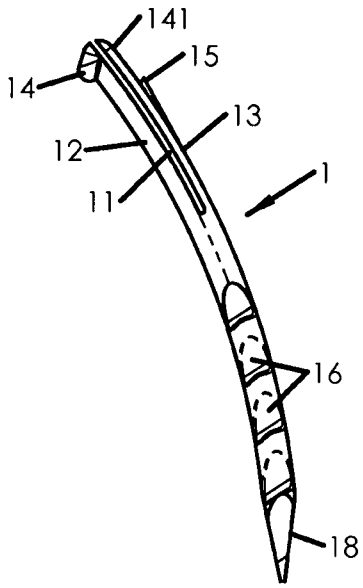


Figure 6B

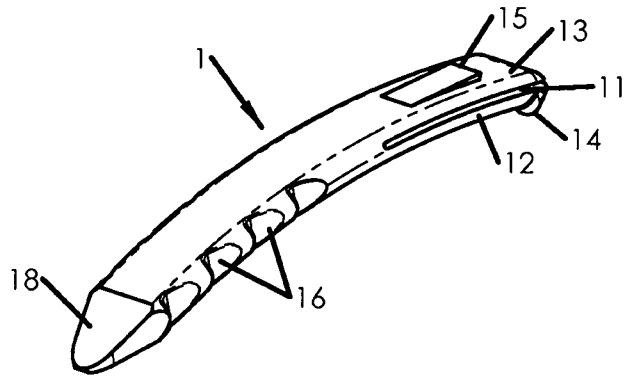
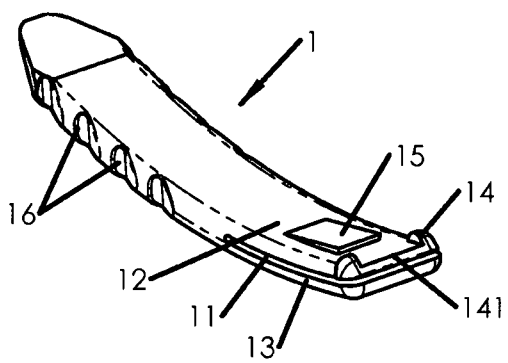


Figure 6C



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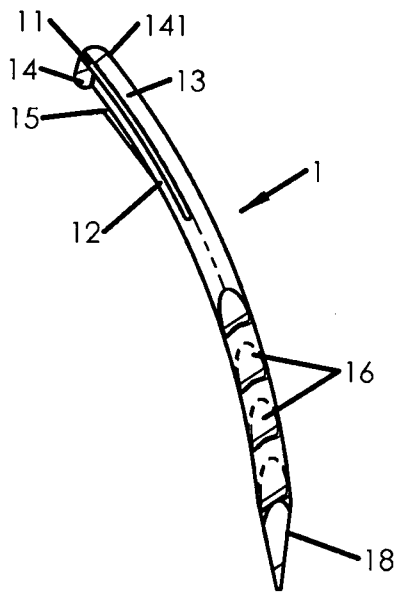
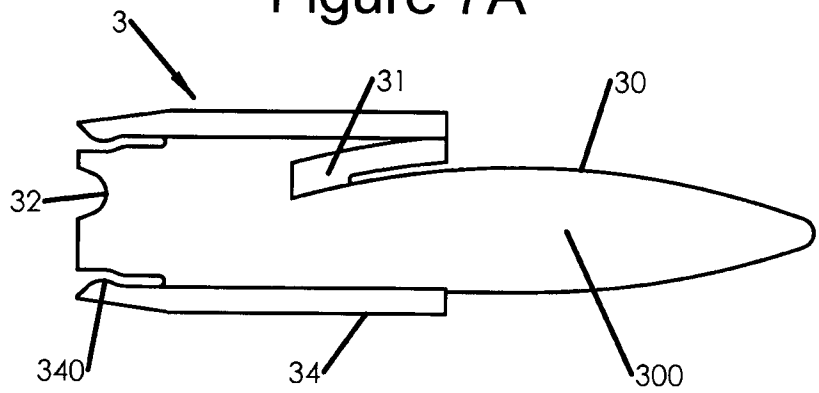


Figure 7A



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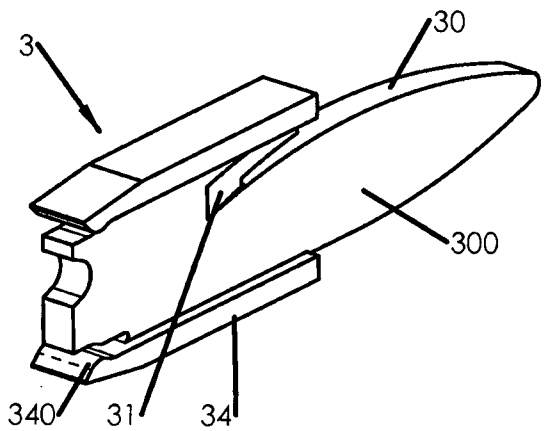


Figure 7C

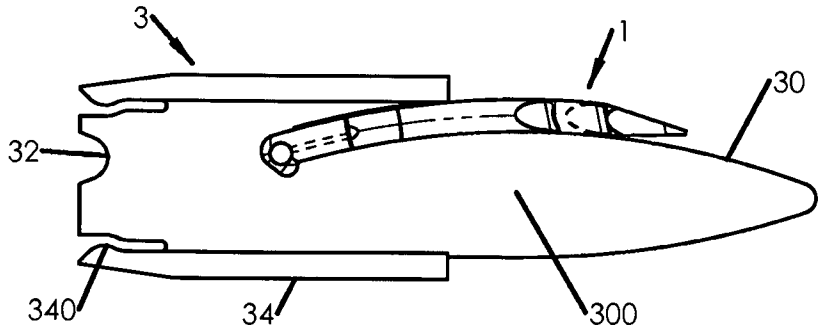
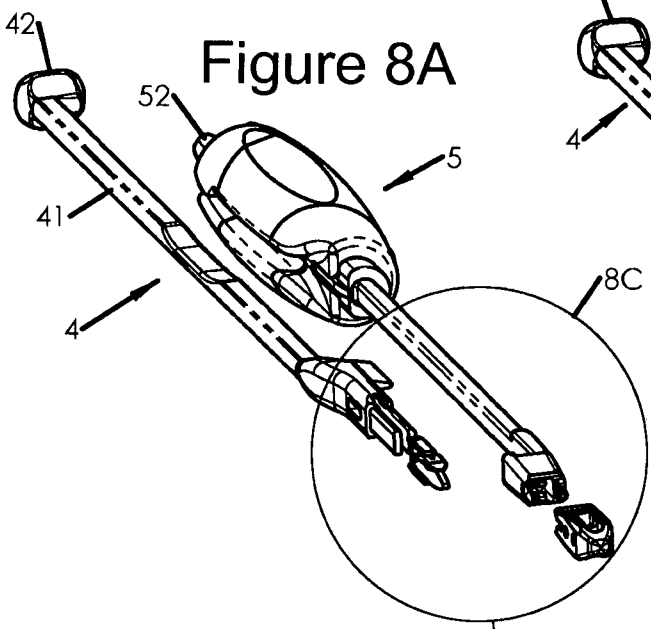


Figure 8A



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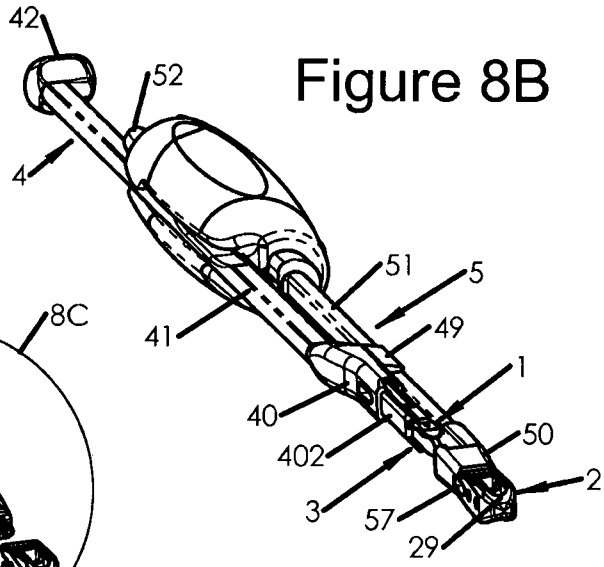

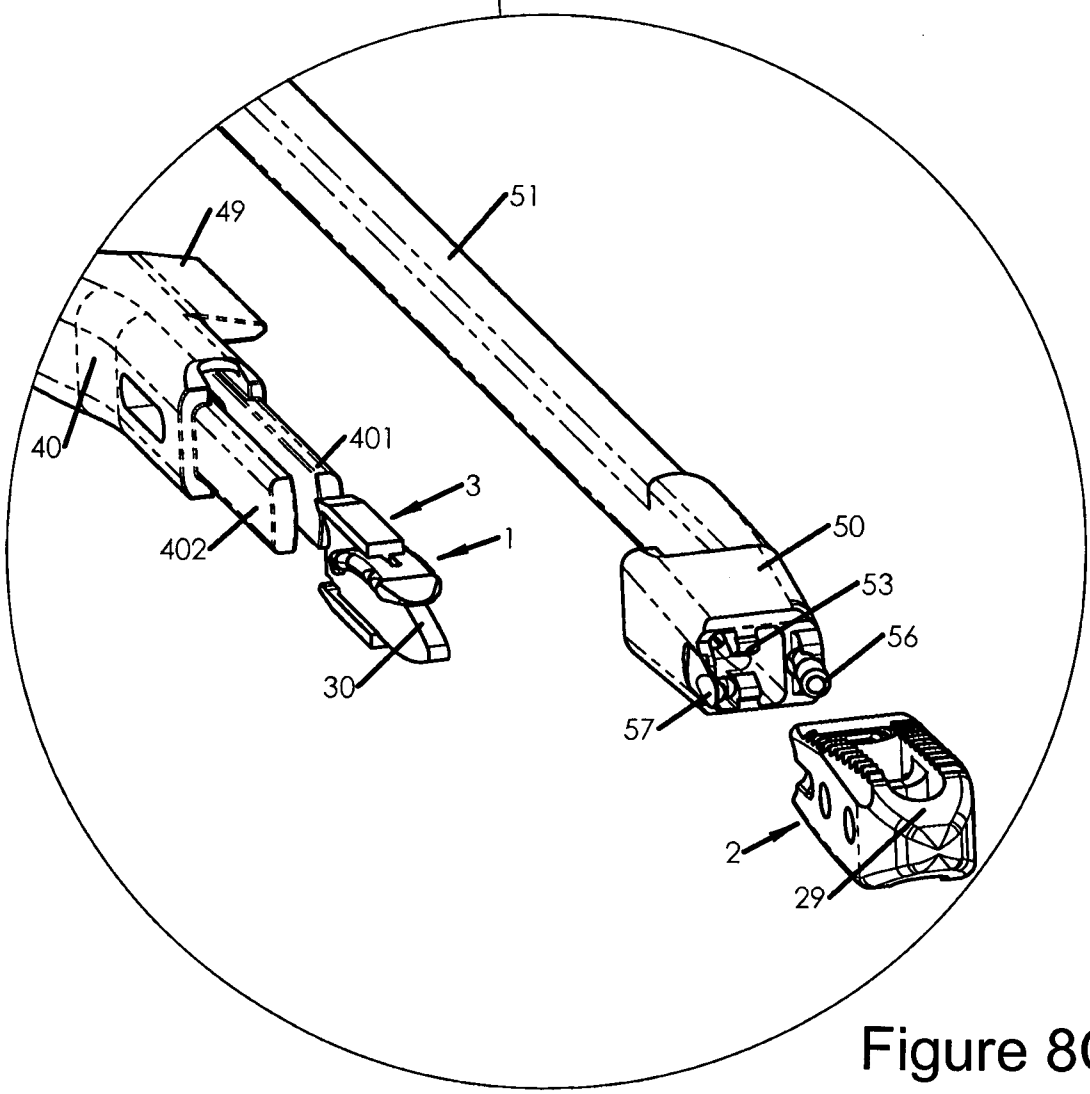

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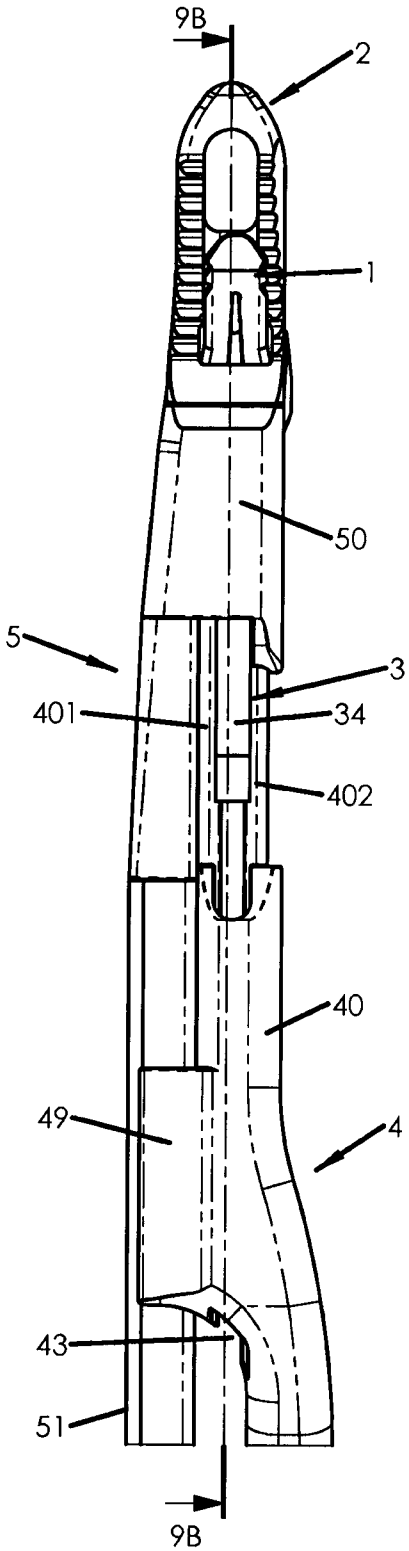

Figure 9A

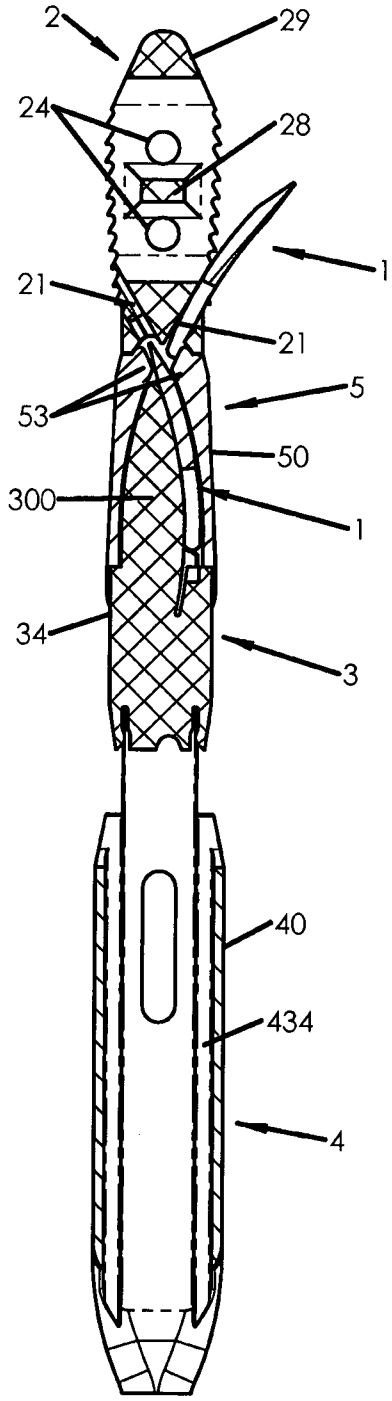

Figure 9B

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/053622

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F2/44
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)
A61F

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/033100 A1 (INTRINSIC THERAPEUTICS INC [US]; LAMBRECHT GREGORY [US]; BOYAJIAN THOM) 12 March 2009 (2009-03-12) figures 30a-30c,31a,b	1-4
A	WO 2010/090801 A2 (INCITE INNOVATION LLC [US]; KIRWAN JOHN M [US]; BROWN R QUINN [US]; PF) 12 August 2010 (2010-08-12) figures 47,49	1
A	WO 2011/129973 A1 (SYNTHES USA LLC [US]; SYNTHES GMBH [CH]; DONNER THOMAS [US]; SCHOENLY) 20 October 2011 (2011-10-20) figure 6A	1

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

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"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
21 May 2013	29/05/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Korth, C

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2013/053622

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2009033100 A1	12-03-2009	US 2010049259 A1	25-02-2010
		US 2011196492 A1	11-08-2011
		WO 2009033100 A1	12-03-2009
WO 2010090801 A2	12-08-2010	EP 2381899 A2	02-11-2011
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		WO 2010090801 A2	12-08-2010
WO 2011129973 A1	20-10-2011	CA 2789803 A1	20-10-2011
		CN 102843995 A	26-12-2012
		EP 2558036 A1	20-02-2013
		US 2011098747 A1	28-04-2011
		WO 2011129973 A1	20-10-2011

(19)中华人民共和国国家知识产权局

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WO2013/124453 EN 2013.08.29
(71)申请人 LDR医疗公司
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(74)专利代理机构 北京纪凯知识产权代理有限公司 11245
代理人 赵蓉民 董巍
(51)Int.Cl.
A61F 2/44(2006.01)

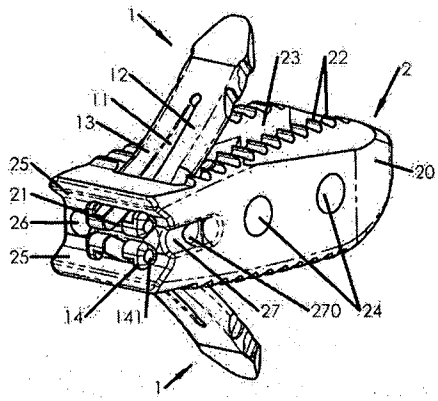
权利要求书4页 说明书30页 附图11页

(54)发明名称

用于椎间植入物的锚定装置和系统、椎间植入物以及植入仪器

(57)摘要

本发明涉及一种用于椎间植入物的锚定装置、椎间植入物和仪器植入的各种实施例，共享该特征以与锚定装置(1)配合，该锚定装置(1)包括主体，其包括至少一个弯曲且刚性的板(10)，该主体沿纵向轴线(L)伸长，使得其前端进入至少一根椎骨，而其后端通过用至少一个保持止动件(14)按压所述植入物(2)靠着所述椎骨保持在植入物(2)的通道(21)中，该装置(1)的特征在于板(10)包括至少一个纵向狭槽(11)，该至少一个纵向狭槽(11)分离所述板(10)的至少一个后面部分为两个分支(12、13)，所述两个分支中的至少一个包括至少一个经配置保持装置(1)在植入物(2)中的撤回止动件(15)。



CN 104135971 A

1. 用于将至少一个椎间植入物 (2) 锚定到至少一根椎骨中的装置 (1)，所述装置意在从该脊柱的外周通过穿过所述植入物 (2) 的至少一部分的通道 (21) 被插入，该装置 (1) 具有沿在前端和后端之间延伸的纵向轴线 (L) 是细长的主体，该主体包括至少一个弯曲且刚性的板 (10)，该板 (10) 经配置使得其前端进入至少一根椎骨而其后端保持在所述植入物 (2) 的所述通道 (21) 中，从而由于至少一个止动件 (14、140) 按压所述植入物 (2) 靠着所述椎骨，其中所述止动件即所谓的保持止动件，所述止动件经取向不平行于所述板 (10) 的所述纵向轴线 (L) 且压靠所述植入物 (2) 的互补表面 (25)，该装置 (1) 的特征在于所述板 (10) 包括至少一个狭槽 (11)，所述至少一个狭槽 (11) 经取向基本平行于其纵向轴线 (L) 且将所述板 (10) 的至少一个后部分离为两个分支 (12、13)。

2. 根据权利要求 1 所述的装置 (1)，其特征在于所述分支 (12、13) 中的至少一个包括至少一个撤回止动件 (15、150)，其经取向不平行于所述板 (10) 的所述纵向轴线 (L) 且经配置与所述植入物 (2) 的互补表面配合并保持所述装置 (1) 在所述植入物 (2) 中。

3. 根据权利要求 1 或权利要求 2 之一所述的装置 (1)，其特征在于所述狭槽 (11) 在其厚度上分离所述板 (10)。

4. 根据权利要求 1 至权利要求 3 之一所述的装置 (1)，其特征在于所述狭槽 (11) 在其宽度上分离所述板 (10)。

5. 根据任何前述权利要求所述的装置 (1)，其特征在于所述狭槽 (11) 相对于所述板 (10) 的所述后部被配置成当压力被施加在其上时允许所述两个分支 (12、13) 逼近在一起。

6. 根据前一权利要求所述的装置 (1)，其特征在于所述狭槽 (11) 经配置由于其长度和 / 或其宽度和 / 或其形状而当压力被施加在其上时允许所述两个分支 (12、13) 逼近在一起。

7. 根据任何前述权利要求所述的装置 (1)，其特征在于所述狭槽 (11) 的宽度沿所述板 (10) 的所述纵向轴线 (L) 变化。

8. 根据任何前述权利要求所述的装置 (1)，其特征在于所述前端包括促进所述装置 (1) 在所述椎骨中穿透的至少一个倒角 (18) 或至少一个斜角。

9. 根据任何前述权利要求所述的装置 (1)，其特征在于所述前端包括促进所述装置 (1) 在所述椎骨中穿透的至少一个凹口。

10. 根据任何前述权利要求所述的装置 (1)，其特征在于所述主体 (10) 具有凹口 (16)，所述凹口 (16) 被取向成当被植入到椎骨中时反抗所述装置 (1) 的撤回。

11. 根据前述权利要求之一所述的装置 (1)，其特征在于所述保持止动件 (14) 包括至少一个邻接表面，其经取向基本面向所述前端面，意在与意在要固定所述装置 (1) 的所述植入物 (2) 上的至少一个邻接表面 (25) 配合，且保持所述植入物板 (2) 靠着其中意在锚定所述装置 (1) 的所述椎骨。

12. 根据前述权利要求之一所述的装置 (1)，其特征在于所述保持止动件 (14) 包括在所述板 (10) 的至少一侧和 / 或至少一边缘上的至少一个突出调整片。

13. 根据任何前述权利要求所述的装置 (1)，其特征在于至少一个撤回止动件 (15) 在与所述狭槽 (11) 相反的一侧上从所述装置 (1) 的所述分支 (12、13) 中的至少一个突出。

14. 根据前述权利要求所述的装置 (1)，其特征在于在与所述狭槽 (11) 相反的一侧上从所述装置 (1) 的一分支 (12、13) 突出的所述撤回止动件 (15) 包括在其前端上的至少一个成斜角表面，以便形成斜坡，从而通过这个成斜角表面与所述植入物 (2) 中的所述通道

(21) 的壁的接触，来促进所述装置 (1) 在所述植入物 (2) 中的插入并允许所述装置 (1) 的所述分支 (12、13) 向彼此的渐进接近。

15. 根据任何前述权利要求所述的装置 (1)，其特征在于其包括在所述分支 (12、13) 中的至少一个上的至少一个抓持布置 (141)，其经配置悬挂用于所述锚撤回的工具的一端，从而允许所述两个分支 (12、13) 彼此接近，以便脱开所述至少一个撤回止动件 (15)。

16. 根据前述权利要求之一所述的装置 (1)，其特征在于所述主体的所述弯曲板 (10) 勾勒具有尺寸和至少一个曲率半径的至少一个圆形或椭圆形弧，其经配置使得锚定装置 (1) 通过使得其纵向轴线 (L) 基本在椎间空间的平面中，沿与所述脊柱的竖直轴线形成近似 90° 角度的接近轴线可植入到椎骨板中。

17. 根据权利要求 3 至权利要求 16 之一所述的装置 (1)，其特征在于，一方面，所述板 (10) 通过其曲率限定其两端之间的平均弧 (AM)，另一方面，所述两个分支 (12、13) 相对于彼此偏移，其中各分支在所述平均弧 (AM) 的相反侧上。

18. 根据权利要求 3 至权利要求 16 之一所述的装置 (1)，其特征在于所述两个分支 (12、13) 具有彼此互补的形状，其经配置使得当所述两个分支靠近彼此时，所述两个分支 (12、13) 的至少后部能够至少部分地覆盖彼此，而不增加所述装置的总厚度。

19. 根据权利要求 3 至权利要求 18 之一所述的装置 (1)，其特征在于所述狭槽 (11) 被形成在所述板 (10) 的厚度中，但形成在不垂直于所述板 (10) 的宽度的平面中。

20. 根据权利要求 3 至权利要求 19 之一所述的装置 (1)，其特征在于所述狭槽 (11) 通过勾勒曲率从所述纵向轴线偏离。

21. 一种椎间植入物 (2)，其包括主体 (20)，在所述主体 (20) 中，称为后部的至少一个部分包括至少一个通道 (21)，其经配置容纳至少一个根据任何前述权利要求所述的锚定装置 (1)，以便允许刚性锚定装置 (1) 在即使有曲率也不变形的情况下通入，这个通道 (21) 从外周穿过所述植入物 (2) 到顶表面或底表面、沿适于所述锚定装置 (1) 的所述曲率的直线并倾斜的路径基本上被插入到所述植入物 (2) 的平面中，以便将所述锚定装置 (1) 定向在其间经设计要植入所述植入物 (2) 的椎骨中的一个椎骨的端板的方向上，其特征在于所述通道 (21) 包括与根据权利要求 2 至权利要求 20 中的任一项所述的锚定装置 (1) 的至少一个撤回止动件 (15) 互补的至少一个表面。

22. 根据前一权利要求所述的植入物 (2)，其特征在于包括用于所述锚定装置 (1) 的所述通道 (21) 的所述后部包括围绕所述通道 (21) 的至少一个壳体，其表面 (25) 经配置容纳所述锚定装置 (1) 的至少一个保持止动件 (14) 且后者不从所述植入物 (2) 的所述主体 (20) 伸出。

23. 根据权利要求 21 和权利要求 22 之一所述的植入物 (2)，其特征在于包括用于所述锚定装置 (1) 的所述通道 (21) 的所述后部包括围绕所述通道 (21) 的至少一个壳体，其表面 (25) 经配置提供向所述锚定装置 (1) 的抓持布置 (141) 的通达，以便悬挂用于通过从彼此移动所述两个分支 (12、13) 以脱开所述至少一个撤回止动件 (15) 而撤回所述锚的工具的一端。

24. 根据权利要求 21 至权利要求 23 之一所述的植入物 (2)，其特征在于所述主体 (20) 接近所述后部具有用于植入所述植入物 (2) 的工具 (5) 的至少一个抓持布置 (26、27)。

25. 根据权利要求 21 至权利要求 24 之一所述的植入物 (2)，其特征在于所述后部包括

两个通道 (21)，其中每个通道均朝向所述植入物 (2) 的所述上表面和下表面之一取向，以便允许将锚定装置 (1) 锚定在其间意在植入所述植入物 (2) 的所述椎骨中的每根椎骨中。

26. 根据权利要求 21 至权利要求 25 之一所述的植入物 (2)，其特征在于所述主体 (20) 包括与包含所述通道 (21) 的所述后部相反的前部，所述前部包括至少一个成斜角部分 (29)，以便促进在所述椎骨之间插入所述植入物 (2)。

27. 根据权利要求 21 至权利要求 26 之一所述的植入物 (2)，其特征在于其构成保持架，其中所述主体 (20) 沿所述纵向轴线是细长的，被至少一个孔 (23、24) 横穿并且包括至少两个侧面、上表面、底表面、后部和前部，所述主体 (20) 的形状和尺寸经配置用于通过后面或经椎间孔路径植入所述植入物。

28. 根据权利要求 27 所述的植入物 (2)，其特征在于所述上部和 / 或下部中的至少一个具有凹口 (22)，所述凹口 (22) 反抗所述植入物 (2) 在所述椎骨之间的滑动。

29. 根据权利要求 27 和权利要求 28 之一所述的植入物 (2)，其特征在于所述侧面以及上和下表面之间的至少一些接合处的至少一部分成斜角，以便在所述植入物 (2) 在相对于最后位置围绕其纵向轴线旋转 90° 的位置中被插入时促进所述植入物在所述椎骨之间的旋转，其中在所述最后位置中所述上和下表面与经设计所述植入物 (2) 要被植入其间的邻近椎骨接触。

30. 用于在邻近椎骨之间植入根据前述权利要求之一所述的椎间植入物 (2) 且用于在这些椎骨中的至少一根椎骨中植入根据前述权利要求之一所述的至少一个称为锚的锚定装置 (1) 的仪器 (3、4、5)，所述仪器的特征在于其包括：

——至少一个保持器 (3)，其包括具有的宽度小于所述锚 (1) 宽度的主体 (300) 且包括具有与所述锚 (1) 的所述板 (10) 的至少一个曲率半径基本相同的至少一个曲率半径的至少一个引导表面 (30)，以在所述植入过程中容纳并引导所述锚；

——至少一个冲击器 (4)，其包括适于接收所述保持器 (3) 的头部 (40)，其所具有的两个臂形件 (401、402) 的长度大于所述保持器 (3) 的所述主体 (300) 的长度且所述两个臂形件被一段大于或等于所述保持器的所述主体 (300) 的宽度的距离间隔开，以便允许通过沿所述保持器 (3) 滑动所述冲击器 (4) 来推动被保持在所述保持器 (3) 上的所述锚 (1)；

——沿纵向轴线具有细长形状的至少一个引导件 (5)，所述纵向轴线在用于夹持所述植入物 (2) 的称为抓持端的第一端和称为推动端的第二端之间延伸，所述抓持端具有在其端处设置有至少一个抓持布置 (56、57) 的头部 (50)，所述至少一个抓持布置 (56、57) 意在与所述植入物 (2) 的至少一个保持布置 (26、27) 配合，所述头部 (50) 被通向所述植入物的纵向通道横向穿过，其具有经配置至少部分容纳所述保持器 (3) 的所述主体 (300) 和所述冲击器 (4) 的所述臂形件 (401、402) 的形状和尺寸，所述头部的所述通道包括用于引导所述锚定装置 (1) 的至少一个表面 (53)，所述至少一个表面 (53) 与所述保持器 (3) 的所述引导表面 (30) 互补，以便在所述冲击器 (4) 沿所述保持器 (3) 滑动到所述引导件 (5) 的所述头部 (50) 中的过程中，在所述引导件和所述保持器的这两个引导表面 (30、53) 之间引导所述锚定装置 (1)。

31. 根据前一权利要求所述的仪器 (3、4、5)，其特征在于所述冲击器 (4) 具有用于引导所述冲击器 (4) 沿所述引导件 (5) 的所述纵向轴线滑动的引导布置 (49)。

32. 根据权利要求 30 和权利要求 31 之一所述的仪器 (3、4、5)，其特征在于所述抓持布

置 (56、57) 包括杆 (56) 的抓持端，当由手柄或旋钮 (52) 致动时该杆在所述引导件 (5) 的主体 (51) 中滑动进和出形成用于附接所述抓持布置的布置的所述植入物 (2) 的壳体 (26)。

33. 根据前一权利要求所述的仪器 (3、4、5)，其特征在于所述杆 (56) 具有螺纹端，当所述杆由所述手柄或旋钮 (52) 致动时，该螺纹端与所述壳体 (26) 的内螺纹配合以用于固定所述植入物 (2)。

34. 根据权利要求 30 至权利要求 33 之一所述的仪器 (3、4、5)，其特征在于所述抓持布置 (56、27) 包括：第一，杆 (56) 的抓持端，当手柄或旋钮 (52) 致动时该杆在所述引导件 (5) 的主体 (51) 中滑动进和出形成用于附接所述抓持布置的布置的所述植入物 (2) 的壳体 (26)；和第二，调整片 (57)，其经布置接合在所述植入物 (2) 的所述主体 (20) 的侧面上的凹槽 (27) 并且允许用作在所述椎骨之间定位所述植入物 (2) 的杠杆臂形件。

35. 根据前一权利要求所述的仪器 (3、4、5)，其特征在于所述凹槽 (27) 包括用于接收所述调整片 (57) 的嵌钉的壳体 (270)，以便改进所述仪器对所述植入物 (2) 的夹持。

36. 根据权利要求 30 至权利要求 35 之一所述的仪器 (3、4、5)，其特征在于所述冲击器的所述头部 (40) 由能够完全容纳至少一个保持器 (3) 的并允许其从所述头部的与配备有两个臂形件 (401、402) 的端部相反的端部移除的通道横向穿过。

37. 根据权利要求 30 至权利要求 36 之一所述的仪器 (3、4、5)，其特征在于所述保持器在所述主体 (300) 的所述上和下表面中的每个上包括宽度大于所述主体宽度的板 (34)，以将所述保持器 (3) 稳定在所述冲击器 (4) 的所述臂形件 (401、402) 上，其中所述上和下表面被间隔开一段大于或等于所述冲击器 (4) 的所述臂形件 (401、402) 高度的距离。

38. 根据权利要求 30 至权利要求 37 之一所述的仪器 (3、4、5)，其中所述引导件 (5) 的所述抓持端具有与所述植入物的所述后部互补的形状，其中至少一个表面被取向在不垂直于所述引导件 (5) 的所述纵向轴线的平面中，但两条垂直于所述引导件 (5) 的所述纵向轴线的轴线穿过所述至少一个表面，以便促进所述植入物围绕所述纵向轴线的旋转。

用于椎间植入物的锚定装置和系统、椎间植入物以及植入仪器

技术领域

[0001] 本发明涉及矫形植入物，例如，其特别包括脊柱植入物，如躯体间（或体间）保持架（cage）。躯体间保持架可被植入到两根邻近椎骨之间，用于骨组织移植物（或替代物）在盘空隙中的放置和生长并获得关节固定（两根椎骨的融合）。例如，在保持架被安置之后，椎间隙可填充有自体松质骨或合适的骨替代物，这也可以（或替代地）在其被安置在椎间隙中之前被放置在保持架中的空腔中。特别地，本发明涉及椎间植入物、植入物锚、植入物通过锚到椎骨的固定以及通过植入仪器植入物在盘空隙中的植入。

背景技术

[0002] 本领域中的一个问题涉及一旦脊柱植入物已经植入，特别是当需要关节固定，例如使用躯体间保持架或其他允许关节固定的植入物（其可以例如用诸如骨缝合棒的辅助稳定结构部署）时，脊柱植入物在盘空隙中的稳定性。例如，存在如下风险，即由于当病人移动时甚至当植入物在其椎骨接触表面上设置有凹口或齿时施加的力，植入物将在椎间隙中移位。因此，固定脊柱植入物到脊柱植入物植入其间的邻近椎骨往往是必要的。也常常提供骨缝合棒以用于优选用脊柱前凸来稳定椎骨，以防止保持架从椎间隙移出。提供具有骨锚定装置的脊柱植入物的解决方案在现有技术中是已知的，其中所述骨锚定装置允许牢固地附接植入物到计划其间要植入植入物的椎骨的椎骨端板中。

[0003] 本领域中的另一问题涉及侵入，并且特别是通达到椎间隙（盘空隙），其中由于所涉及的尺寸，特别是由于血管和神经存在于椎间隙附近，所以侵入和通达椎间隙常常是特别精细的。骨锚定装置必须穿透到椎骨内足够深度以确保良好固定，并且也必须具有小尺寸且允许在不危及周围的血管和神经的情况下（例如，通过不要求在接近椎间隙期间具有比脊柱植入物本身的植入所必要的空隙更多的空隙）固定植入物。特别地，一些体间保持架经设计用后面的（从病人后面）或经椎间孔的（穿过椎间孔）方法（即，路径）的方式被植入。后面方法通常要求关节突（关节）的部分切除且在硬膜和关节突之间穿过（一般提供经设置基本平行于矢状平面的两个保持架）。因此，这种方法使用非常靠近脊髓的路径，并要求较小尺寸的保持架。该经椎间孔方法使用倾斜于矢状平面的路径，并要求具有减小的尺寸但具有足够的长度以便与矢状平面倾斜或垂直设置的保持架。通常寻求可能的最小通达路径，以便限制外科手术植入的侵入。此外，在限制侵入的这种精神下，最终试图避免必须安装后面材料，如骨缝合棒（其通常带有椎弓根螺钉）。如果锚定构件可靠，则用于附接保持架的锚定构件的使用可以解决这个问题。保持架通常被放置在端板上的前位置中的椎骨之间，从而用于允许呈现脊柱前凸。骨缝合棒可以被用于维持防止保持架向后滑动的脊柱前凸，但是如果所获得的植入物的固定和稳定性可靠，则锚定构件反而将是优选的。这样的锚定构件也优选地解决限制性侵入的问题。此外，通常希望能够移除骨锚定构件和植入物。这要求锚定构件稳定地保持在骨植入物中，但锚定构件也可以用尽可能小的侵入尽可能容易地被移除。

[0004] 在现有技术中，特别是从公布的由本申请受让人提交的申请 WO2008/149223 和 WO2011/080535，这两个申请通过引用并入本文且读者可以参考这两个申请来审查由此类型的解决方案解决的各种问题和由此类型的解决方案提供的各种优点，锚定装置是已知的，适合于被牢固地植入，并且具有足够深度在椎间端板中，以确保植入物被保持紧紧地靠着这些椎骨，但沿用于大体插入椎间隙的平面中的接近轴线。此类型的解决方案通常包括至少一个由弯曲且刚性的板形成的锚，其经布置以便穿过植入物穿透到椎骨的端板中且其设置有至少一个止动件来保持此植入物靠着此椎骨。此类型的锚的刚性是允许有效固定的重要特征，所述有效固定显著比卡钉 (staple) 或者其他薄且 / 或相对柔软且常常脆弱的装置更有效。包括弯曲板的这些类型的锚定装置（或“锚”）可产生在锚嵌塞到椎骨的过程中或者由于一旦植入椎骨中在植入物和 / 或锚上施加的力的原因而导致的分裂椎骨的风险的问题。这些类型的锚也可能呈现在锚嵌塞到椎骨的过程中形成太大的切口的风险，允许不希望的锚活动的可能性，这使得植入物固定薄弱且 / 或不可靠。申请 WO2011/080535 旨在解决此类型的问题。应该注意，这里使用术语嵌塞来指明该锚定装置被驱动到椎骨中这一事实。也将注意的是，本申请描述冲击器，其是一种用于嵌塞所述锚的装置，因为其经布置帮助驱动锚定装置到椎骨中。此外，具有弯曲板的这些类型的锚的另一潜在问题涉及其刚性。在一些情况下，锚足够刚性使得其在施加在其上的力的影响下将不变形且 / 或具有较多游移，以便其不会逐渐从其嵌入的椎骨出来，这是重要的。另外，锚穿过植入物的通道和此类锚在植入物内的稳定性的维持（易受最终所需的游移，例如，最小游移）也是确保在一些情况下的可靠安装的重要方面。申请 WO2011/080535 也旨在解决此类型的稳定性问题。这些锚定装置用限制性侵入提供良好锚定解决方案，但是其仍然需要实质性的尺寸来确保在一些情况下的良好稳定性，且因此可以被改进以甚至更多地限制侵入，特别是用于穿过后面和 / 或经椎间孔路径的植入。另外，此类型的锚定装置的撤回经常是有问题的，特别是希望如果在保存限制性侵入的同时容易撤回。

发明内容

[0005] 因此，包括本申请中描述的各种技术特征的某些实施例旨在通过提出一种用于椎间植入物的锚定装置来减轻现有技术的这些和 / 或其他缺点中的一个或更多个，其中所述椎间植入物可以是（更）紧凑的（具有较小阻碍）且（更）容易植入的，尤其是沿基本垂直于脊柱轴线的轴线，并且所述椎间植入物可以是刚性的且允许带有减小的损害椎骨风险的（更）可靠固定，特别是用于穿过后面和 / 或经椎间孔路径的植入。

[0006] 例如，此目标是通过用于锚定至少一个椎间植入物到至少一根椎骨中的装置达到的，所述装置意在从脊柱的外周通过穿过植入物的至少一部分的通道被插入，该装置具有沿在前端和后端之间延伸的纵向轴是细长的主体，该主体包括至少一个弯曲且刚性的板，该板经配置使得其前端进入至少一根椎骨，而其后端保持在植入物的通道中，从而由于取向不平行于该板的纵向轴线且压靠植入物的互补表面的至少一个止动件，即所谓的保持止动件，而按压所述植入物靠着于所述椎骨，该装置的特征在于该板包括至少一个狭槽，所述至少一个狭槽经取向基本平行于其纵向轴线且分离该板的至少后面部分为两个分支。

[0007] 根据有利特征，所述分支中的至少一个包括至少一个撤回止动件，其经取向不平行于该板的纵向轴线且经配置与植入物的互补表面配合并保持该装置在该植入物中。

[0008] 根据另一有利特征，所述狭槽相对于所述板的后面部分配置成，例如由于其长度和 / 或宽度和 / 或形状，而使得当压力施加在其上时允许两个分支逼近在一起。

[0009] 根据另一有利特征，所述板通过其曲率限定其两端之间的平均弧，并且这两个分支围绕该平均弧相对于彼此偏移，以便当该装置就位时，一个分支更接近第一椎骨，而另一分支更接近邻近第一椎骨的第二椎骨。

[0010] 其他特征和优点在本申请中呈现。

[0011] 包括本申请中描述的各种技术特征的某些实施例的另一目标是通过提出可以基本植入椎间隙的平面中的椎间植入物，减轻现有技术的所述（和 / 或其他）缺点中的一个或更多个，其中所述椎间植入物可以通过可以基本植入椎间隙的平面中的锚定装置的构件牢固地附接到椎骨。

[0012] 此目标是例如通过包括主体的椎间植入物达到的，在所述主体中，称为后部的至少一个部分包括至少一个通道，其经配置容纳至少一个根据本发明的锚定装置，以便允许此刚性锚定装置的通道，尽管其具有曲率但不变形，此通道从外周穿过植入物到顶表面或底表面，沿适于锚定装置曲率的倾斜直线路径基本上插入植入物的平面中，以便在植入物意在要植入其间的椎骨之一的端板的方向上取向该锚定装置，其特征在于该通道包括与该锚定装置的至少一个撤回止动件互补的至少一个表面。

[0013] 植入物的其他特征和优点在本申请中呈现。

[0014] 包括本申请中描述的各种技术特征的某些实施例的另一目标是通过提出用于在椎骨之间植入椎间植入物和在这些椎骨中的至少一根椎骨中植入锚定装置的仪器，减轻现有技术的所述（和 / 或其他）缺点中的一个或更多个，其中该仪器允许将植入物基本植入椎间隙的平面中且沿接近轴线将锚定装置基本植入椎间隙的平面中。

[0015] 此目标是例如通过用于在邻近椎骨之间植入根据本发明的椎间植入物和用于在这些椎骨中的至少一根椎骨中植入根据本发明的至少一个称为锚的锚定装置的仪器达到的，所述仪器的特征在于其包括：

[0016] ——至少一个保持器，其包括具有宽度小于所述锚宽度的主体且包括具有与所述锚的板的至少一个曲率半径基本相同的至少一个曲率半径的至少一个引导表面，以在植入过程中容纳并引导所述锚的板；

[0017] ——至少一个冲击器，其包括适于接收该保持器的头部，其所具有的两个臂形件 (arm) 的长度大于该保持器的主体的长度且两个臂形件被间隔一段大于或等于该保持器的主体宽度的距离，以便允许通过沿该保持器滑动该冲击器而推动被保持在该保持器上的锚；

[0018] ——至少一个沿纵向轴线的细长形状的引导件，该纵向轴线在用于抓持植入物的称为抓持端的第一端和称为推动端的第二端之间延伸，该抓持端具有在其端处设置的至少一个抓持布置的头部，所述至少一个抓持布置意在与植入物的至少一个保持布置配合，该头部由通向植入物的纵向通路横向穿过且具有经配置至少部分容纳保持器的主体和冲击器的臂形件的形状和尺寸，该头部的通道包括至少一个用于引导所述锚定装置的表面，所述至少一个表面与保持器的引导表面互补，以便在冲击器沿保持器向引导件的头部中滑动的过程期间引导所述锚定装置在引导件和保持器的这两个引导表面之间。

[0019] 该仪器的其他特征和优点在本申请中呈现。

附图说明

[0020] 在阅读下面参照附图所作的描述时，本发明的各种实施例的其他特征和优点将变得更清楚，在附图中：

[0021] ——图 1A 和图 1B 分别是具有两个锚构件的保持架的一些实施例的后视图和透视图，且图 1C、图 1D 和图 1E 对于上述分别表示根据这些实施例的锚定装置的轮廓图和透视图；

[0022] ——图 2A 示出具有两个锚构件的保持架的一些实施例的透视图，图 2B 和图 2C 分别是根据这些实施例的装置锚的顶视图和透视图，且图 2D 和图 2E 分别表示该锚的其他实施例的透视图和侧视图；

[0023] ——图 3A 和图 3B 示出配备有两个锚定装置的体间保持架的各种实施例的透视图，且图 3C、图 3D、图 3E 和图 3F 分别是锚定装置的各种实施例的透视图、侧视图、透视图和侧视图；

[0024] ——图 4A 和图 4C 是回到配备有两个锚定装置的体间保持架的不同实施例的视图，且图 4B 和图 4D 是锚定装置的各种实施例的透视图；

[0025] ——图 5A 示出具有两个锚构件的保持架的一些实施例的后视图，图 5B 和图 5C 示出分别沿图 5A 的平面 5B 和平面 5C-5B-5C 的截面图，且图 5D 示出在图 5B 的平面 5D-5D 中的横截面；

[0026] ——图 6A 和图 6B 分别是锚定装置的一些实施例的侧视图和透视图，且图 6C 和图 6D 分别示出该锚的其他实施例的侧视图和透视图；

[0027] ——图 7A 和图 7B 分别是用于锚定装置的保持器的一些实施例的侧视图和透视图，且图 7C 示出根据一些实施例的带有装置锚的保持器的侧视图；

[0028] ——图 8A 和图 8B 分别是用于植入体间保持架和锚定装置的仪器的某些实施例的分解透视图和组装透视图，其中该仪器配备有用于锚定装置的保持架和保持器以及锚定装置的一个实施例，且图 8C 表示图 8A 的部分 8C 的放大；

[0029] ——图 9A 和图 9B 分别示出根据用于植入体间保持架和锚定装置的仪器的实施例沿图 9A 的平面 9B-9B，即一端的顶视图和截面图，其中该仪器设置有用于锚定装置的保持架和保持器以及锚定装置的实施例。

具体实施方式

[0030] 现在将参照本申请的附图描述本发明的各种实施例。本发明同时涉及三组对象：

[0031] ——锚定装置 (1)（或“锚”）和 / 或锚定系统，所述锚定系统包括多个可以相同、不同或互补的复数的锚定装置 (1)；

[0032] ——椎间植入物 (2)，其经配置用于接收此类锚定装置 (1) 或系统中的一个或更多个，包括但不限于经配置用于穿过后面或经椎间孔路径植入的体间保持架；和

[0033] ——用于在椎骨之间植入植入物 (2) 和用一个或更多个锚定装置 (1) 或锚定系统固定植入物的仪器 (3、4、5)。

[0034] 每组对象可包括与给定对象有关的各种可能的实施例。每个对象包括以至少一个技术特征为特征的各种元件（通常是该对象的构成部分）。由至少一个技术特征涉及的

（给定组的）每个对象可例如相对于至少一个互补技术特征，与至少一个（相同组或另一组的）其他对象关联，以便所述组的对象共享共同的发明构思。本发明可因此也涉及集合体，该集合体包括这些对象中的至少两个对象以及每个单独对象。元件（例如，板、止动件、狭缝、斜面（chamfer）或斜角（bevel）等）及其技术特征（例如，曲率、取向、长度、宽度、高度等）在本申请以下中更详细描述。与给定对象的元件对应的至少一个技术特征解决至少一个技术问题，特别是在本申请的前序中提及的那些问题。因此，本申请通过指定至少一个元件的至少一个技术问题，描述用于每个对象或每组对象的各种实施例和配置。将从阅读本申请中理解到，至少一个实施例或配置中描述的每个元件的各种技术特征可与由所述实施例或配置涉及的（且因此关于相同元件或另一元件的）对象（或由所述实施例或配置涉及和／或与其关联的对象）的其他特征分离，并且／或者可在各种实施例或配置中与本文所述的任何其他技术特征组合，除非另有明确规定，或者除非这些特征是不相容的和／或其组合不是功能性的，特别是因为可由此类分离或组合的特征要求的结构调整可直接源于由本公开提供的功能性考虑的理解。同样地，虽然参考锚装置在这里讨论了一些技术特征，但是这些技术特征可并入锚定系统的各种实施例中。一般来说，关于给定元件的具体技术特征不应该视为从关于另一元件的那些技术特征排除，也不应该视为从关于相同元件的其他技术特征排除，除非明确呈现这些技术特征的组合是不可能的或非功能性的。虽然本申请详细描述本发明的各种实施例或配置（包括优选实施例），但是其精神和范围不应该限制于给定的示例。

[0035] 例如，根据本发明的锚定装置（1）的各种实施例与椎间植入物（2），如躯体间保持架或椎间盘假体是有用的。椎间植入物经设计成，在骨缝合板（其可以单独地或与躯体间保持架组合使用）的情况下在其外周处，被植入在脊柱（脊椎）的两根邻近椎骨之间或者提供两根椎骨之间的连结。锚定装置（1）经设计锚定在所述椎骨之一中，以便附接植入物到此椎骨。根据本发明的锚定装置（1）的各种实施例包括至少一个弯曲且刚性的板，其经配置用于穿过植入物穿透到椎骨中且包括至少一个止动件，以保持此植入物靠着此椎骨。关于“锚”对象的“板”元件的“弯曲／曲率”和“刚性”的技术特征在下面详细描述。用于锚定椎间植入物（2）在椎骨中的装置（1）也将在本申请中由术语“锚”（1）指代，而不引入任何限制。这种类型的锚已经在由本申请的受让人提交的申请的公开 WO2008/149223 和 WO2011/080535 中描述，其全部内容通过引用并入本文，但是本申请涉及在各种结构和方法中的改进，其可用于各种部署中以降低植入物和锚的植入所必要的外科手术过程的侵入。在各种实施例中，锚（1）包括沿纵向轴线（L，图 1C 和图 2B）是细长的主体，其包括至少一个刚性弯曲板（10）。锚（1）的这个纵向轴线（L）在将被称为前面端的第一端和将被称为后面端的第二端之间延伸，其中所述第一端经设计穿透到椎骨中。注意参考其中锚（1）将插入的方向在本申请中使用锚（1）、植入物（2）和仪器（3、4、5）的“后面”端和“前面”端的名称。因此，对于锚（1），第一端（称为前面端）是经设计首先插入且经设计穿透到椎骨中以固定植入物的一端。关于植入物，表示为“后面”的壁和端是包括用于锚插入的通道开口的壁或端，无论部署过程中此壁是否实际在植入物的后面。在本申请中描述的体间保持架（2）的情况下，此后面端一般确实设置在病人的后部，因为这些保持架本质上是用于穿过后面或经椎间孔路径植入。关于仪器，前面端是意在在植入过程中邻接在植入物上（或至少最接近植入物）的一端。植入物（2）的某些实施例，包括本公开中详细描述的且关于躯体间

保持架的一些实施例，是用于经椎间孔插入盘空隙中，并相应地后面端将安置在椎骨的横向侧和后侧上，而前面端将靠近前部且相对的横向滑动被安置。尽管如此，将仍然使用术语“前面”和“后面”，因为其更容易从植入的角度理解且不管所选择的植入方法（植入路径），均可以通过参考锚 (1)、植入物 (2) 和仪器 (3、4、5) 共同地且方便地使用。因此，术语“前面”和“后面”不意在相对于病人或病人的解剖特征简单指代。此外，在这里使用术语“高度”和“厚度”以指定（当植入其中时）根据平行于脊柱轴线的取向的元件的尺寸，并且术语“上位”和“下位”一般也根据此取向（当病人直立站着时是竖直的）被限定。此外，术语“宽度”和“长度”在这里指定沿垂直于脊柱轴线的平面（横向平面）的尺寸，其中宽度一般在中部 - 横向方向，而长度一般在前后方向。也将注意，这里对这两端之间的纵向轴线 (L) 作出参考，并且此纵向轴线 (L) 因此对应于锚 (1) 的前后轴线，但此限定在这里延伸到植入物 (2) 和仪器 (3、4、5)，仍然参照锚 (1) 的插入方向。也将注意，术语“基本上”在本描述中被多次使用，特别是关于诸如取向或方向的技术特征，以便指示所涉及的特征事实上可以稍微不同且不是准确地如所陈述的一般（例如，“基本垂直”这一表达应该解释为“至少近似垂直”，因为其可以是有可能选择用于允许起到基本相同作用的不是准确的垂直的取向）。此外，本申请中使用的术语“基本上”也可以解释为限定该技术特征可以是“大体上”（“通常”）并且如所述的，往往“优选”，但是其他实施例或配置可以在本发明的范围内。

[0036] 在各种实施例中，用于椎间植入物 (2) 的骨锚定装置 (1) 意在从脊柱的外周通过穿过植入物 (2) 的至少一部分的通道 (21) 插入。装置 (1) 在一些实施例中包括沿在前端和后端之间延伸的纵向轴线 (L) 伸长的主体，该主体包括至少一个弯曲的刚性板 (10)。锚定装置 (1)（即，锚）可大体由板 (10) 形成，而不包括延伸超过该板的其他结构以及后者包括的元件。因此，该锚可以由至少一个板构成，或者在一些实施例中可以由至少一个板组成。在一些实施例中，板 (10) 经配置使得其前端进入至少一根椎骨，而其后端保持在植入物 (2) 的通道 (21) 中或靠着植入物 (2) 的边缘，从而用至少一个与板 (10) 的纵向轴线 (L) 成角度（即，不平行）取向的止动件（例如，保持止动件 14、140）按压所述植入物 (2) 靠着所述椎骨且压靠植入物 (2) 的互补表面 (25)（例如，在该植入物的边缘上或在其通道 (21) 中）。各种实施例的锚 (1) 的板 (10) 大体包括至少一个狭槽（狭缝、间隙、切口、剪边等）(11)，其基本平行于其纵向轴线 (L) 取向且分离板 (10) 的至少后面部分为两个分支 (12、13) 或腿形件 (leg) 或臂形件（该术语是非限制性的）。因此，在一些实施例中获得可以至少在一些方向上保持刚性的锚，但是狭槽允许两个分支 (12、13) 移动使这两个分支 (12、13) 更接近在一起。这样的运动可以通过使用用于具有合适变形特征（例如，在刚性和弹性之间折衷）的分支 (12、13) 的材料获得或者通过使用诸如铰链的所述板的结构，例如具有合适变形特征的每个分支 (12、13) 的具体区域获得。一般地，当压力施加在其上时，所述狭槽 (11) 的长度和 / 或宽度和 / 或形状经配置允许两个分支 (12、13) 彼此逼近。优选地，该板将一般是金属的（生物相容的），以提供足够刚性，同时允许由狭槽针对的弹性效果。然而，其他材料也是可能的，如 PEEK 或其他适合于在主体中植入且适合于本发明的植入所必要的特征的材料。

[0037] 一般地，锚 (1) 优选在这些分支 (12、13) 中的至少一个上包括至少一个止动件，其经配置用于保持或锁定锚 (1) 在植入物 (2) 中。锚 (1) 在植入物 (2) 中的这种保持或锁定可由不同类型的闩、锁、止动件等在各种实施例中取得。在各种有利实施例中，这种保持或

锁定通过至少一个撤回止动件（15、150）取得，所述至少一个撤回止动件（15、150）可以以与板（10）的纵向轴线（L）成一定角度（即，不平行）取向且经配置与植入物（2）的互补表面配合并保持锚（1）在植入物（2）中。此类撤回止动件（15、150）的一些实施例利用狭槽（11），如下面详述。在一些实施例中，至少一个撤回止动件（15、150）在与邻近狭槽（11）的一侧相反的分支侧上，从装置（1）的至少一个分支（12、13）伸出或突出。在一些实施例中，在一个与该狭槽相反的一侧上被设置在一个分支（12、13）上的至少一个撤回止动件（15）或所述撤回止动件（15、150）中的至少一个包括至少一个成斜角表面，其大体面向装置（1）的前端取向，以便形成斜坡，该斜坡促进装置（1）在植入物（2）中的插入并且允许装置（1）的分支（12、13）通过此成斜角表面或锥形表面与植入物（2）中的通道（21）的壁接触从而逐渐接近彼此。因此，随着至少一个撤回止动件（例如，15、150）在分支（12、13）中的至少一个上，该锚将从来自植入物的自发的且意想不到的提取中保持。在一些具有成斜角表面或锥形表面的实施例中，狭槽（11）能够允许分支在将锚插入植入物中时挤压在一起，其中当该装置到达该植入物内的如下位置时，所述分支恢复到其静止配置，其中在所述位置时至少一个撤回止动件与该植入物的互补表面，如接收例如伸出的撤回止动件的通道中的壳体配合（注意这些止动件经优选定位在该通道内或在该通道附近，而不是在该通道的外面、在其出口之后，其中该撤回止动件的这种自发部署会由骨组织阻碍）。另外，该狭缝或狭槽通过允许两个分支接近彼此而促进该锚的主动撤回，且因此促进撤回止动件（15、150）从植入物的互补锁定表面脱开。此布置具有这样的优点，即撤回止动件（15、150）可以小于柔性调整片（tab）或其他结构的替代布置，并且可避免使用会是脆弱的高度柔性结构。此外，可以部署在锚周围不需要太多空间来允许其移除（例如，通过脱开撤回止动件）的锁定配置。实际上，这些类型的布置可避免植入物（2）中需要槽道，以通达到锚（1）的撤回止动件（15、150），并且因此（除了避免可由使用额外槽道引起的削弱之外）可允许减小植入物（2）的尺寸。因此，据理解此类布置的这些优点一般解决锚的且因此植入物的固定的稳定性问题，并且也解决由于减少的尺寸限制而引起的侵入问题。

[0038] 在一些实施例中，锚（1）包括在分支（12、13）中的至少一个上的至少一个夹持资源（141），所述至少一个夹持资源经配置接合用于通过挤压两个分支（12、13）更接近彼此以脱开一个或更多个撤回止动件（15、150）来移除该锚定装置的工具。夹持资源与工具的接合允许，同时使所述分支更接近彼此以释放撤回止动件（15、150）（一个或多个）来（例如通过在该夹持资源上的拉动）拉动该锚并从植入物将其提取。夹持资源可以因此增强由狭槽（11）可能产生的装置（1）的移除。这样的夹持资源可以由壳体在该锚的后端中如在图 1D 和图 1E 中所示的保持止动件处简单地形成。然而，可以使用其他夹持资源，如从该锚突出的凸耳或调整片（141）或者保持止动件的一部分，其中所述保持止动件的一部分经布置不与植入物接触且因此为用于在该锚上拉动的工具的插入提供壳体。例如，图 2B 和图 2C 示出锚，其在锚的每个分支或腿形件（12、13）的侧边缘上具有突出调整片（141）。例如，如图 2A 中所示，此调整片（141）不形成保持止动件，因为其不与植入物的通道（21）周围的表面（25）接触，但是另一凸耳或调整片（141）形成保持止动件。注意，在其他实施例中，如果具有与植入物的通道（21）周围的表面（25）接触的表面（同时维持不与植入物接触的表面且基本面向植入物，以允许在锚上的拉动且因此形成夹持资源），则形成夹持资源的此类调整片（141）也可以形成保持止动件。

[0039] 在一些实施例中，板 (10) 的曲率沿该板的厚度延伸，也就是说板 (10) 的曲率限定锚 (1) 的凹面（其中弯曲的内侧沿该板的上面或下面延伸）和凸面（其中弯曲的外侧沿该板的相反面延伸），其中锚 (1) 的两侧（或边缘）连接凹面和凸面。

[0040] 在一些实施例中，至少一个保持止动件 (14、140) 包括至少一个基本面向前端取向的止动件表面，所述至少一个止动件表面意在与装置 (1) 意在固定于其上的植入物 (2) 上的至少一个止动件表面 (25) 配合，以便保持并按压植入物 (2) 靠着椎骨，其中装置 (1) 经设计被锚定。例如，保持止动件 (14、140) 在板 (10) 的至少一侧和 / 或至少一边缘上可包括至少一个突出调整片。注意止动件的取向在本申请中经常被限定为与纵向轴线“成角度”和 / 或“不平行”，因为可能提供不同取向且因为随着其不会形成充分有效的邻接来约束沿该锚的纵向轴线的运动，最少功能性的取向将平行于该纵向轴线。因此，所有其他取向是可能的，但是为了更大效率，近似垂直于纵向轴线的取向一般是优选的。在一些实施例中，例如在板 (10) 的一个分支 (12、13) 的后端处可提供单个止动件 (14 或 140) 用于保持。保持止动件 (14、140) 可设置在该板上的任何位置中，其中该位置导致与植入物 (2) 的（不平行于该锚的纵向轴线的）表面接触，以便按压植入物 (2) 靠着椎骨（即，沿植入物的上表面或下表面上的在其出口之前的通道 (21) 任何位置）。图 1A、图 1B、图 1C、图 1D 和图 1E 示出说明性和非限制性示例，其中每个分支具有保持止动件 (14)。优选地，至少一个止动件设置在该锚的后端处，以便避免为接收植入物通道内的止动件提供互补表面的需要。这些止动件可以例如由凸耳、调整片、嵌钉或其他形式的从该板的一面或边缘延伸的突出部形成。在图 1 的这些示例中，这些止动件是由锚的凹面上的小突出凸耳 (14) 形成的，但是其可以是凸面，尽管凹面一般是优选的，以便不阻碍第二锚的嵌塞并且 / 或者以便为固定植入物到其他椎骨的第二锚的止动件留下空间。另外，可在锚的至少一个（或更多个）横向边缘上，而不是在一个（或更多个）面上提供至少一个保持止动件 (140)。这两种布局或布置也可以同时被提供。例如，在图 2B 和图 2C 中，第一类型的保持止动件 (14) 布置在锚的一侧上（在这些非限制性示例中，在两个分支的每个上），并且第二类型的保持止动件 (140) 由在板的至少一个横向边缘上（在这些非限制性示例中，在两个分支的每个分支的侧边缘上）突出的结构取得。

[0041] 在一些示例中，其说明性且非限制性示例示于图 6A、图 6B、图 6C 和图 6D 中，狭槽 (11) 以其厚度分离板 (10)。这会产生带狭槽的板 (10) 且其在凹面上具有分支 (12) 且在凸面上具有分支 (13)。在这些实施例的一些实施例中，两个分支 (12、13) 之一包括至少一个撤回止动件 (15、150)，而在其他实施例中，两个分支每个都可包括至少一个撤回止动件 (15)。在单个面上具有一个撤回止动件 (15) 的一些实施例中，包括至少一个撤回止动件 (15) 的是凸面的分支 (13)，如图 6A 和图 6B 中所示，而在其他实施例中，包括至少一个撤回止动件 (15) 的是凹面的分支 (12)，如图 6C 和图 6D 中所示。

[0042] 在一些实施例中，至少一个狭槽 (11) 以其宽度分离板 (10)。这得到了分支 (12、13) 在板 (10) 的两个横向面中的每个面上。在一些实施例中，提供了狭槽的这两个可能取向的组合。在这样的实施例中，纵向狭槽以其宽度分离该板，但不超过其整个厚度，并且纵向狭槽以其厚度分离该板的后面部分。因此，以获得其宽度分裂锚的一部分，其中一个板 (19) 硬化锚的后部，例如，如图 2D 和图 2E 中所示。优选地，在其中至少一个狭槽以其宽度分裂该板的这些实施例中，两个分支每个都包括至少一个撤回止动件 (15、150)，如在示出

具有两个横向分支的锚的大部分附图中所示。在一些实施例中，每个分支可包括若干撤回止动件（15、150），优选地在最接近前端的一个（或那些）止动件上具有至少一个成斜角表面。例如，图 2B 和图 2C 示出这种包括第一撤回止动件（15）和第二撤回止动件（150）的锚的非限制性说明示例，其中第二撤回止动件（150）被置于比第一撤回止动件（15）稍微更后部。则，植入物优选具有第二表面，其与这个第二止动件互补且经取向防止锚从植入物返回（即，具有与锚的纵向轴线成角度（不平行）且优选地垂直取向），例如，如图 5D 中所示。注意第二撤回止动件（150）可由一结构（例如，凸出部）取得，其中该结构也可形成保持止动件（140），如通过参考保持止动件（14、140）在本申请中限定的，因为其前部表面（根据在本申请中限定的命名惯例）具有一表面，其与纵向轴线成角度（不平行）且位于朝向该板的前端（优选基本面向前端）的一侧上且如果该植入物具有互补表面来接收或邻接它则适于反抗该锚在植入物中的前进，例如，如图 5D 中所示。与植入物的这种互补表面配合的这个第二撤回止动件（150）能够以与本申请中限定的保持止动件（14、140）相同（实现基本相同的功能）的方式保持植入物。然而，本申请中限定的保持止动件（14、140）的一些实施例经设置更接近锚的后部端，且因此具有提供保持止动件而不需要在植入物（2）的通道（21）内的互补表面（即，不需要制造相对困难的沿该通道的壁以允许容纳用于该止动件的轴承表面的壳体）的优点。另外，本申请中限定的保持止动件（14、140）的一些实施例被设置在锚的面上而不是在其边缘上，且因此具有提供保持止动件（14）的优点，其中即使分支接近彼此，所述保持止动件（14）也阻止所述锚。因此，一般优选为该锚提供至少一个保持止动件（14、140），尽管其可包含若干撤回止动件（15、150），其中至少一个撤回止动件（150）能够通过其包括朝向前端的邻接表面这一事实形成保持止动件。注意提供保持止动件（14）在以其宽度分裂的锚的凹面和 / 或凸面上（或者相反地提供止动件在以其厚度分裂的锚的边缘上）允许停止该锚，即使其分支（12、13）朝向彼此移动，这将不一定是用于撤回止动件（140）在侧边缘上的情况，其中仅仅如果分支处于静止位置，也就是说在距彼此一段距离（并且构成锚穿透太远到植入物中并吸附其分支彼此接近且其侧止动件在通道内的风险），所述侧边缘最终根据其长度能够形成保持止动件。然而，植入一般使用一种防止锚在植入物中穿透太深（且在各种配置中防止保持止动件被插入通道中）的仪器。确实，在下文描述的冲击器一般配置有防止将锚推到太深的止动件表面，且其根据锚和 / 或植入物的形状和 / 或尺寸被调整或者是可调整的。此外，也可以优选横向保持止动件（140），因为不像被布置在至少一个面（凹面和 / 或凸面）上的止动件（14），这些横向保持止动件可减少在锚上面和下面所需要的空间，特别是因为有时可能横向保持止动件（140），其是足够长以便即使当分支朝向彼此移动时也起作用（以防止该锚穿透太远到植入物中）。在其他配置中，例如，意在用于穿过后面或经椎间孔路径植入的体间保持架的那些配置，所述接近施加对植入物宽度的限制，并且因此保持止动件（例如，14、140）优选从该锚的各面（凸面和 / 或凹面）伸出，以便不要求扩大宽度，特别是当至少一个夹持资源（26、27）接近通道（在植入物的横向面附近或其上）被设置时。根据其中拥塞是最麻烦的配置和方向，可能选择最合适的位置和 / 或形状止动件，以最小化元件（组件）和对象的尺寸（在高度和 / 或宽度上的尺寸）（且因此最小化侵入），同时确保可靠的装置。

[0043] 使用至少一个板（10）允许锚（1）至少在基本垂直于该板的方向上确保良好保持，因为该板的宽度提供锚和因此（垂直于此表面的）植入物在其中植入植入物的骨组织中的

表面对置运动。将注意的是，当板弯曲时，此保持沿至少一个基本径向于板的曲率半径的方向产生。事实上，本发明的各种实施例，像在上面引用的申请中描述的一个的各种实施例，具有这样的优点，即具有的曲率允许在植入物植入其间的椎骨的水平处（或椎间隙的平面中）沿基本垂直于脊柱轴线的接近轴线被植入到椎骨的椎骨端板中，这可促进植入且允许通过最小化到需要植入锚的椎间隙的外科手术接近的侵入来避免一些与到椎骨的接近的阻碍（尺寸）关联的缺点。因此，通过使得锚的纵向轴线 (L) 基本在椎间隙的平面中，主体的弯曲板 (10) 优选勾勒具有尺寸和至少一个曲率半径的至少一个圆形或椭圆形弧，其经布置使得锚定装置 (1) 可以沿与脊柱轴线形成约 90° 角度的接近轴线被植入端板中。据理解，锚的各种实施例经设计从盘空隙的外周穿透到椎骨中，优选到上椎骨的下位椎骨端板中或者到下椎骨的上位椎骨端板中，特别是在诸如躯体间保持架或椎间盘假体等植入物的情况下。另外，锚的其他实施例可经配置用于优选植入椎间隙附近的椎骨体的外周中，尤其是在诸如骨缝合板等椎间植入物的情况下。当锚意在用于例如穿过诸如躯体间保持架或椎间盘假体等植入物植入椎骨板中时，该锚的曲率经优选配置使得一旦嵌在椎骨中，脊柱轴线与其前面末端的相当大部分基本相切，或者至少前面端的这部分与脊柱的竖直轴线形成小的（或微小的）角度。

[0044] 在各种实施例中，锚有利地具有可相对薄的板形状，从而促进锚 (1) 穿透到骨组织中。板 (10) 的这种薄度可造成锚 (1) 在椎骨中的稳定性问题，在某种程度上该板可形成一种叶片，其可以在沿板宽度（横向于各种实施例的纵向轴线 (L)）的方向上分裂椎骨，特别是在椎骨中的嵌塞过程中或者稍后，例如由于当病人移动时施加在其上的显著应力。此外，此薄度可减弱板的刚性。在一些申请中，刚性可以是有效固定的重要特征，从而导致比卡钉或其他薄且 / 或相对柔软、往往脆弱的装置具体更有效的实施例，所述装置由于其柔性和 / 或薄度和 / 或其脆弱性而不允许良好保持。因此，刚性锚优选用于许多实施例（弯曲的锚也是优选的，但用于促进到椎骨的接近），而不是可变形锚。刚性锚通过横穿植入物的至少一部分的通道 (21) 穿透到椎骨中，而未在此通道 (21) 中变形。对于这些刚性实施例，植入物中的这个通道 (21) 的内壁优选具有的形状和尺寸允许锚通过以下穿过：通过与锚的曲率互补的曲率，或者通过具有的高度稍微大于锚高度的未弯曲（直）形状，以允许其在不管曲率和刚性如何的情况下（从而避免在植入物中机加工弯曲通道，这可以是复杂的且昂贵的）穿过。

[0045] 本发明的各种实施例通过在锚 (1) 的主体的至少一个面的至少一个部分上面使用至少一个纵向肋形件来解决锚 (1) 的稳定性和刚性问题。此纵向肋形件优选在各种实施例中基本平行于纵向轴线 (L) 沿板 (10) 长度方向上取向，例如，如在由本申请的受让人拥有的申请 WO2011/080535 中描述的。然而，由于该锚在至少后部上设置有狭槽 (11)，所以该肋形件将优选在未分裂的锚的一部分上，从而在锚的前部上。

[0046] 此外，在本发明的各种实施例中，通常优选通过除肋形件以外的构件、资源、布置或配置解决任何最终稳定性问题，因为肋形件一般将对植入物施加尺寸限制（其通常将具有凹槽来容纳该肋形件），而许多本发明实施例一般旨在最小化侵入且因此最小化本发明的元件（项目）和对象的尺寸。解决锚的潜在不稳定性问题的这些其他配置中的一些配置可例如包括穿过锚的骨生长，以稳定锚（虽然要求进行生长的时间）且 / 或提供具有足够厚度和足够软（即，不尖锐的）横向边缘的锚，以避免分裂椎骨。另外，尽管不存在肋形件

且存在狭槽，不过使用足够刚性的材料可提供良好稳定性，同时维持仍然限制侵入的尺寸。确实，使用狭槽的适当配置可以允许使锚的后面部分足够柔软以用于撤回止动件的释放，但允许保持锚整体非常刚性，因为止动件可以相对于锚的其余部分在尺寸上被配置得非常小。另外，两个分支的柔性和锚的整体刚性之间的折衷可以用狭槽和 / 或分支的形状和尺寸的适当配置来控制。

[0047] 在一些实施例中，板 (10) 通过其曲率限定在其前端和后端之间的平均弧 (AM，图 3D 和图 3E)，并且具有两个分支或腿形件 (12、13)，所述两个分支或腿形件 (12、13) 在中间弧 (AM) 或平均弧 (AM) 的相反侧上相对于彼此偏移。事实上，这两个分支优选围绕该平均弧相对于彼此偏移，以便当该装置就位时，一个分支更接近第一椎骨，而另一分支更接近邻近第一椎骨的第二椎骨。图 3A、图 3B、图 3C、图 3D、图 3E 和图 3F 示出所述锚的分支的这种配置的说明性且非限制性示例 (以及图 3A 和图 3B 中植入物的实施例的相关示例)。在这些实施例中，两个臂形件被偏移且可以更接近彼此，使得一个在另一个之上。这种布置减小分支的逼近所要求的狭槽宽度，并且可限制锚的整体宽度。另一方面，此布置通过提供偏移的分支提供横于板的锚与椎骨骨头的较大接触表面，且因此提供更大阻力，从而允许降低由锚在骨中的横向运动切割骨头的风险。因此，独立于用于允许分支逼近的任何配置 (即，狭槽是否可经配置成用于分支逼近)，带有偏移分支或腿形件 (12、13) 的这种板 (10) 均可经配置用于稳定锚定装置在椎骨中。确实，这种偏移的分支同样对于锚定装置的稳定性是有利的。然而，不具有其偏移分支的逼近的锚定装置可包括如申请 WO2011080535 中描述的诸如柔性调整片的另一类型的移除机构，以便能够使板锁定在植入物内，同时保存从植入物移除锚定装置的可能性。具有偏移分支的锚 (1) 的这种类型的布置通常要求调整植入物中通道 (21) 的形状和尺寸，如下面详述。确实，具有偏移分支的这种锚经常要求扩大该通道。然而，在图 3A、图 3B、图 3C、图 3D、图 3E 和图 3F 示出非限制性示例的一些实施例中，锚 (1) 经布置使得其不必扩大植入物 (2) 的通道 (21) 太多来允许锚 (1) 的插入。确实，在这些实施例中，未分裂的锚的前面部分包括两个部分，其中每个在所述分支之一的延伸中，所述这两个部分也相对于彼此 (在与分支相同的方向上) 偏移。此偏移提供锚 (1) 的前面部分一个适于植入物 (2) 的通道 (21) 形状的形式，其是保持锚 (1) 的后面部分所必要的。因此，通道 (21) 可被调整成锚 (1) 的后面部分且前部适于通道 (21)。注意该通道仍然优选地具有中央部分，其适于经过在两个前面段之间形成偏移的部分。其他更简单的解决方案是可能的，即使其通常不允许获得也被调整 (且尽可能最好地保持该锚) 的通道。例如，可能使锚的前面部分变细，以便其更容易穿过通道而不扩大该通道太多，但然后该通道应该仍然包含一部分，该部分适于经过形状为基本与平均弧 (AM) 相切 (或平行) 的所述锚的前面部分，而所述分支相对于此平均弧偏移。注意所述分支的和所述前面部分的偏移更重要地是朝向其后面端而不是朝向前面端。因此，在这样的实施例中，在邻近狭槽的边缘上，优选地至少在狭槽的前端附近，所述分支中的至少一个优选包括至少一个成斜角平面或倒角，以避免当更接近在一起时这两个分支的最终摩擦。可替代地或另外地，可能在其前端处加宽狭槽，以防止分支之间的接触。

[0048] 在一些实施例中，两个分支或臂形件 (12、13) 具有彼此互补的形状，其经配置使得当两个分支接近彼此时，所述分支 (例如，12、13) 之一的至少一个后部可以覆盖至少部分地覆盖所述分支 (例如，12、13) 中的另一分支的至少一个后部，而不增加该装置的总厚

度。图 4A 和图 4B 示出锚分支的这种配置的说明性且非限制性的示例（以及图 4A 中植入物的关联示例性实施例）。这种布置减少分支逼近所需要的狭槽宽度，并且可限制锚的总宽度。在一些实施例中，分支实际上可至少部分在静止状态中重叠，这允许减少锚的总宽度。此外，例如由于由分支形状的互补性提供的壳体，这些布置中的一些布置通过提供不对称但互补的分支可提供骨向内生长，并且其可迅速提供一种方式，以限制通过锚在骨中的横向位移切割该骨的风险。

[0049] 在一些实施例中，至少一个狭槽 (11) 可在板 (10) 的厚度中形成，但不在垂直于板 (10) 宽度的平面中形成。在一些实施例中，狭槽 (11) 可部分或完全地从勾勒曲率的纵向轴线偏离。图 4C 和图 4D 示出锚的狭槽 (11) 的实施例的这些可独立部署方面的组合的说明性且非限制性示例（以及图 4C 中的关联植入物的示例性实施例）。确实，在这些附图中，该狭槽具有在板的厚度中的倾斜取向（其不垂直地交叉）。此外，该狭槽在板的长度上弯曲。虽然在此附图中被组合地呈现，但是将会理解一个狭槽可以分离这两个特征且提供如在图 4B 中的锚，不过其中倾斜狭槽有助于两个分支在极端位置中的逼近。另外，在这些示例中，狭槽的曲率 / 弯曲 (curvature) 从纵向轴线 (L) 朝向锚的横向边缘偏离。在其他示例中，狭槽可勾勒基本居中在纵向轴线 (L) 上的曲率。使用朝向锚的边缘偏离的曲率，获得具有的一个分支 (13) 比另一分支 (12) 更柔软的锚，这在一些配置中可以是有利的。例如，撤回止动件 (15)（一个或多个）然后可以仅被设置在比另一分支更柔软的这个分支 (13) 上，以便当需要移除锚时促进撤回止动件 (15)（一个或多个）的脱开。此外，比另一分支较不柔软的分支 (12) 可为锚提供更好的整体刚性。

[0050] 关于锚本身长度和 / 或狭槽 (11) 长度的锚的各种实施例是可能的。确实，不同长度（和不同曲率）的锚可根据应用被提供用于或多或少深度的锚定。另外，如上面所提到的，当压力施加在其上时，所述狭槽 (11) 的长度和 / 或宽度和 / 或形状经配置允许两个分支 (12、13) 逼近在一起。在一些实施例中，狭槽 (11) 的长度优选至少大于装置 (1) 的宽度（或其长度的四分之一）。甚至通常优选的是，狭槽 (11) 的长度大于板 (10) 长度的三分之一，或者甚至板 (10) 长度的一半，以促进两个分支的逼近。然而，一般在可影响削弱锚或使其太柔软的风险的各种参数之间进行折中，所述参数如狭槽的长度（其可以不取决于板的长度）、狭槽的宽度、板的截面（在高度和 / 或厚度上的尺寸）、未分裂的后面端的尺寸等。另外，狭槽的宽度可根据应用而变化，并且在所述狭槽 (11) 的宽度沿板 (10) 的纵向轴线 (L) 变化的地方可使用各实施例。例如，图 1C 示出狭槽，其在后端处的宽度大于在前端处的宽度。确实，狭槽没必要在其前端处非常宽，因为通常在锚的后端处最需要分支的逼近。在一些实施例中，例如如果板具有一定宽度使得不可能（或过于困难）获得带有单个纵向狭槽的分支的逼近，则该狭槽可具有适于允许分支的逼近的更复杂形状（例如，T 形状或任何其他合适配置）。如果必要，也可能布置多个各种形状的多个狭槽 (11) 在板 (10) 中。另外，狭槽可以可选地允许骨生长穿过板 (10)，这稳定了锚（且因此稳定了植入物）。因此，对于其中狭槽在其前端处是宽的或扩大的（例如，部分 17）提供各实施例，以促进骨生长穿过锚。也可以提供除狭槽以外的至少一个穿过板 (10) 厚度的孔，以允许一旦被植入则骨生长穿过装置 (1)。

[0051] 在各种实施例中，狭槽 (11) 的前端设置有一个部分 (17)，该部分 (17) 经配置防止板在锚上的应力的影响下沿该狭槽的延伸分裂。这样的部分 (17) 可以例如是圆角的，如

图 1C 中所示，但足够提供可以不与纵向轴线平行（优选垂直）的表面，以降低剪切或分裂的可能性。

[0052] 关于所部署的锚的数量或位置，本发明并不受限制，尽管某些配置是特别有利的，特别是就植入物的阻力或尺寸而言，例如，在颈椎植入物的情况下，其中小尺寸对该尺寸具有强的约束并且其中材料的强度要求植入物不因为通道 (21) 被做得过度脆弱，尤其是在由 PEEK（聚醚醚铜）制成的躯体间保持架的情况下。

[0053] 在本发明的各种锚和锚系统实施例中，板 (10) 可以基本上是矩形的，如在许多附图中所示，但是当然在不背离本发明精神的情况下，可以具有各种其他形状。优选地，无论该板外周的形状是什么，其呈现至少一个具有足够尺寸的表面用于有效反抗其在椎骨中的运动，这与卡钉、钉子或其他已知装置不同。例如，附图中所示的大部分板具有基本矩形外周，不过具有本申请中详述的形状变化。此外，锚 (1) 可以包括若干板，并且 / 或者在不背离本发明精神的情况下，主体的单个板可以具有各种形状。事实上，在所需的保持可以由至少一个提供至少一个具有这里所述足够尺寸的表面作为板宽度的板来获得的程度上，锚可以包括具有基本梯形或三角形外周或者具有不同形状变化的板。例如，在锚 (1) 的某些变型（未示出）中，锚定装置 (1) 的主体可具有两个板，其基本彼此平行（且 / 或具有基本相同曲率）并且在后面端处连接在一起，如在公开 FR 2,827,156（以及 WO 03/005939 和 US 2004/0199254) 和 FR 2,879,436（以及 WO 2006/120505 和 US 2006/0136063) 中描述的，其中每个公开通过引用并入本文，这可在植入物上形成止动件保持锚 (1) 且因此保持该植入物靠着椎骨。另外，锚 (1) 的各种实施例可包括至少一个直板，如这些公开中描述的，或者包括两个由链路连接的直板，其中所述链路能够或者经配置形成允许固定植入物的止动件。一般地，本发明的各种锚实施例可使用狭槽 (11) 允许使分支接近彼此，并且即使事实上所述分支形成双重板的后端，此狭槽也可实现其功能。

[0054] 本发明的各种实施例努力减小装置和相关仪器的尺寸，以便允许沿基本在椎间隙（盘空隙）的平面中的轴线植入锚定装置。如在上面所引用的且通过引用并入本文的申请 WO 2008/149223 和 WO 2011/080535 的公开中所描述的，弯曲板 (10) 沿纵向轴线勾勒圆的至少一个弧和 / 或椭圆的至少一个弧，其尺寸和曲率半径经产生使得锚定装置 (1) 可以通过使其垂直轴线基本在椎间隙的平面中，即沿基本垂直于脊柱轴线的接近轴线（即，当锚接近椎骨时，所述平面或所述接近轴线基本与前面端的至少一部分相切），被植入椎骨的椎骨端板中。与上面引用的申请类似，本发明的各对象的各种实施例涉及锚定装置 (1) 的曲率半径的技术特征。锚定装置 (1) 的各种实施例事实上针对不同锚具有不同的曲率半径，并且 / 或者在给定锚 (1) 的主体的不同部分上具有若干不同曲率半径。因此，例如，锚 (1) 的主体可具有圆的弧或椭圆形的弧，但是也可勾勒更复杂的曲率，犹如具有相同曲率半径或不同曲率半径的圆的若干弧端对端地被放置或者犹如具有相同曲率半径或不同曲率半径的椭圆的若干弧端对端地被放置，或者圆或椭圆的弧或者甚至沿主体变化的曲率半径的任何组合。在本描述中，术语“圆的弧”或“曲率半径”包括所有这些不同的可能性。因此，本发明的各种实施例提供关于曲率半径的不同变型和锚定装置 (1) 的某些相关方面，以及与其关联的植入物 (2) 和仪器 (3、4)。事实上，例如，根据装置 (1) 的使用并且特别是其预定的沿脊柱的植入位置，可以优选具有较大或较小曲率半径。根据锚定装置 (1) 的曲率半径，分别穿过装置 (1) 的穿透端和止动端的轴线形成一个角度，该角度通常被包括在近似

90° 和 180° 之间，尽管其也可以经选择成小于 90° 。优选地，此角度将被包括在 110° 和 160° 之间，这在许多情况下将比在这些值外的角度更好地促进植入该装置。根据希望通过锚定装置 (1) 获得的固定，该角度将经选择成或多或少开放的。如果希望例如促进保持架或假体靠着椎骨端板紧紧固定，则被包括在 120° 和 180° 之间的角度可以是优选的，而如果希望防止植入物在盘空隙的平面中移动，则被包括在 90° 和 150° 之间的角度可以是优选的。虽然这些角度变化未示于图中，但是锚定装置 (1) 的不同角度允许涵盖所希望的不同类型的锚定，以便确保适于这种情况的植入物的固定。也可以在用于通过按压植入物紧靠椎骨端板且防止其在盘空隙的平面中移动两种方式来固定装置的优选实施例之一中提供其角度是在最优值（例如 135° 附近）的装置 (1)。此外，根据植入物 (2) 的各种实施例，对于该装置可以选择不同角度，以特别地允许良好固定，而不管是可能的脊柱前凸、脊柱后凸或者甚至脊柱侧凸，无论其是天然的、病理性的或由植入物所施加的。因此，锚定装置 (1) 和植入物 (2) 的各种实施例通过其曲率半径和其将插入其中的通道 (21) 的取向可以沿基本在椎间隙的平面（即其中植入植入物 (2) 的平面）中的接近轴线被植入，这促进植入物和装置的所有元件向椎间隙的接近。在一个实施例中，由锚 (1) 的主体勾勒的一个（或多个）弧具有尺寸和至少一个曲率半径，使得锚定装置 (1) 可以沿与脊柱的竖直轴线形成被包括在 40° 和 140° 之间的且优选约 90° 的角度的接近轴线被植入在椎骨端板中。此角度可以根据到椎骨的接近的尺寸针对同一锚定装置 (1) 是变化的，并且也可以根据所使用的装置 (1) 的曲率半径（和因此在其前面端和后面端之间形成的角度）针对不同锚定装置 (1) 改变。此外，各种实施例提供锚 (1)，其包括至少一个直的（未弯曲的）板 (10)。注意在直锚 (1)（即，其包括至少一个直板）的情况下，接近轴线可优选基本不在盘空隙的平面中，但可以是倾斜的。因为到椎骨的通路的受阻，这种类型的倾斜轴线一般不是优选的，但仍然可能在一些情况下使用。与此类直锚 (1) 一起使用的植入物 (2) 优选包括至少一个直通道 (21)，其沿脊柱的外周和椎骨之间的倾斜路径（不垂直于脊柱轴线）朝向至少一根椎骨取向。与此类具有直通道的植入物 (2) 和此类直锚 (1) 一起使用的仪器优选将在前面端处具有与该植入物接触的表面，其相对于其纵向轴线（根据本申请中使用的惯例是前 - 后的）倾斜，以便允许相对于椎骨的倾斜接近轴线。此外，锚 (1) 的各种实施例也可以具有主体，其包括至少两个在彼此之间形成一个角度的直板 (10)（或板部分）。这些直板 (10)（或板部分）可例如由至少一个形成这个角度的连接部分链接（例如由于此连接部分的曲率）。由于锚 (1) 的各种部件或部分与通道 (21) 内壁的各种部件或部分接触，这些各种实施例可以例如与包括弯曲通道 (21) 的植入物 (2) 关联使用，例如以便促进锚 (1) 的穿过且 / 或确保锚 (1) 在植入物 (2) 内的最小游移。锚 (1) 的各种实施例也可以具有主体，其包括至少一个直板 (10)（或板部分）和至少一个弯曲板 (10)（或板部分）。锚 (1) 主体的这些各种配置允许关于包括各种部分的锚提供本发明的潜在对象的各种实施例。这些特定对象经配置解决促进锚 (1) 穿过植入物 (2) 的问题（一个或多个），且 / 或提高锚 (1) 在植入物 (2) 内的稳定性且 / 或限制侵入。也提供锚定系统（和关联的植入物和仪器），在所述锚定系统中可以结合在本文以及在申请 WO2008/19223 和 WO2011/080535 中描述的锚的各种实施例和特征。这些特定对象（例如，这些在其主体中包括至少一个直的和 / 或弯曲的板（或板部分）的实施例中的任何实施例）也可以根据各种实施例包括或不包括为本申请中公开的任何对象（或对象的组合）的任何元件（或元件组合）而描述的任何技术特征（或技术特

征的组合），只要其不是不相容的，特别是因为可以由此类分离或组合特征所要求的结构调整直接源自对本公开的理解。

[0055] 锚定装置（1）一般与至少一个通道（21）配合，所述至少一个通道（21）横穿过意在要被固定的植入物的一部分。此类通道可以是例如为锚定装置的穿过而布置的各种形状和尺寸的导管或槽道，该布置特别是在横截面（例如，带有圆角的基本矩形横截面）上。优选地，通道（21）是直的，以便促进其机加工，并且其尺寸是为弯曲且刚性锚定装置（1）的穿过而布置的，而不管其曲率半径如何均不要求此装置的变形。在锚（1）是弯曲的各种实施例中，通道的（开口的）高度因此优选稍微大于锚定装置（1）的厚度，足以不管其曲率及其刚性如何均允许此装置在通道（21）内穿过而不变形，但足够小，以确保由锚定装置（1）对植入物（2）的良好保持，而该装置在通道（21）内无太多游移。在本发明的某些实施例中，通道（21）的宽度可以基本等于装置（1）的宽度，以便一旦被插入通道（21）中，此装置具有很少或无横向游移。锚定装置（1）的长度可适于要横穿的通道（21）的长度和其必须在椎骨端板中穿透的深度。

[0056] 在一些配置中，锚（1）的前面端经设计穿透到邻近待固定的植入物（2）的植入位置的椎骨中。在锚（1）的某些实施例中，例如，如图1中所示，前面端具有至少一个倒角（18）或斜角，从而促进锚（1）穿透到椎骨中。在一些实施例中，此前面端可以包括例如以凹口形式的切口，从而促进前面端穿透到椎骨端板中。还注意凹口的内边缘可以或可以不被削尖。一般地，由于前面端是经设计穿透到椎骨端板中的一端且可引导锚（1）的其余部分，所以优选地，其被制成以便促进穿透到骨组织中。在某些实施例中，此前面端可因此包括至少一个点。因此，本申请的附图示出基本配置成点形状的前面端（如在本公开的其他地方进一步解释）。据理解，此端可以被削尖（或磨削），但是由于骨组织可以是相对抵抗的，所以优选保留此前面端的整体性。因此，例如，如在图1中可以特别看到的，前面端优选在板（10）的每个面上具有倒角，并且该板的横向侧成斜角，以便减小前面端的宽度。优选地，这些斜角在离彼此一段距离处终止，并且前面端因此由相对尖锐的平面或弯曲表面终止。另一方面，如前面提到的，优选地锚（1）容易穿透到椎骨中，而没有分裂它们超过锚（1）的尺寸的风险。因此，（一般地主体的）板（10）的横向侧（或边缘）将优选是平的，如大多数附图中所示。因此，一般地，锚（1）的板（10）的横向侧优选是平的，以便避免分裂椎骨。

[0057] 如上面所提到的，为了增强锚保持植入物（2）靠近椎骨的能力，各种实施例提供靠着意在固定的植入物的至少一个表面停止的锚，以便保持该植入物靠着椎骨端板，优选牢固地压靠该椎骨端板。在锚定装置（1）的各种实施例中，主体相应地包括至少一个保持止动件（14）。保持止动件（14）优选具有至少一个面向前面端取向的止动件表面。优选地，此表面近似垂直于纵向轴线取向且面向前面端，无论其被定位在后面端处还是进一步朝向前方。此保持止动件（14）经设计与设置在装置（1）被设计所固定的植入物（2）上的互补止动件（25）的至少一个止动件表面配合，以便保持植入物（2）靠着椎骨，其中锚定装置（1）经设计被锚定在所述椎骨中。在各种实施例中，止动件（25）优选包括至少一个面向后面端（即，朝向植入物的外周）取向的止动件表面，以便最优地与保持止动件（14）配合。这些配合止动件表面可以具有各种配置，例如，平的、弯曲的、棱形的等。注意保持止动件（14）优选在后面端处，如本申请的大多数附图所示。在许多配置中，保持止动件（14）定位在后面端的水平处（即，在后面端处或附近），以便其位于或靠近植入物中通道（21）的入口，从而

邻接植入物的止动件 (25) 的互补表面。互补止动件 (25) 的这个表面可以例如是植入物的外周壁的表面，但其可优选由凹部形成，以便当锚 (1) 完全插入其中时止动件 (14) 不从植入物伸出（或延伸超过该植入物）。此外，据理解，止动件 (14) 可以进一步朝向锚的前方，以便其可以在通道 (21) 内被发现，例如只要植入物的互补止动件表面 (25) 适当地定位即可。然而，在许多实施例中，保持止动件 (14) 在后面端的水平处的定位具有提供对植入物的良好保持的优点，特别是当锚经配置从通道的入口直到出口接触植入物时。另外，当配置植入物 (2) 和锚 (1) 以促进该锚的有意撤回时，这种后面位置可以是优选的，如在本公开的其他地方为各种配置所讨论的。

[0058] 在锚 (1) 的某些实施例中，保持止动件 (14) 包括从锚 (1) 的至少一个面和 / 或侧（或边缘）伸出的至少一个部分。例如，保持止动件 (14) 可包括至少一个凸耳。例如，保持止动件 (14) 在锚定装置 (1) 的同一面上特别是在凸面上包括两个凸耳。在其他配置中，至少一个凸耳可以设置在任何面和 / 或侧（或边缘）上，或者至少一个凸耳可以设置在每个面和 / 或侧（或边缘）上，或者可以有以同样精神的任何其他变型。在锚 (1) 的某些实施例中，保持止动件 (14) 在锚定装置 (1) 的主体的至少一个横向侧或边缘上包括至少一个凸耳。优选地，至少一个凸耳将被定位在两个横向侧中的每个上，以便增强保持。如保持止动件 (14) 的这些示例配置所示，这里所用的术语“凸耳”不应该以限制方式解释，并且该凸耳的精确形式可以例如在提供平面止动件表面的小板和提供弯曲止动件表面的小嵌钉之间变化，或者是任何其他变型，尽管一些特定形状可具有各种优点，例如就锚的有效保持或主动撤回方面。另外，保持止动件 (14) 可以具有各种取向，以便保持锚 (1) 在植入物中且以最优方式保持该植入物紧靠椎骨。若干不同保持止动件 (14) 也可以被设置、定位在锚 (1) 上的不同位置处。在锚 (1) 和植入物 (2) 的一些实施例中，保持止动件 (14) 和互补止动件 (25) 的形状可以布置成使得锚的止动件 (14) 例如通过锁定凸耳接合凹部而与植入物的止动件 (25) 配合或者锁定到植入物的止动件 (25)。在锚 (1) 带有两个由未弯曲部分连接的弯曲板的情况下，或者在单个板带有弯曲部分（钩形状，如在申请 FR 2,879,436、WO 2006/120505 和 US 2006/0136063，其每个通过引用并入本文，特别是在假体的固定情况下）的情况下，此部分可以用作保持止动件，例如与轴或与至少一个位于通道 (21) 入口处的表面配合。锚定装置 (1) 在许多实施例中是可拆卸的，且可以被植入椎骨中并在其被安装在椎骨之间之后与植入物配合，这允许可以在由锚 (1) 的明确固定之前调整植入物在椎骨之间的位置。在一些实施例中，保持止动件可以被用于拉动锚 (1)，以从椎骨将其移除，并且如果必要（例如，在弯曲钩或夹持资源 (141) 提供如上面所提到的在锚上拉动的方式情况下）从植入物移除。

[0059] 应该注意撤回止动件可以被定位在板 (10) 上的各种位置处（至少在一侧和 / 或至少一个边缘上且在沿纵向轴线的各种位置处）。优选地，这些撤回止动件 (15) 将不会被设置成太接近后面端，以致要求从通道 (21) 出口实现（节省）的深凹部来形成接收这些止动件 (15) 的互补表面。根据撤回止动件 (15) 的位置，这些互补表面可以在植入物上的各种位置中形成。例如，在撤回止动件 (15) 接近后面端的情况下，互补表面可由凹部形成，产生在通道 (21) 的壁中，例如靠近该通道的横向侧。被设置成进一步远离后面端的撤回止动件 (15) 可以接合在通道外（在其出口处）的表面，但更后的止动件是优选的，因为使分支接近彼此将允许与此类止动件的脱开比与进一步远离后面端的止动件的脱开更容易。

[0060] 在锚 (1) 的某些实施例中，主体可以配置有凹口 (16)，其被取向成一旦被植入椎骨中则反抗装置 (1) 的撤回。优选地，这些凹口将仅存在于沿锚 (1) 的主体的部分，其中所述锚 (1) 的主体的所述部分经设计当该锚被完全插入植入物中时从通道出现。如可以特别地从图 1C、图 2C 和图 6B 中所示的非限制性示例看到，这些凹口 (16) 可以在数量、尺寸和形状上变化。此类凹口用来稳定锚到骨中且防止锚从骨撤回，尤其是当骨生长已经填充凹口之间的空隙时。在锚 (1) 的一些实施例中，靠近板 (10) 的后端可以提供成至少一部分的厚度大于板 (10) 的其余部分厚度，从而限制该装置在植入物 (2) 的通道 (21) 中的余隙。

[0061] 在某些实施例中，容易撤回锚的能力是优选的，并且在那些实施例中，允许骨穿过锚生长的凹口 (16) 或结构，如孔或扩大的狭槽一般将是不希望的。本文所述的某些实施例包括至少一个允许锚 (1) 移除的机构，并且在那些实施例中，这些开口和 / 或狭槽的尺寸可被限制，以便其可以起到保持锚 (1) 的作用，且具有骨生长，而不具有借助于本文所述的阻碍锚 (1) 的撤回。同样地，也可以调整凹口 (16) 的形状和尺寸，以便反抗锚 (1) 的自发撤回，同时允许借助于本文所述的机构的有意撤回。因此，这些实施例不一定是排他的，并且取决于开口的尺寸和 / 或狭槽 (11) 的尺寸且 / 或凹口 (16) 的形状和尺寸。

[0062] 在某些实施例中，如果必要的话，锚 (1)(和 / 或植入物) 包括撤回机构，如至少一个夹持资源 (141)，其通过使用锚提取工具促进锚从植入物和椎骨的有意撤回。用于提取锚定装置 (1) 的工具可以具有各种形式且可以例如包括至少一个轴，其在其末端处弯曲 (像钩子)，以便穿透到凹部中且允许通过在轴上拉动而撤回锚。例如，在某些实施例中，保持止动件 (14) 可以配置有捕捉件，以促进锚 (1) 的撤回。在这些实施例的一些实施例中，此类捕捉件可以通过使至少一个保持止动件 (14、140) 与植入物 (2) 的互补止动件 (25) 接触来提供由工具可通达的自由空隙 (141) 而获得。植入物 (2) 的互补止动件 (25) 或附近区域可配置有空隙 (space) 或间隙 (gap)，其允许插入锚提取工具，以在保持止动件 (14) 上拉动。由于狭槽 (11) 的存在，撤回止动件 (15) 意在通过在至少一个所述分支上施加压力以使他们更接近彼此，从而从植入物的配合表面脱开。因此，可以例如作为撤回机构提供夹持资源 (141)，如在每个分支上的壳体，以允许例如被配置成具有穿透所述壳体的弯曲端的夹具的工具，能够夹紧两个分支且在锚上拉动。因此，据理解，本发明的各种实施例具有在较小拥塞的情况下容易移除锚 (和因此植入物) 的优点，同时保证锚的良好稳定性。

[0063] 在某些实施例中，锚定装置 (1) 包括一种机构，其将协助稳定该锚定装置 (1) 在植入物中的通道 (21) 中。例如，在某些实施例中，提供弯曲的锚，以穿过植入物的直通道，而即使锚 (1) 具有曲率其也没有变形。带有直通道 (21) 的植入物 (2) 的这些实施例比带有弯曲通道 (21) 的植入物 (2) 的实施例更容易且更便宜地被制造。然而，对于弯曲锚穿过直通道，通道 (21) 的高度必须在水平取向 (在板深度的方向上弯曲) 的锚的实施例中至少稍微大于板 (10) 厚度，或者在竖直取向 (在板宽度的方向上弯曲) 的锚的实施例中大于板 (10) 宽度。可是，优选的是锚在植入物 (2) 的通道 (21) 中具有较少或无游移，以便至少防止将趋向于使锚离开椎骨的所述锚 (和 / 或植入物) 的运动。如在本公开的其他地方所注的，一些配置中锚的主体可以在两端 (前面和后面) 之间具有各种曲率半径。在某些实施例中，锚定装置 (1) 在后面端处的曲率可以经配置充分接合通道 (21) 的壁，以提高锚定装置 (1) 在植入物 (2) 上的保持。在某些实施例中，主体的弯曲板 (10) 包括在后面端附近的一部分，其优选基本上为平面的表面通过稍微比板 (10) 的其余部分更厚而限制该装置

在植入物 (2) 的通道 (21) 中的游移。据理解，接近后面端的加厚部分大体至多对应于通道 (21) 的整个长度，但是它们优选是较短的，因为如果太长则锚穿过通道 (21) 的插入会被抑制。用于穿过植入物将锚 (1) 插入椎骨中的仪器（例如，3、4、5）（在本公开中的其他地方描述的）是本发明的潜在对象，并且因此，优选配置锚 (1)，以穿过此仪器 (3、4)。因此，优选地在锚的长度的一部分上的可能是平面的加厚部分不会阻碍引导锚到仪器中且穿过该仪器。因此，在各种实施例中，锚可以借助于具有的厚度大于板 (10) 的其余部分厚度的至少一个加厚稳定部分而被稳定在通道中，所述至少一个加厚稳定部分通常被设置在锚的两个分支 (12、13) 上且优选地靠近板 (10) 的横向边缘。稳定部分不应该防止保持止动件 (14) 停止在植入物中的互补止动件 (25) 上，所以当这些保持止动件创建在板的一个面上时，该稳定部分将因此优选地被定位在与包括保持止动件 (14) 的面相反的面上，这将增强其止动 / 停止功能。在锚 (1) 的各种配置的插入过程中，如果厚度的增加太突然，则该稳定部分会阻碍锚的穿过。因此，稳定部分可包括至少一个倒角或成斜角表面，例如在其会合板的地方，基本朝向前面端，从而形成斜坡，以便提供逐渐增加厚度达到按压锚 (1) 在通道 (21) 中且因此限制其游移的最优厚度。也注意称为稳定部分的加厚部分（一个或多个）的厚度优选将仍然稍微小于通道 (21) 的高度，以便限制游移但不完全消除游移。然而，在某些变型中，此厚度（和 / 或高度）将等于或甚至稍大于通道 (21) 的高度（和 / 或凹槽的深度，相应地），特别是在其材料（如 PEEK）允许稍微变形的躯体间保持架的情况下。

[0064] 单个锚定装置 (1) 可以被用于锚定植入物 (2) 在椎骨中，但在大多数申请中至少两个装置将优选被用于固定植入物 (2) 在其将要被植入其间的两个邻近椎骨中（对于每个椎骨至少一个锚）。如前面所提到的，本发明的另一个潜在对象是一种用于包括两个锚定装置 (1) 的植入物的锚定系统，所述两个锚定装置 (1) 彼此相同或不同或者彼此互补，其中至少一个锚定装置根据本申请中描述的实施例之一配置。因此，锚的任何实施例和本文所述的特征的各种组合中的任何组合是在本发明的范围内，以及根据这些实施例之一的一个锚与另一类型的骨锚定装置，如在上面引用的本申请受让人的在先申请中描述的实施例之一的类型的任何组合（例如对于两个不同椎骨）（只要植入的情况允许此类组合）。

[0065] 植入物

[0066] 包括至少一个通道 (21) 的椎间植入物 (2) 也是在本发明的范围内，所述至少一个通道 (21) 经设计接收锚定装置 (1)，如横穿该植入物的一部分的狭缝、导管或经布置接收锚定装置 (1) 的其他类型的槽道。优选地，此类植入物经配置接收包括至少一个弯曲且刚性的板的至少一个锚定装置 (1)，以便允许此锚定装置 (1) 通过通道 (21) 穿过而不变形，即使装置 (1) 具有曲率。在大多数配置中，通道 (21) 沿适合于锚定装置 (1) 的曲率和植入物的所需固定的优选直线且倾斜的轨迹从植入物 (2) 的外周横穿植入物 (2) 到植入物 (2) 的上表面或下表面，如在本公开的其他地方详细讨论。本申请不详细描述椎间盘，而是仅描述为关节固定设计的躯体间保持架的各种实施例。然而，本领域技术人员在理解本公开之后将理解到根据本发明配置有各种特征和特征的各种组合的锚定装置 (1) 可与假体使用，其中该假体包括至少一个经配置接收如本文所述的锚 (1) 的后面部分，可以理解作为后面的指定是相对于植入（例如，在植入中和 / 或假体的设计中采用的接近）的具体情况的上下文。例如，椎间假体是已知的，其椎骨接触板具有足够的高度来提供外周壁，其中在外周壁中可能为锚定装置的插入创建如本文所述的通道。同样地，椎间假体是已知的，其包括两

个板和在所述板之间的移动核心，并且其中所述板之一的外周壁限制该核心的运动。因此，通过在壁中产生至少一个通道 (21)，横穿所述壁从外周表面到板的椎骨接触表面（上表面或下表面）而不阻碍诸如核心的假体各部分的运动，本发明可以适于此类型的假体。在各种实施例中，板中的通道 (21) 不需要从板的外周壁横穿该板，而是反而可以从一侧到另一侧（即，从上表面到下表面，或反之亦然）横穿该板，则相应地（直的或弯曲的）倾斜轴线从其自身假体的外周区域延伸到椎骨端板，并且锚 (1) 的保持止动件（例如，14、140) 和 / 或撤回止动件（例如，15、150) 能够适于（直接地或经由布置在板内的止动件表面）接触所述板的上表面或下表面。例如，其中每个通过引用并入本文的（由本申请的受让人提交的）公开 FR 2,879,436、WO 2006/120505 和 US 2006/0136063 示出具有由在锚的后面端处的弯曲部分（钩形状）形成的保持止动件的直锚，其经配置接合靠近板的边缘的杆 (stem)，并且这种一般的接近可以在充分理解本公开之后适于在这里公开的实施例。本发明的锚 (1) 可以例如是弯曲的且 / 或包括用于此类假体的至少一个狭槽 (11) 和 / 或一个或更多个保持止动件（例如，14、140) 和 / 或一个或更多个撤回止动件（例如，15、150)，并且附加特征和 / 或本文所述的特征的组合可以适于此类使用。在锚经设计横穿过假体的板情况下，术语“后面的”、“部分 (part)”或“部分 (portion)”或者术语“外周壁”可以用于指定靠近板外周且可从假体的外周区域通达的部分。

[0067] 因此，本发明的某些实施例也涉及用通常为植入物 (2) 描述的构件创建的椎间盘假体。各种类型的椎间盘假体是已知的并且在这里不给出细节，除了其可以例如包括至少两个板，其（例如经由板的铰接表面和 / 或中间核心）铰接在一起并且其中至少一个包括至少一个通道 (21)。根据本发明配置的躯体间保持架也可以具有各种形式，包括与本申请的附图中表示的说明性示例明显不同的配置。然而，本申请也涉及如本申请中所述的躯体间（体间）保持架，因为所述躯体间保持架特别适于侵入和稳定性的问题，并且本申请中所述的锚的使用结合此类保持架可以是特别有利的。本文的描述参照附图给出若干非限制性实施例变型，但在充分理解本公开之后，将理解至少当涉及植入物与至少一个锚的组合时，根据本发明设计的各种植入物在不背离本发明的精神和范围的情况下可以具有其他形式。因此，在本申请中，一般参考椎间植入物来指定保持架和假体，并且还有骨缝合板。然而，当躯体间保持架的特定实施例要求参考保持架的具体技术特征时，可以参考躯体间保持架，而不是椎间植入物。

[0068] 本文所述的各种椎间植入物 (2) 包括一般具有至少一个外周壁的主体 (20)，其后面部分（根据本描述中所采用的惯例）包括至少一个具有合适尺寸的通道 (21)，以接收至少一个根据本发明配置的锚定装置 (1)。如本文其他地方所解释的，该通道可以是直的，以避免弯曲通道的复杂且昂贵的机加工。然而，在植入物在通道处可分离成可联接在一起的两个部分的情况下，创建弯曲通道是较容易的。此外，可能通过模制来制造植入物，如躯体间保持架。然后，例如通过使用具有弯曲插入件的模子，可以较容易地生产具有弯曲通道的植入物。另外，某些新近技术允许弯曲机加工，尤其是在固体材料（例如，金属）中。因此，特别在其板由金属制成的椎间盘假体的情况下，可以创建经设计接收弯曲锚的弯曲通道，而没有超过机加工直通道的额外费用和负担。如果植入物中的通道 (21) 是弯曲的，则其高度可以大体等于（或稍大于）锚板 (10) 的厚度。如果通道 (21) 是直线的（直的），则其高度优选将至少稍微大于弯曲锚的厚度，以允许其穿过而没有锚 (1) 变形，即使其具有曲率

及刚性，如在本申请中的其他地方所讨论的。植入物内的弯曲通道 (21) 的这个技术特征允许诸如植入物和锚定装置和 / 或系统等对象的许多实施例，其中植入物包括弯曲通道并且其中锚是弯曲的且包括至少一个狭槽 (11)。这些特定对象（即，包括植入物中的弯曲通道或与植入物中的弯曲通道关联的这些实施例的任何实施例）可经配置解决植入物固定的稳定性问题和 / 或侵入问题。

[0069] 在一些实施例（未示出）中，通道 (21) 可具有带有倾斜取向的入口，其中该通道的宽度既不平行于盘空隙的平面取向，也不平行于脊柱的轴线取向，而是居中间且与（在大多数附图中示出的）这些参考取向形成角度。在这些实施例中，优选具有被植入同一椎骨的两个锚 (1)，并且这些锚 (1) 优选具有在板厚度中的曲率和一个或更多个比一般用于可与具有水平地（在盘空隙的平面中）取向的通道入口的植入物关联的锚的曲率半径更短的曲率半径，以便锚具有足够的曲率来提供良好保持，即使其具有倾斜取向。此倾斜取向可以在各种情况下是有用的，以解决当面对植入的各种约束时锚和植入物的稳定性问题。一些实施例可提供例如与包括至少两个通道的植入物关联的两个此类锚，所述至少两个通道具有此类朝向同一椎骨引导的倾斜取向，但具有彼此相反的取向（例如，一个入口向右倾斜 45°，且另一个向左倾斜 45°）。然而，该通道的水平取向大体是优选的，特别是用于较容易使用，尤其是与如本申请中描述的仪器使用。

[0070] 包括弯曲板的锚与骨缝合板的使用可以是特别有利的，特别是在椎骨 L5 和 S1 之间盘空隙的情况下，因为骶骨朝向脊柱背面的取向使其一般难以通达此区域，甚至是通过前面接近。一般地，甚至具有弯曲锚 (1)，也优选使用在骶骨的水平处倾斜的（不垂直于椎骨的）仪器的接近轴线，这是因为骶骨具有朝向脊柱背面的取向。在仪器的前面端处与植入物接触的表面可以相对于其纵向轴线（根据本申请中使用的惯例的前 - 后）倾斜，用于允许与骨缝合板的最优接触。尽管如此，接近轴线在一些情况下可以基本垂直于骨缝合板，并且然后仪器将适于此接近轴线。此外，也可能使用包括直板的锚，以便在各种情况下（例如，倾斜路径或垂直于椎骨的路径）允许此植入。该仪器将因此根据锚的形状和所选择的接近轴线被调整。根据本发明用各种特征设计的植入物可包括骨缝合板，所述骨缝合板包括通道 (21)。然后，后面部分或外周壁可对应于骨缝合板本身，从而在盘空隙的外部和内部之间形成壁。然后，根据本文所述实施例之一的锚沿基本垂直于骨缝合板（和在所涉及的盘空隙的水平处的脊柱轴线）的接近轴线插入通道中。该板中的通道 (21) 可以布置成被放置在盘空隙或椎骨体水平处且通往端板或直接在椎骨体的外周中。如上所解释的，通道 (21) 的入口取向可以是倾斜的。除了如本文所述的至少一个锚，这些固定板还可以用常规螺钉进一步靠着椎骨固定。

[0071] 应当注意，本发明的各种对象（锚、锚系统、植入物和仪器）的通道、孔、凹口、止动件、凹部、凸耳和其他元件可以以一般的方式由诸如机加工、钻孔、铸造、焊接等各种方法形成，并且本文给出的示例不应被限制性地理解。

[0072] 如在本文其他地方所注的，锚 (1) 优选包括在板 (10) 的至少一个后面部分上的至少一个狭槽 (11)。植入物可以通过若干锚被固定，并且其将因此包括若干通道 (21)。优选地，将有两个通道 (21)，其中每个通道都朝向其间必须植入植入物的椎骨中的不同一个取向。因此，在某些实施例中，外周壁包括两个通道 (21)，其中每个通道都朝向植入物 (2) 的上表面和下表面（植入物的椎骨接触表面）之一取向，以便将锚定装置 (1) 锚定在其间设

计要植入植入物 (2) 的椎骨中的每个中。锚 (1) 的通道 (21) 产生在植入物的壁中，以便出现在植入物的椎骨接触表面上。

[0073] 本发明的各种实施例涉及椎间植入物 (2)，其包括具有称为后面的至少一个部分的主体 (20) 以及至少一个通道 (21)，所述通道经配置容纳根据本发明的至少一个用于锚定的装置 (1)，以便允许此刚性锚定装置 (1) 穿过而不扭曲，即使其具有曲率。在这些实施例中，通道 (21) 通常沿适于锚定装置 (1) 的曲率的直线且倾斜的路径从周边穿过植入物 (2) 到顶表面或底表面，这意在基本在植入物 (2) 的平面中插入，以便在其间意在植入植入物 (2) 的椎骨之一的端板的方向上的插入过程中定向锚定装置 (1)。为了保持锚 (1) 但允许该锚的撤回，这由其上存在的狭槽 (11) 促进，通道 (21) 具有与锚定装置 (1) 的至少一个撤回止动件 (例如，15、150) 互补的至少一个表面。注意接收撤回止动件 (例如，15、150) 的植入物的这个互补表面一般在植入物的通道 (21) 中形成，优选在其入口 (或在后面外周壁) 或其 (通向椎骨接触表面的) 出口的附近或者接近此出口处形成。此表面将根据撤回止动件 (例如，15、150) 在锚定装置 (1) 上的位置被提供。可提供若干表面用于接收锚定装置 (1) 的多个撤回止动件 (例如，15、150)。优选地，在锚定装置 (1) 的分支 (例如，12、13) 中的每个上有至少一个撤回止动件 (例如，15、150)，但在每个分支上可以提供若干撤回止动件。所述止动件一般靠近板 (10) 的后面端被提供，因为这些是由于狭槽可以最容易接近彼此的分支的后端。本发明也涉及本申请中描述的植入物的各种实施例与本申请中描述的锚的各种实施例的组合。此类组合使其可能特别响应特定植入伴随的在各种情况下的侵入和 / 或稳定性的问题。本发明也可涉及具有两个或更多植入物、带有或不带有锚定装置的植入物系统。特别地，在通过后面接近的保持架的实施的情况下，两个躯体间保持架一般平行于彼此布置在矢状平面的任一侧上。在经椎间孔植入的过程中，据预期一般仅一个保持架，优选是较大尺寸的保持架，将倾斜地或垂直地植入到矢状平面。

[0074] 在某些实施例中，如果阻碍约束允许，则植入物 (2) 的外周壁包括两个重叠的通道 (21) 或偏移通道，其中每个通道朝向上表面和下表面之一取向，以便将锚定装置 (1) 锚定在其间设计要植入植入物 (2) 的椎骨中的每根椎骨中。在其他实施例中，植入物 (2) 包括仅一个通道 (21)。假体的实施例类似地可具有仅一个包括通道 (21) 的板且另一个板不包括。

[0075] 根据与植入物使用的一个锚 (1) 或多个锚 (1) 的各种实施例，用于植入物的通道可具有各种形式，包括在后面部分中的入口处。在其分支 (12、13) 对称的锚的情况下，例如对应于图 1A、图 2A 和图 5A 中所示示例的实施例的那些，通道的入口优选是基本矩形的 (可能带有圆角)，以用于板穿过该通道。此类矩形通道也可以适合于一些其分支不对称的锚，例如像对应于图 4A 和图 4C 中所示示例的实施例的那些。然而，对于一些带有不对称分支的锚实施例，例如对应于图 3A 和图 3B 中所示示例的实施例的那些，该通道优选将适于这样一个事实，即所述分支相对于其他移位 (偏移)。在这些实施例中的一些实施例中，锚的前面端至少到其中分支将分开的点可以是比其他实施例的锚更薄 (较不太厚)，如上面提到的。然而，此解决方案不一定完全足够。可替代地或另外地，可能调整该通道适应锚并且反之亦然，如上面详述。图 3B 示出某些实施例的非限制性且说明性的示例，其中锚至植入物的相互调试最小化整体侵入。代替扩大该通道以允许锚的插入，锚的一些实施例在其前端处具有偏移，以便更容易穿过，并且通道 (21) 仅具有中央部分 (例如如图 3B 的下通道中所

示，其未配备有锚），该中央部分适合于在偏移部分之间（在锚的前方处）形成接点的锚的部分的穿过，而该通道的其余部分调整成锚的形状和尺寸（例如如图 3B 的上通道上所示，其配备有锚）。也注意图 3A 和图 3B 表示两个不同替换物的示例。确实，对于图 3A 中的示例，植入物包括上通道和下通道。上通道经配置接收例如在图 3E 中所示类型的锚（其右分支低于左分支）。类似地，图 3A 的植入物的下通道经配置接收例如图 3E 中所示类型的锚（其右分支低于左分支）。因此，植入物被布置成使得其锚的分支是偏移的，这暗示在其高度上对植入物具有较少设计约束。然而，对于图 3B 中的示例，上通道经配置接收例如图 3E 中所示类型的锚（其右分支低于左臂形件），而下通道经配置接收例如图 3C 中所示类型的锚（其右分支高于在左边的分支）。此配置对植入物的高度设计施加更多约束，但在其宽度上较少约束，包括可能提供更接近通道的夹持资源 (26)。注意止动件的位置和 / 或取向和 / 或尺寸仍然适合，以最小化图 3A 和图 3B 中示例的侵入。一般在朝向植入物的（在其高度上的）中间偏移的最长分支上设置保持止动件，而不是在移位到植入物上表面或下表面的分支上。各种止动件也可以布置在所述侧或边缘上，如上面所解释的。也注意，在所有情况下，通道中心的部分（在宽度上）经优选布置允许两个臂形件的充分逼近，以允许撤回止动件 (15) 的释放。在植入锚定装置 (1) 以保持植入物 (2) 在适当位置之前，有时存在植入物 (2) 将在盘空隙中移动的风险。因此，在某些实施例中，植入物 (2) 的（上和 / 或下）椎骨接触表面中的至少一个可包括凹口 (22)，其避免或限制植入物 (2) 在椎骨之间的运动（例如，反抗植入物 (2) 在椎骨之间的滑动）。在椎间盘假体的情况下，也可能在经设计与椎骨接触的表面上提供稳定构件，如凹口或鳍状物或任何类型的防止其在椎骨之间移动的结构，以便在由锚定装置 (1) 固定之前确保（或提高）假体的稳定性。根据不同实施例，这些凹口 (22) 或其他稳定构件可以具有不同取向。例如，凹口 (22) 可以基本平行于彼此并且所有都垂直于植入物插入轴线取向，或者相反，凹口 (22) 可以在植入物 (2) 的不同部分上具有不同取向，以便防止在各种方向上的运动，例如可以是人字形图案，其相对最适合于反抗在大多数方向上的运动，并且特别是反抗与在具有横向插入的保持架的这些示例中的前后轴线垂直的运动（即，沿脊柱的矢状平面或对位矢状 (para-sagittal) 平面中的轴线的运动）。

[0076] 应当注意在本申请的各种附图中，所表示的保持架的示例包括在其整个或几乎整个椎骨接触表面上的但不是在保持架的外周壁上的凹口。在这些示例中，保持架的椎骨接触表面的后面部分无凹口。然而，如果不干扰各种止动件、肋形件和 / 或可配置在这些植入物和 / 或与其关联的锚上的其他元件和特征，可能在各种实施例中在此外周部分和其他外周部分上提供凹口。

[0077] 在一些实施例中，椎间植入物 (2) 包括体间保持架。通常，保持架包括主体 (2)，其可由至少一个孔 (23、24) 横穿。对于此类保持架，外周壁可以因此限定空腔，其在经设计接收骨组织移植物或替代物的植入物的上表面和下表面（与椎骨接触的那些）上开放。虽然躯体间保持架可以包括在由其壁限定在其中心的空腔，如本申请的附图中所示，不过保持架也可以由实心件组成，而没有在本发明范围内的其他配置中的内空腔。例如，此类型的保持架可以经设计至少成对使用，以便限定保持架之间的空腔，如在现有技术中已知的。此外，在具有至少一个空腔的保持架的情况下，并且如在图 1、图 2C 和图 2 中所示的某些示例中特别可见的，开口 (24) 可以在植入物的壁（在所示示例中的横向壁）中产生，以便也允

许骨组织横向穿过盘空隙（即，通过保持架、平行于椎骨端板）的生长。孔（23、24）优选横穿主体且不仅穿过上和下面之间，而且穿过横向面。例如，对于图 1B、图 2A、图 3A 和图 3B 的说明性且非限制性示例，主体（20）不仅由（在上表面和下表面之间）竖直孔（23）横穿，而且由（在侧表面之间）水平孔（24）横穿。体间保持架（2）可因此带有或不带有中央凹部，尤其是如果若干体间保持架（2）必须位于同一椎间隙中的情况下。此类保持架通常用于包含骨（移植物），该骨（移植物）将在椎间隙内生长且允许其所植入其间的两个椎骨的融合（关节融合）。也已知使用替代物，而不是骨移植物。在所有情况下，保持架（2）的目的是恢复或维持椎骨之间的空隙。在移植物的生长和脊柱融合之前，保持架（2）应该保持在盘空隙中就位，并且本发明的各种实施例促进其稳定。类似地，在所有情况下，假体通常应该被固定到椎骨端板。在某些实施例中，躯体间保持架可包括加强件（28），该加强件（28）从一侧到另一侧穿过其空腔，以加强保持架（2）的壁，例如如图 5B、图 5C 和图 9B 中所示。空腔优选地配备有加强件（28），以固化植入物。此加强件可以具有不同形状和取向，并且可以沿椎骨之间的保持架（2）的插入轴线（例如，主体的纵向轴线）取向，但将优选的是横向，从而在横向面之间连接空腔的内壁（基本垂直于植入物主体的纵向轴线）。此横向取向允许在可能是最脆弱的方向上加强保持架，并且一般允许其不干扰锚的穿过。在各种实施例中，该加强件可以具有比保持架的其余部分更低的高度。该加强件相对于保持架其余部分的这个较低高度允许该保持架采取椎骨端板形状的各种可能的不规则性并且避免完全划分保持架空腔中包含的移植物或替代物。该加强件可以或不可以设置有凹口。另一方面，在某些实施例中，通道（21）的一部分出现在空腔中。一般地，可以根据通道（21）来定尺寸壁，并且通道（21）将根据锚定装置（1）被定尺寸和取向，以便取向和保持此装置在其中必须固定锚定装置（1）的椎骨的方向上。此外，该取向可以根据所需固定被选择，如在本文其他地方提到的（例如，通过为锚选择的弯曲）。然而，注意植入物尺寸根据其间设计植入植入物的椎骨而变化，并且该锚定装置的尺寸也可以根据那些椎骨被调整适应植入物的那些尺寸。

[0078] 甚至在通道（21）的水平处植入物的形式不是限制性的，只要允许引入至少一个锚（1）即可。例如，在本申请的附图中表示的且在图 5B 和图 5C 中特别可见的保持架（2）具有基本长方形外周。特别是带有前面端的主体的形状可以具有诸如外圆角（子弹或乳钵）形状的形状。一般地，包括通道（21）的保持架的后面端可具有基本直的壁，并且保持架将由仪器（3、4、5）保持在所述壁的附近。然而，甚至在这些示例中，也没有必要该壁在此区域中是大体平面的。特别地，本发明优选提供通道的入口配备有与保持止动件（14）互补的表面（25），这可涉及非平面形式。因此，在一些实施例中，包括用于锚定装置（1）的通道（21）的植入物（2）的后面部分在通道（21）周围包括至少一个壳体，其表面（25）经配置容纳锚定装置（1）的至少一个保持止动件（14），而该锚定装置不从植入物（2）的主体（20）伸出。锚（1）被提供用于（至少）不从脊柱伸出，甚至不从植入物伸出太多（因为这会损伤组织，从而提供趋向于将锚移出植入物或干扰第二锚的插入的悬挂或夹持结构）。因此，锚（1）经优选被设置成根本不从植入物伸出，如图 5B 中所示。另一方面，在一些实施例中，包括用于锚定装置（1）的通道（21）的后面部分在通道（21）周围包括至少一个壳体，其表面（25）经配置提供通达到锚定装置（1）的夹持构件（141），该构件用于夹持用于通过移动两个分支或腿形件（12、13）朝向彼此以脱开一个或更多个撤回止动件（例如，15、150）而与撤回锚

的工具的一端。注意在各种说明的躯体间保持架中，基本长方形形状具有轻微的弯曲（尤其是在顶视图中可见），但同样，此形状相对于本发明的范围不是限制性的，即使其优选用于任何申请。本申请的各种附图示出各种形状的躯体间保持架可具有外周壁，其包括平面侧面（或表面）以及稍微凸起的上位侧面和下位侧面（或表面）、基本平的后面（或表面）以及弯曲的前面（或表面），但同样，此形状相对于本发明的范围不是限制性的。然而，例如在图 5B 和图 5C 中可见的诸如外圆角（子弹或乳钵）的形状是特别适于保持架穿过后面的或经椎间孔路径植入。上位和 / 或下位表面（一个或多个）的凸形状有利于匹配椎骨端板的形状。确实优选的是，根据其间将植入植入物的椎骨形状和为其植入所预见的解剖路径轴线，来选择植入物的形状。在某些实施例中，沿纵向轴线 (L)（其可对应于脊柱的前后或倾斜轴线）的例如位于植入物中心周围的至少一个部分比植入物的其余部分更厚，以便采取椎骨的形状。优选地，植入物的表面适于椎骨的解剖学。然而，对称形状一般优选地用于植入物，以允许根据不同植入类型而将其上下颠倒（即，上位面设置在底部，下位面设置在顶部）并且 / 或者对其进行使用。

[0079] 如上面提到的，一些实施例涉及椎间植入物 (2)，其实际上是保持架。此类保持架优选具有沿纵向轴线是细长的主体 (20)。其优选地由至少一个孔 (23、24) 横穿且包括至少两个侧面、上表面、底表面、后部分和前部分。主体 (20) 的形状和尺寸优选配置用于由植入物 (2) 的后面或经椎间孔植入。在这里识别的经配置用于或适于通过后面和经椎间孔接近而植入的尺寸具有对技术人员而言相对清楚的暗示。然而，为了清楚起见且以纯粹的说明性且非限制性方式，可以引用下列尺寸范围：一般为用于后面植入的保持架提供比为经椎间孔植入更短的主体 (20)，因为后者往往暗示保持架倾斜地定位在椎骨之间且应该覆盖更长区域。因此，为用于后面植入的保持架提供约 22mm 至 26mm 的长度范围，而为意在用于经椎间孔植入的保持架提供约 32mm 至 34mm 的长度范围。相反，对于操作的侵入问题，在高度和宽度的尺寸是至关重要的。宽度仅是 10mm 或 11mm 等级的保持架是特别有利的，特别是带有如本申请中描述的锚。此外，根据需要由保持架恢复或维持的椎间高度，可以从高度（或厚度）的范围，例如针对最小高度（例如，位于后面处）从 7.5mm 至 14mm 的一样小的范围选择一个（或多个）保持架。由于该保持架往往具有不平行的上表面和下表面，以施加一个角度到椎骨，所以 14mm 最小高度得出最大 17mm 的此类高度。

[0080] 一般地，在各种实施例中，植入物 (2) 的形状可以改变，并且将与植入物 (2) 接触的仪器 (3、4、5) 的端形状可以因此改变。优选地，主体 (20) 包括在后面部分附近的用于植入仪器的至少一个紧固件或夹持资源 (26、27)。夹持资源 (26、27) 可以在后面部分和 / 或横向面上，优选地二者均用于在这两个位置之间提供杠杆作用，这促进植入物的操纵（显著地用于如以下详述的枢转运动）。各种实施例的植入物 (2) 事实上可以具有与如下植入物一致的不同形状，该植入物具有至少一个通道 (21) 和优选紧固件（或夹持资源或附接资源）(26、27)，其中至少一个通道 (21) 适合于锚定装置 (1) 的插入，紧固件 (26、27) 经设计与植入仪器的一端配合。紧固件 (26、27) 可以根据各种特定实施例与在此紧固件 (26、27) 附近的植入物的特定形状关联，以提供与该仪器的良好配合，或者甚至具有与该仪器的互补形状配合的特定形状。例如，该仪器可以包括遵循植入物形状的接触表面。确实，植入物的后面部分经优选配置用于允许使用仪器。例如，在图 1B、图 2A、图 3A 和图 3B 上可以看到通道入口周围的表面 (25) 是朝向通道 (21) 的入口倾斜的平表面。此形状允许保持止动件

(14) 不从植入物伸出，但也允许具有互补形状的仪器 (5) 提供在植入物的后面部分上良好分布的接触，这促进对植入物的操纵（显著地用于如以下详述的枢转运动）。

[0081] 在某些情况下，显著地根据其间必须植入植入物 (2) 的椎骨，希望除维持椎骨之间的空隙以外，植入物 (2) 还施加、容纳或校正脊柱前凸、脊柱后凸或者甚至脊柱侧凸。因此，某些实施例提供穿过植入物 (2) 的（例如，保持架的或假体的至少一个板的）上表面和下表面的平均平面在至少一个相对于其间植入植入物 (2) 的椎骨施加、容纳或校正脊柱前凸、脊柱后凸或脊柱侧凸的方向上形成一个角度。此一般接近例如在申请 FR 2,869,528（和 WO 2005/104996 和 US 2005/0246024）和 FR 2,879,436（和 WO 2006/120505 和 US 2006/0136063）中描述，所述申请每个通过引用并入本文，特别是涉及允许植入物平均平面的此类倾斜的技术特征（即，由于在至少一个板的平均平面之间的角度或者在保持架的接触椎骨表面之间的角度，并且 / 或者由于非对称核且 / 或该核的偏移位置）。对平均平面的参考在这里反映出（上和下）椎骨接触表面不一定是平面的，因为其可以设置有凹口或者可以是凸的或者甚至凹的；因此，平均平面意在反映搁置在该表面上的椎骨将采取的大体取向。例如，本申请的附图中所示的若干躯体间保持架 (2) 是脊柱前凸诱导保持架，其经设计被横向插入且其意在定位在椎骨前面侧上的部分比相反部分更厚。上表面和下表面（无论凸的或平的，且无论是否装有凹口）是不平行的但是是倾斜的且在前端的方向上彼此分开。因此，在上表面和下表面之间的主体的尺寸在植入物的前端附近比在其后端附近更大且当通过后面或经椎间孔植入时用于施加脊柱前凸。表面也可以横向分开，以便在一侧面上的尺寸比在另一侧面上的更重要。因此，可以获得适于经椎间孔植入的脊柱前凸且 / 或可以施加或校正脊柱侧凸。

[0082] 虽然某些实施例具有穿过形成角度的植入物 (2) 上表面和下表面的平均平面，但是可以提供直的保持架，这通常将因此是对称的且具有穿过经配置基本平行于彼此的植入物 (2) 上表面和下表面的正中面。根据所需的用于植入物的植入路线，角度可以施加在各种方向上。对于脊柱后凸和脊柱前凸，此方向相对于脊柱是前后的，其中植入物朝向脊柱前面变薄以施加脊柱后凸，或者植入物朝向脊柱后面变薄以施加脊柱前凸。为了施加脊柱侧凸，穿过上表面和下表面的平均平面必须沿盘空隙平面的另一方向（沿额侧的或冠状方向，即沿相对于脊柱正中 - 横向取向的轴线）形成角度，其中植入物朝向右或左变薄，这取决于所需的效果。一般地，关于意在用于后面或经椎间孔植入的本发明的体间保持架，施加脊柱前凸的保持架是优选的，因为此配置避免保持架朝向已经从其植入的脊柱的一部分移动。

[0083] 在某些实施例中，对于图 5B 上所示的示例，上位和下位表面中的至少一个表面的至少一个部分包括至少一个斜角。例如，植入物 (2) 的主体 (20) 包括在前面部分（使用在本文其他地方所注的方向惯例，因此在包括用于锚的通道 (21) 的后面部分相反）的水平处的至少一个成斜角部分 (29)，例如在其上和下表面中的至少一个表面的至少一个外周部分上的至少一个倒角，以便促进植入物 (2) 在椎骨之间的插入。注意在上位和下位表面中的至少一个表面上的成斜角部分 (29) 与（例如具有的长度小于植入物长度的三分之一的）主体的尺寸相比不应该太大，以用于留下上位和下位表面与椎骨端板的足够大的接触表面。例如，可以仅具有一方面在上位和下位表面中的至少一个表面和另一方面保持架的前面部分之间的接合的一部分，其是成斜角的（例如在体间保持架的情况下的前面三分之

一)。

[0084] 如在图 5B 和图 5C 的躯体间保持架的示例中特别可见,保持架的前面端具有基本外壳的点 / 头(外圆角、乳钵)的形状,以优化保持架在椎骨之间的穿透,尤其是在所述椎骨之间的空隙不足够的情况下。倒角或斜角 (29) 可存在于植入物 (2) 的上和下表面二者上。此倒角 (29) 或成斜角轮廓通过赋予在其攻侧(经设计是首先被插入的)上比在保持架的其余部分上稍微更低的高度来促进植入植入物 (2)。另外,也可能在植入物的前端处成斜角侧面,以便其具有促进其在椎骨之间穿透的外圆角形状。另一方面,侧面中的至少一些面与顶表面和底表面的接合处的至少一部分可能被成斜角。特别地,有时需要在相对最后位置(其中上和下表面与邻近椎骨接触)绕其纵向轴线旋转 90° 的取向上插入植入物。确实,如上面所解释的,用于通过后面的或经椎间孔接近植入的保持架的尺寸可以是,使得保持架在高度的尺寸大于该保持架的宽度。因此,可以希望首先在其横向面朝向脊柱顶部和底部(上和下面发现其自身被横于脊柱布置)的情况下插入保持架,且然后旋转该保持架,以恢复椎间隙的高度到所需的值(其通过保持架的高度具有选定值这一事实获得)。因此,在相对于最后位置绕其纵向轴线旋转 90° 取向上插入植入物,然后使其枢转以将其放置在盘空隙中其最后位置中。在这种类型的植入中,希望的是,侧面和上和下表面之间的接合处的至少一些的至少一部分被成斜角,以促进植入物在椎骨之间旋转。可以因此为保持架提供斜角或圆形状或形式,即使不是计划的这种植入类型,但是一般优选的是保持架为给定尺寸提供最大接触区域且因此具有不是太圆的选定接合处。然后,当在植入过程中想要此类旋转时,优选为植入物 (2) 在相对于最后位置绕其纵向轴线旋转 90° 的位置中插入,而提供此类斜角,其中在最后位置处上和下表面与其间经设计植入植入物 (2) 的邻近椎骨接触。一般地,仅一些接合处成锥形(成斜角)就足以,如侧面和上表面之间的两个接合处中的单个接合处以及侧面和底表面之间的两个接合处中的单个接合处。优选选择彼此相反的接合处(例如,与右上接合处相反的左下接合处),如在图 1B 中看到的。另外,一般地且特别地当上和下表面相对于彼此倾斜时(例如,当植入物在其后端比在其前端更薄时),仅这些接合处中的一部分成斜角就足以。确实,仅使在保持架最厚的水平处的部分成斜角就足以,如在图 1B 中看到的。

[0085] 如在本公开中所解释的,植入物 (2) 的各种配置或实施例将优选适于锚 (1) 的配置或实施例,特别是用于保持止动件 (14) 和 / 或撤回止动件 (15)。因此,在某些实施例中,植入物包括优选在通道 (21) 附近的至少一个表面 (25),其大体面向植入物 (2) 的外部且形成被配置成与锚定装置 (1) 的至少一个保持止动件 (14) 配合的止动件,以便一旦锚定装置 (1) 穿过通道 (21) 被完全锚定在椎骨中,则按压植入物 (2) 靠着所述椎骨。此布置允许在椎骨中冲击的锚定装置按压植入物 (2) 靠着该椎骨,而不从脊柱的外周伸出。如在本文其他地方提到的,对于锚定的各种配置,表面 (25)(一个或多个)可以位于通道之上和 / 或之下,以接收在锚之上和 / 或之下突出的凸耳,或者位于通道 (21) 的横向侧上,以便接收在锚定装置 (1) 的主体的各侧上的两个凸耳,或者是这些可能性的任何组合。这些表面 (25) 与植入物的壁的其余部分相比被优选地设置有偏移,也就是说,在植入物 (2) 的厚度中(例如,在壳体中)偏移,以便锚 (1) 的保持止动件 (14) 不从植入物 (2) 伸出。确实,锚 (1) 不应该从脊柱的至少外周伸出,但是特别有利地不从植入物伸出太多或根本不伸出(突出)。因此,通过大部分锚被种植在椎骨中而小部分被保留在植入物中并且不或几乎不从植入物

的后方伸出，来获得可靠固定。优选地，在每种情况下将有两个止动件。优选地，止动件(25)是凹部，其底部形成止动件表面，其中深度足以接收保持止动件(14)，而其不从外周壁(28)伸出。在某些实施例中，植入物包括具有至少一个止动件表面的至少一个撤回止动件(212)，所述至少一个止动件表面大体面向被插入通道(21)的锚定装置的前面端，此撤回止动件(212)与锚(1)的至少一个撤回止动件(例如，15、150)配合，以便反抗锚定装置(1)从植入物(2)撤回。

[0086] 仪器：

[0087] 在某些实施例中，仪器(3、4、5)可用于在椎骨之间插入植入物(2)且引导锚定装置(1)到植入物(2)中并驱动锚定装置(1)到椎骨中。本发明可涉及仪器的元件(3、4、5)的组合，且涉及每个单独仪器，如冲击器(4)、适配器或保持器(3)和引导件(5)。图7A、图7B、图7C、图8A、图8B、图8C、图9A和图9B中所示的说明性且非限制性示例的此类仪器(3、4、5)意在用于根据本发明的椎间植入物(2)在椎骨之间的植入且用于根据本发明的至少一个锚定装置(1)在这些椎骨中的至少一根椎骨中的植入。该仪器优选包括至少一个保持器(3)(或适配器或支架或装填器(charger))，其具有宽度小于所述锚(1)宽度的主体(300)且包括至少一个引导表面(30)，以在植入过程中容纳且引导锚定装置，其中所述至少一个引导表面(30)具有至少一个与锚定装置(1)的板(10)的至少一个曲率半径基本相同的曲率半径。另外，该仪器优选包括至少一个冲击器(4)，其包括适于接收保持器(3)的头部(40)且具有两个长度大于保持器(3)的主体(300)长度且由一段大于或等于该保持器主体(300)宽度的距离间隔开的臂形件(401、402)，以便允许通过沿保持器(3)滑动冲击器(4)而推动被容纳在保持器(3)上的锚定装置(1)。最后，该仪器也优选包括至少一个沿纵向轴线是细长形状的引导件(5)，所述纵向轴线在用于保持植入物(2)的称为抓持端的第一端和称为推动端的第二端之间延伸，所述抓持端具有在其端处配备有至少一个夹持资源(56、57)的头部(50)，所述至少一个夹持资源(56、57)意在与植入物(2)的至少一个夹持资源(26、27)配合，所述头部(50)由纵向通路横向穿过，所述纵向通路通向植入物且其形状和尺寸适于至少部分容纳保持器(3)的主体(300)和冲击器(4)的臂形件(401、402)，所述通路包括至少一个用于引导所述锚定装置(1)的表面(53)，所述表面(53)与保持器(3)的引导表面(30)互补，用于在冲击器(4)沿保持器(3)滑动到引导件(5)头部(50)的过程中在这两个引导表面(30、53)引导所述锚定装置(1)。在保持器(3)和引导件(5)的此类布置的情况下，结合引导件(5)保持植入物(2)在植入物(2)中的通道(21)的入口周围的布置，形成引导锚(1)在该仪器内且到植入物(2)中的槽道。此类槽道具有允许锚(1)避免不正确植入和/或通过锚的插入损害锚或植入物的风险的可靠引导这一优点。此类槽道优选不间断且因此避免在植入过程中由伸出结构夹持锚。

[0088] 该冲击器优选包括至少一个纵向主体(41)，如杆，其意在平行于纵向引导件(5)的主体(51)设置。引导件(5)的主体(51)也优选以杆或管的形式。其优选包括用于保持其的手柄且允许保持植入物在其头部(50)的水平处。冲击器(4)经布置使得在其头部(40)处的臂形件(401、402)进入引导件(5)的头部(50)的通路，以用于推动至少一个锚(1)通过安装在引导件(5)的抓持端上的植入物的通道。冲击器(4)优选在与设置有臂形件的端相反的端处具有推动器(42)，可以在该推动器(42)上推动或敲击，以便使锚穿过植入物穿透到椎骨中。优选地，冲击器(4)具有用于引导冲击器(4)沿引导件(5)的纵向轴线滑动

的引导构件 (49)。这些引导构件 (49) 可以包括例如至少一个调整片 (优选两个腿形件), 其不平行于冲击器的纵向轴线且例如在其纵向延伸的主体 (51) 处延伸到引导件 (5) 并至少部分环绕其或以其他方式跟踪, 从而引导冲击器 (4) 沿引导件 (5) 的纵向轴线滑动, 如在图 8A、图 8B 和图 8C 中特别看到的。

[0089] 在一些实施例中, 用于保持在引导件 (5) 一端处的植入物的抓持端包括至少一个夹持资源 (56、57), 其包括当由手柄或旋钮 (52) 致动时在引导件 (5) 的主体 (51) 中滑动的杆 (56) 的一端。然后, 该主体一般是管, 在该管中的杆 (56) 是可移动的, 用于移动进和出植入物 (2) 的壳体 (26), 其形成该植入物的夹持资源。在一些实施例中, 杆 (56) 具有带螺纹的端, 其与壳体 (26) 的内螺纹配合, 用于当该杆由手柄或旋钮 (52) 致动时固定植入物 (2)。

[0090] 在一些实施例中, 引导件的夹持资源 (56、27) 一方面包括杆 (56) 的一端 (其在由手柄或旋钮 (52) 致动时在引导件 (5) 的主体 (51) 中滑动进和出形成植入物夹持资源的植入物 (2) 的壳体 (26)) 且另一方面包括凸耳 (57), 该凸耳经布置接合在植入物 (2) 的主体 (20) 侧面上的第二夹持资源 (27) 中且允许用作用于定位植入物 (2) 在椎骨之间的杠杆臂。优选地, 第二夹持资源 (27) 包括用于接收引导件调整片 (57) 的嵌钉的壳体 (270), 以便提高由该仪器对植入物 (2) 的夹持。这样的第二夹持资源 (27) 可以例如包括凹槽 (27), 其接收调整片 (57) 且配备有用于嵌钉的壳体 (270), 如在图 1B、图 2A、图 3A、图 3B、图 5C、图 8A、图 8B 和图 8C 中特别看到的。可以仅提供由用于接收凸耳和调整片的凹槽和壳体形成的第二夹持资源 (27), 但一般优选结合两个资源用于便于对植入物的操纵, 特别是如果需要在引导件绕纵向轴线进行 90° 旋转的情况下进行植入时。注意引导件的杆 (56) 可具有沿杆的整体长度的不平行于引导件轴线的取向 (如在图 8A 和图 8C 中看到的), 并且接收此杆的植入物中的壳体 (26) 将具有互补取向 (如在图 5C 中所示的)。此类取向可以由设置有柔性或者设置有肘形件或关节的杆 (56) 获得。在一些实施例中, 该杆和壳体是带螺纹的, 但优选地是不带螺纹的, 并且相当优选的是提供用于良好夹持的第二夹持资源 (27) 和杠杆臂。

[0091] 在一些实施例中, 引导件 (5) 的抓持端具有与植入物 (5) 的后面部分互补的形状, 其中至少一个表面在不垂直于引导件纵向轴线的平面中取向且穿过两个垂直于引导件 (5) 的纵向轴线的轴线, 以促进植入物绕纵向轴线的旋转。确实, 如前面所提到的, 表面 (25) 在植入物的通道周围可形成壳体, 在该壳体中保持止动件不从植入物伸出。通过使得该 (或每个) 表面 (25) 在不垂直于植入物纵向轴线的平面中取向且穿过两个垂直于所述纵向轴线的轴线, 此类型的布置通过减轻施加在夹持构件 (56、57) 上的力而提供支持以促进植入物的旋转。

[0092] 在一些实施例中, 冲击器的头部 (40) 是由通路横向穿过, 该通路能够完全容纳至少一个保持器 (3) 且允许其通过与配备有两个臂形件 (401、402) 的端相反的头部端而移除。此外, 在一些实施例中, 如在图 7A、图 7B 和图 7C 中看到的, 保持器 (3) 在其与引导锚定装置 (1) 的端相反的端处具有壳体 (32)(或凹口), 其经布置容纳另一保持器 (3) 的引导端的前方, 这可以具有逆向取向。因此, 如果希望穿过植入物的通道安装两个锚, 则可以安装保持第一锚 (1) 在冲击器臂形件上的第一保持器 (3), 且然后冲击该锚通过被安装在引导件上的植入物。然后, 向后移动该冲击器, 其中第一保持器 (3) 将沿臂形件滑动, 且然后如

果植入物具有两个带有相反取向的通道，则在与第一通道的取向相反的取向中放置第二保持器 (3)。然后，保持第二锚 (1) 的第二保持器被安装在冲击器的臂形件上，且在冲击器的头部 (40) 中回推第一保持器。通过冲击第二锚，第二保持器通过自身沿臂形件滑动而推动在冲击器的头部内的第一保持器。该冲击器然后被移除且包括两个可以例如由在冲击器头部的相反侧（与提供臂形件的侧相反的一侧）处设置的开口 (43) 移除的保持器 (3)，如在图 9A 中看到的。因此，冲击器的头部优选是一通路，其能够完全容纳至少一个保持器 (3)，以允许在与配备有两个臂形件 (401、402) 的端相反的所述头部的一端处移除。注意横向窗口可以设置在所述头部上，以帮助移除保持器。

[0093] 在一些实施例中，如在图 7A、图 7B 和图 7C 中可见的，保持器在由一段大于或等于冲击器 (4) 的臂形件 (401、402) 的高度的距离间隔开的其主体 (300) 的上和下表面中每个上包括宽度大于主体 (300) 宽度的板 (34)，以将保持器 (3) 稳定在冲击器 (4) 的臂形件 (401、402) 上。在一些实施例中，冲击器 (4) 的头部在横穿其的通路中具有两个凹槽 (434)，以容纳板 (34) 的边缘，如在图 9B 中特别所示的。优选地，该板的宽度小于锚定装置 (1) 的宽度。优选地，所述板由柔性调整片 (340) 结束，其设置有凸起部，以捏住冲击器的臂形件 (4)，以便当准备仪器时将保持器稳定在冲击器上。

[0094] 在一些实施例中，如在图 7A、图 7B 和图 7C 中所示，保持器 (3) 具有至少一个凸脊 (31)，锚 (1) 的狭槽 (11) 可以适配在所述至少一个凸脊 (31) 上，以便该锚随后被更可靠地维持，例如等待使该保持器在引导件 (5) 头部中的冲击器上。此凸脊优选由该保持器的引导表面 (30) 和板 (34) 之间的前部分的边缘形成。然后，该锚倚靠在维持其水平的引导表面 (30) 且由所述凸脊横向保持（保持器的板 (340) 也可以能够维持锚水平）。此凸脊 (31) 优选设置在其间具有一定角度的两个表面之间，该角度适于锚 (1) 的狭槽 (11) 的尺寸和形状。优选地，这些表面与狭槽 (11) 互补或者形成一结构来将锚阻挡在其上，例如以莫氏锥度的形式。

[0095] 方法：

[0096] 本发明的其他潜在对象涉及为椎间植入物 (2) 植入到椎间隙中准备的方法的各种实施例，和 / 或用于植入椎间植入物 (2) 到椎间隙中且用于准备植入物到至少一根椎骨的固定和 / 或用于固定植入物到至少一根椎骨的方法。这些方法可包括组装植入物 (2) 到引导件 (5) 上的步骤、在保持器 (3) 上安装锚 (1) 的步骤、在冲击器上安装保持器的步骤以及相对于引导件放置冲击器 (4) 例如直到保持器至少部分穿透在引导件 (5) 的头部中的步骤。由于本发明的各种对象的布置，这些各种步骤可以以不同顺序实施，如在本申请中讨论的各种实施例中描述的。

[0097] 在各种实施例中，这些用于准备植入的方法可包括：

[0098] 提供根据本申请中讨论的实施例的锚定装置 (1)；

[0099] 提供根据本申请中讨论的实施例的脊柱植入物 (2)；

[0100] 提供根据本申请中讨论的实施例的植入仪器 (3、4、5)；

[0101] 用植入物仪器 (3、4、5) 夹持脊柱植入物 (2) 和 / 或锚。

[0102] 在各种实施例中，这些用于准备植入的方法可进一步包括将至少一个锚定装置 (1) 引入仪器 (3、4、5) 内的步骤。

[0103] 在各种实施例中，这些用于植入脊柱植入物（即，用于插入植入物到盘空隙内或

到椎骨上）的方法可包括用于准备植入的方法的步骤且可进一步包括：

[0104] 将脊柱植入物 (2) 插入在脊柱的邻近椎骨之间的椎间隙中（或者在骨缝合板的情况下到脊柱的邻近椎骨上）；

[0105] 使得锚定装置 (1) 沿基本垂直于脊柱轴线（在邻近椎骨的水平处）的接近轴线；

[0106] 使用植入仪器 (3、4、5) 的冲击器 (4)，将锚定装置 (1) 插入通过植入仪器 (3、4、5) 的引导件 (5) 的引导头部 (53) 且通过植入物 (2) 中的通道 (21)，其中锚定装置 (1) 横向穿过植入物 (2) 的至少一部分；以及

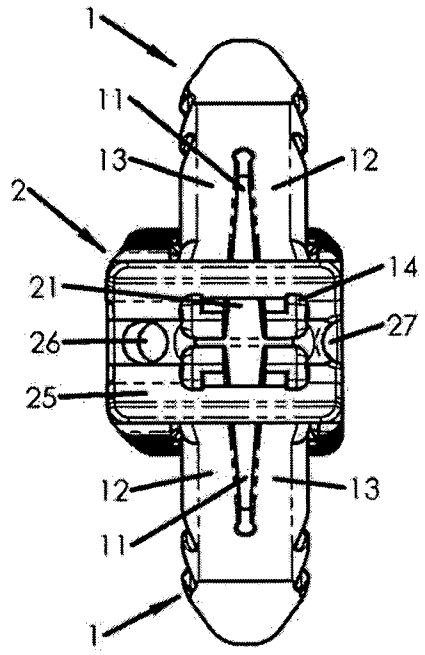
[0107] 使用植入仪器 (3、4、5) 的冲击器 (4)，将锚定装置 (1) 完全插入通过植入物 (2) 且将锚定装置 (1) 的至少一部分植入在邻近椎骨之一中。

[0108] 注意，在用于植入物的若干锚的情况下，可以重复在保持器上安装锚和植入锚的步骤，例如用与第一保持器相比是逆转取向定位第二保持器的步骤。

[0109] 由本申请中描述的各种技术特征解决的大多数技术问题可与本公开的前序中提到的稳定性和 / 或侵入问题有关。在理解本公开之后，本领域技术人员可设计各种结合本申请中描述的技术特征的实施例。

[0110] 在至少一个实施例或配置中描述的且在下面讨论的这些技术特征或这些元件每个都可以与所述实施例或配置所涉及的对象（或由所述实施例或配置涉及的和 / 或与其关联的对象）的其他技术特征分离（且因此涉及同一元件或另一元件），并且 / 或者可以在各种实施例或配置中与本文描述的任何其他技术特征组合，除非另有明确规定，或者除非这些特征不相容且 / 或其组合不是功能性的，特别是因为可以由此类分离或组合的特征要求的结构调整是直接源于由本公开提供的功能性考虑的理解。

[0111] 在充分理解本公开之后，本领域技术人员将理解到以各种其他具体形式的许多实施例和 / 或配置都是可能的且在本发明的范围内。因此，本实施例和 / 或配置应被视为可修改且仍然在所附权利要求书的范围内的非限制性说明示例，并且本发明不应该限于上面提供的细节。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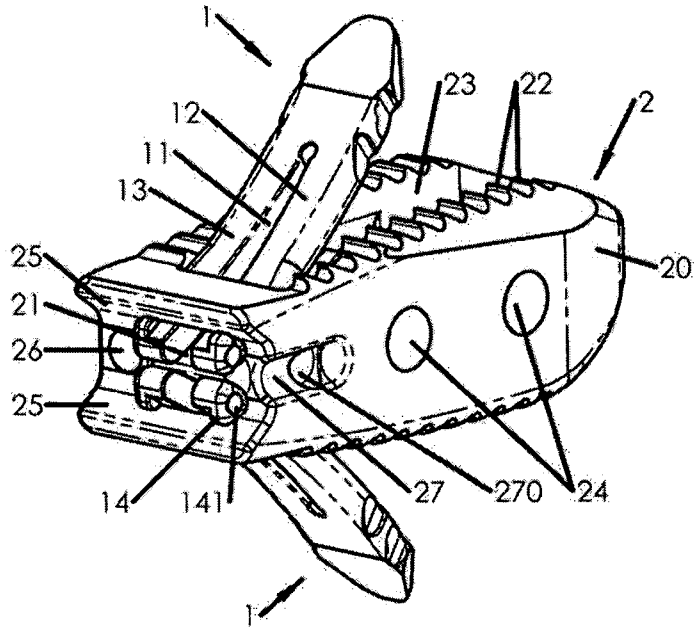
13
11
1

图 1A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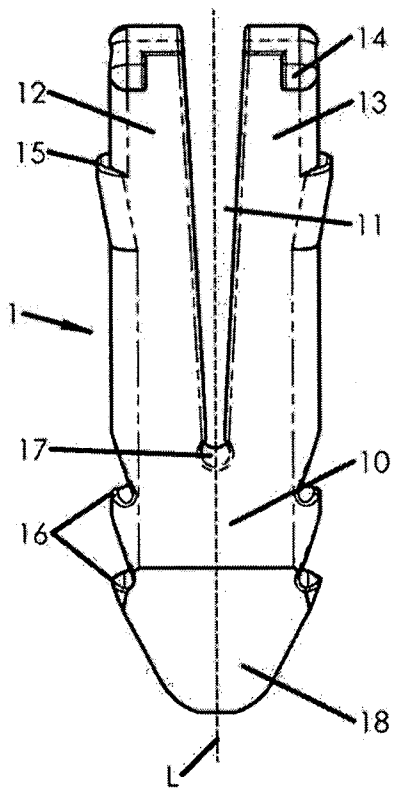
270
24
1

图 1B


14
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15
11
1
17
10
16
18
L

图 1C

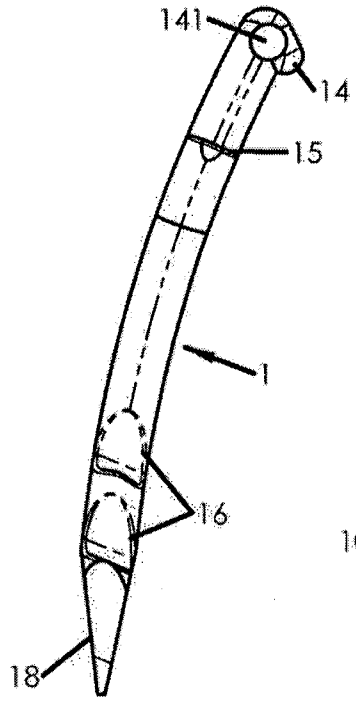


图1D

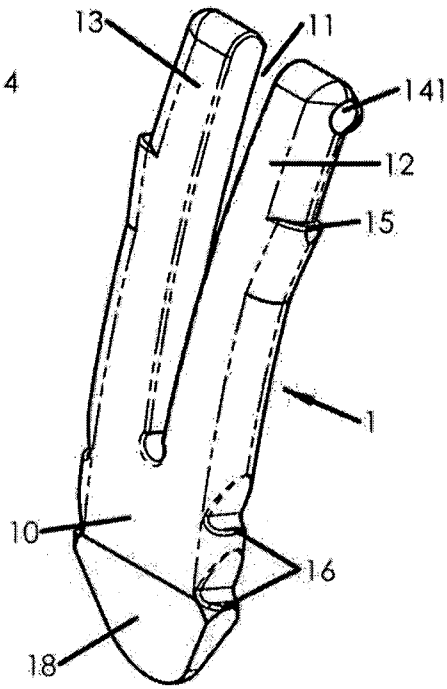
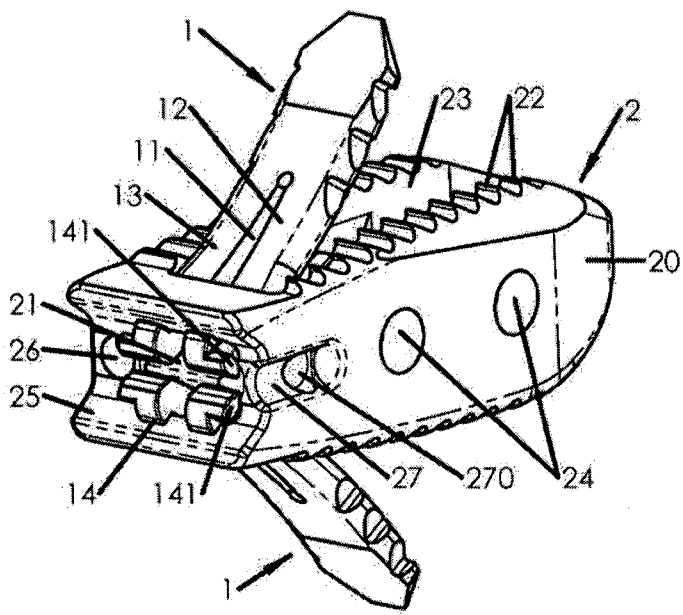


图1E



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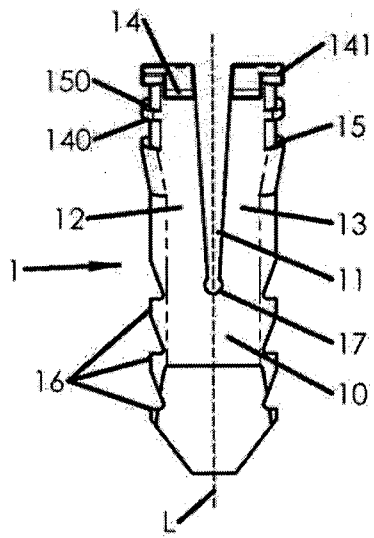


图 2B

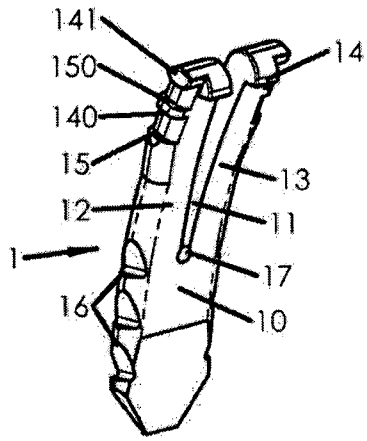


图2C

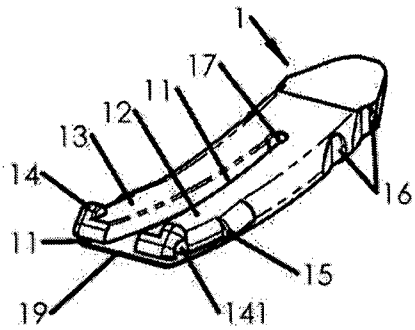


图2D

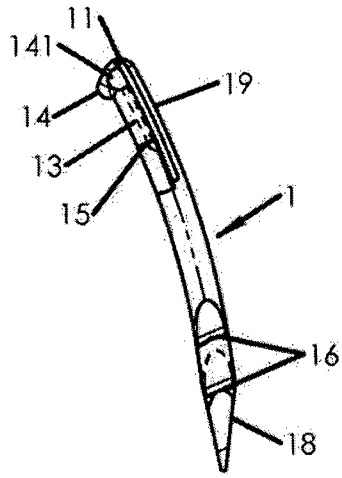


图 2E

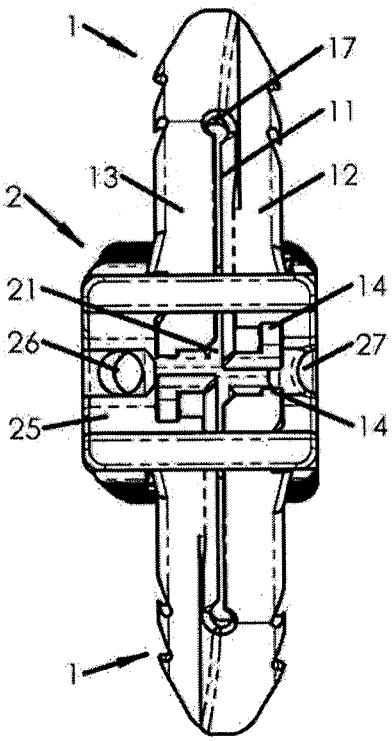


图 3A

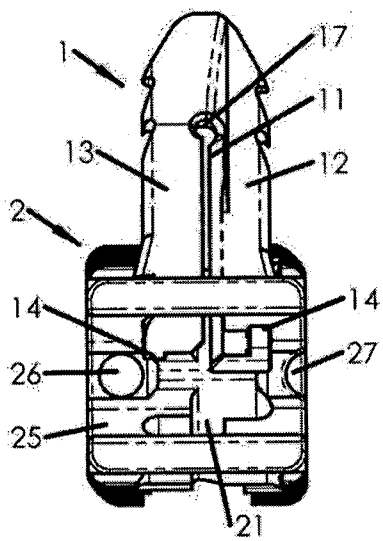


图 3B

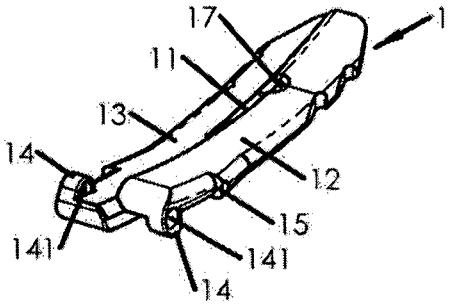


图 3C

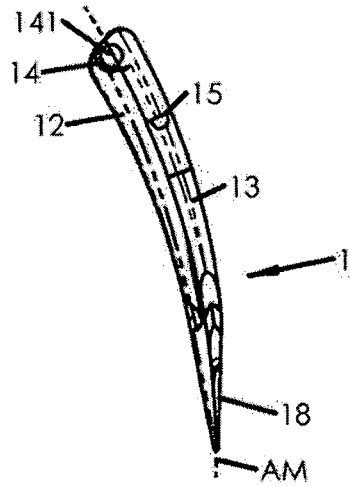


图 3D

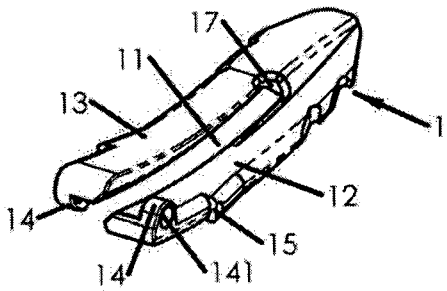


图 3E

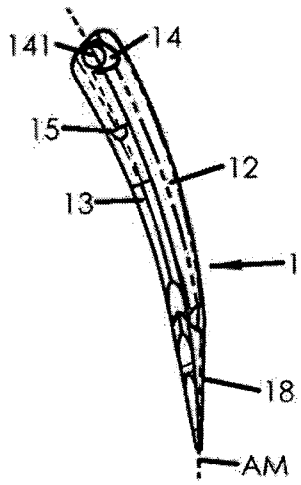


图 3F

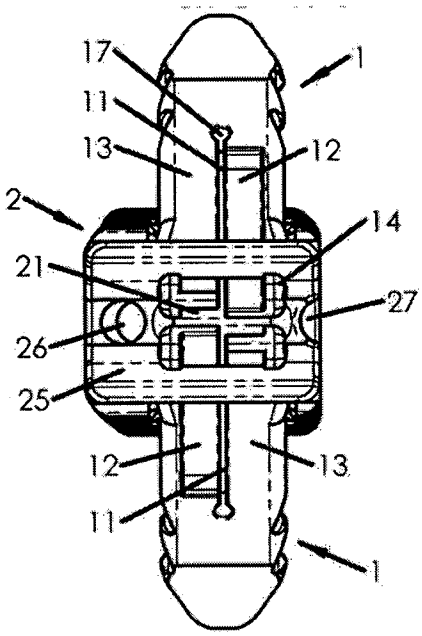


图 4A

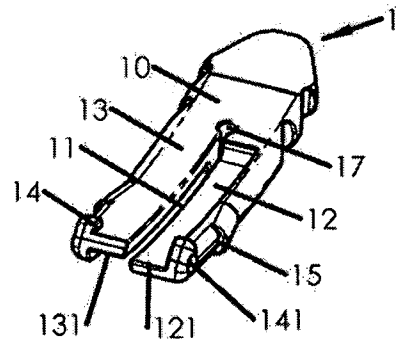


图 4B

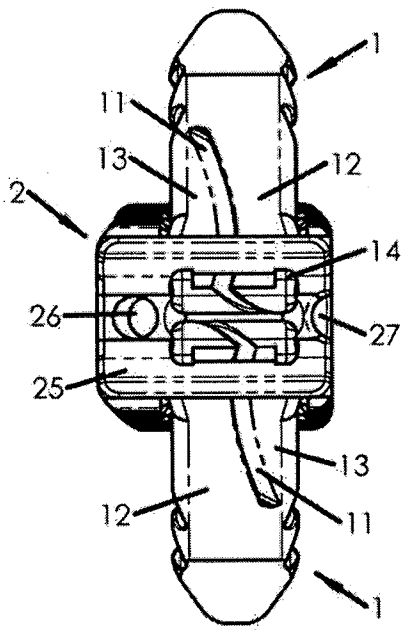


图 4C

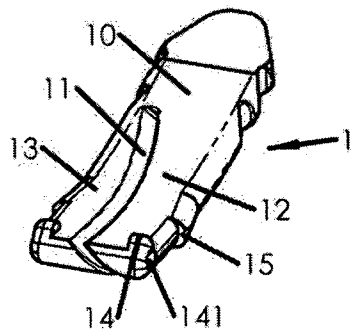
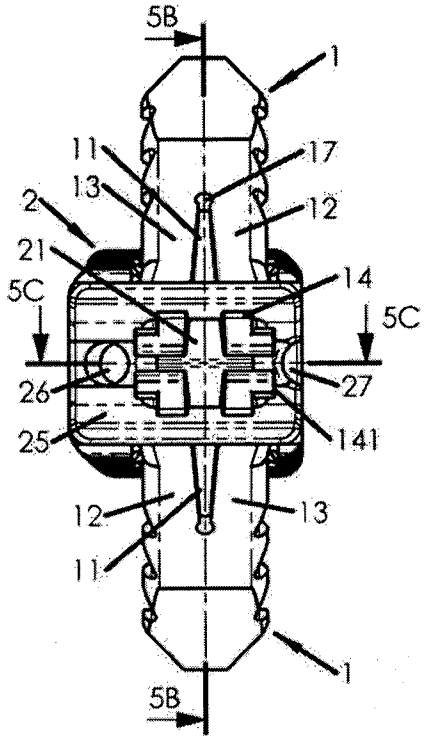


图 4D


5B
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5C
5C
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141
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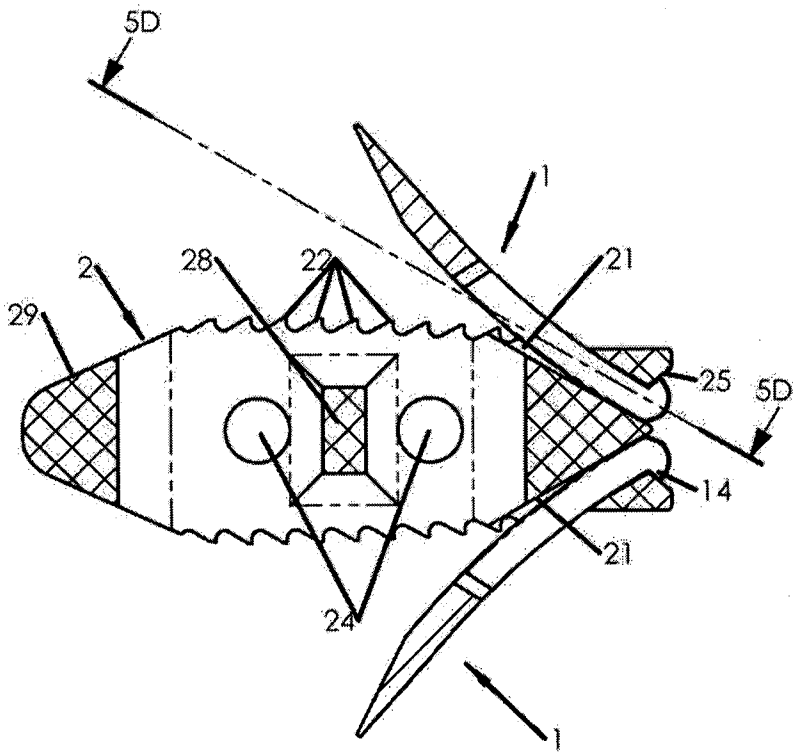
1
5B

图 5A


5D
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29
25
5D
14
21
24
1

图 5B

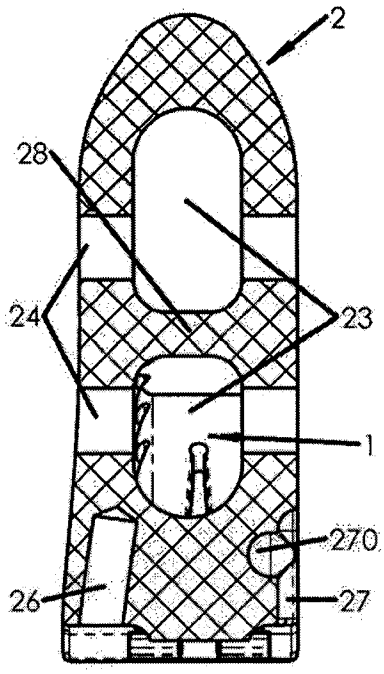


图 5C

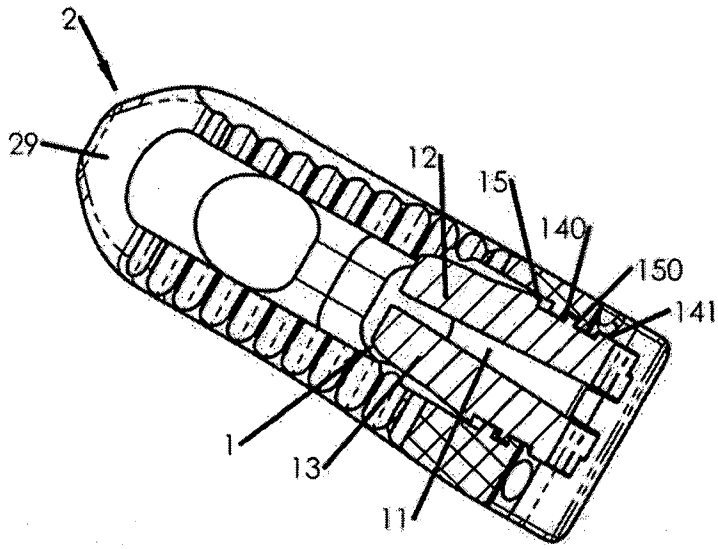


图 5D

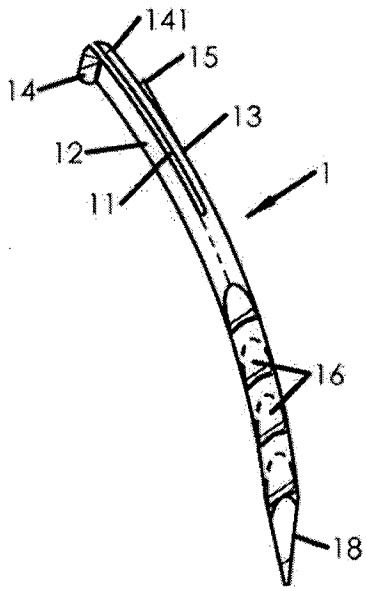


图 6A

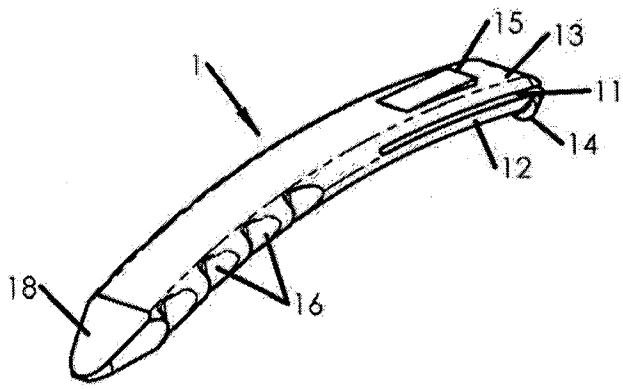


图 6B

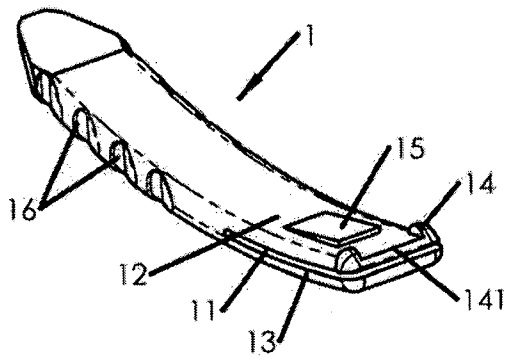


图 6C

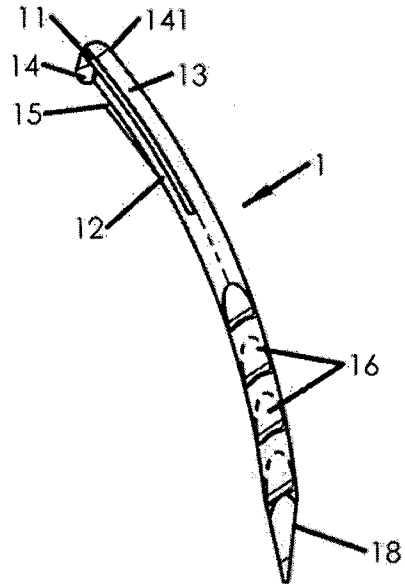


图 6D

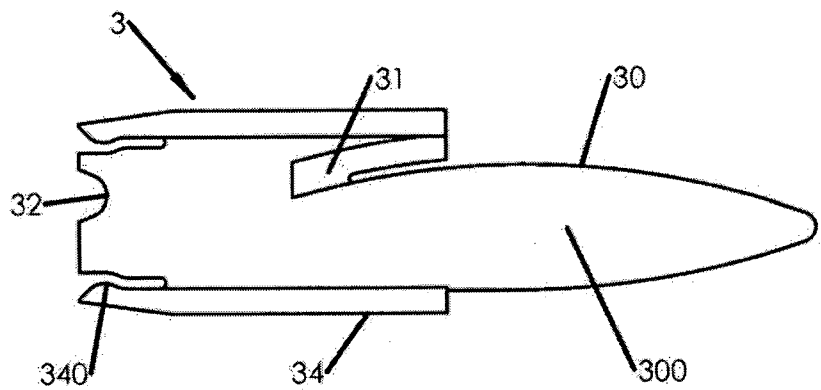


图 7A

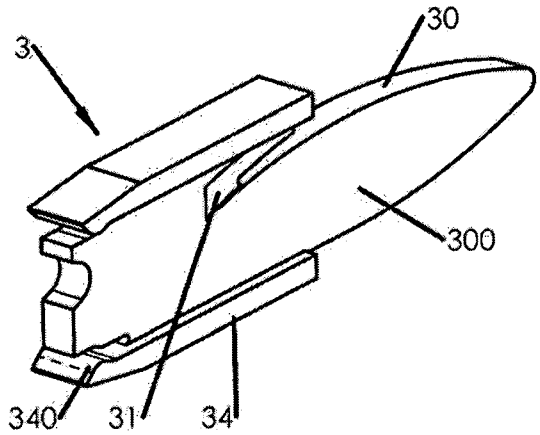


图 7B

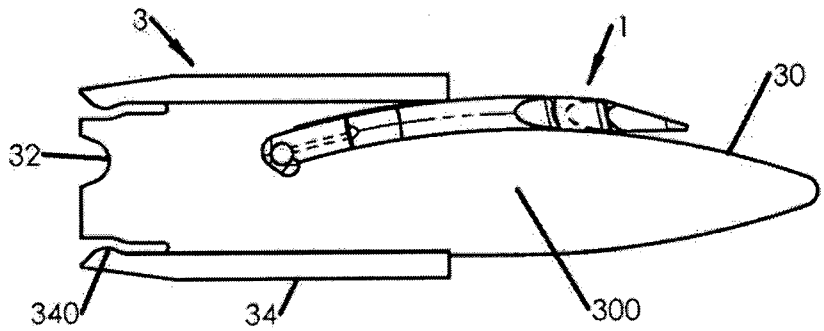


图 7C

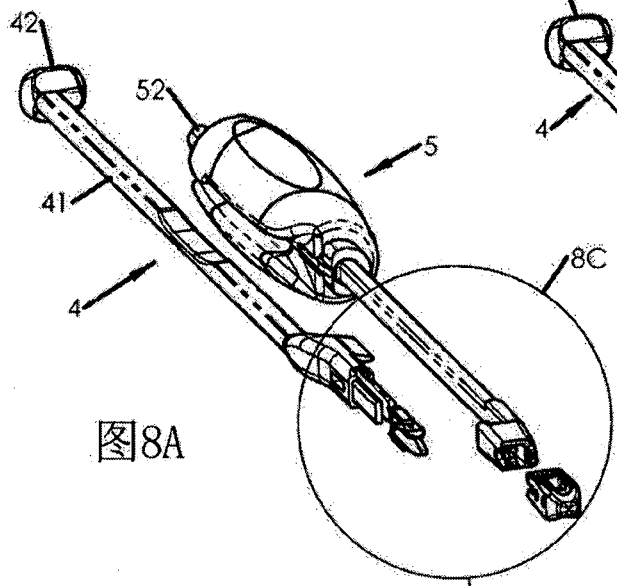
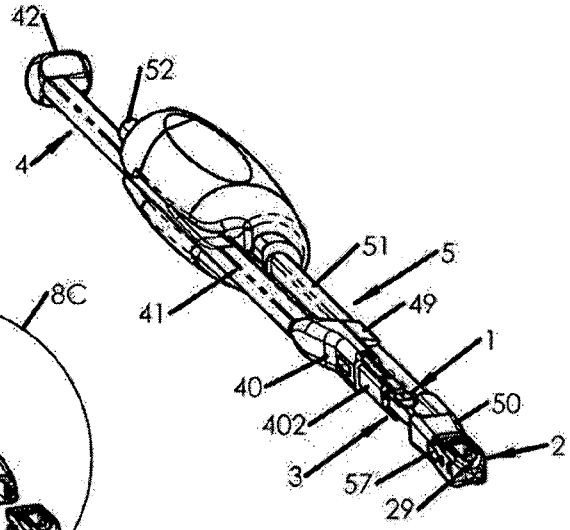

42
52
5
41
4
8C

图8A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52
4
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5
41
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1
40
50
402
2
3
57
29

图8B

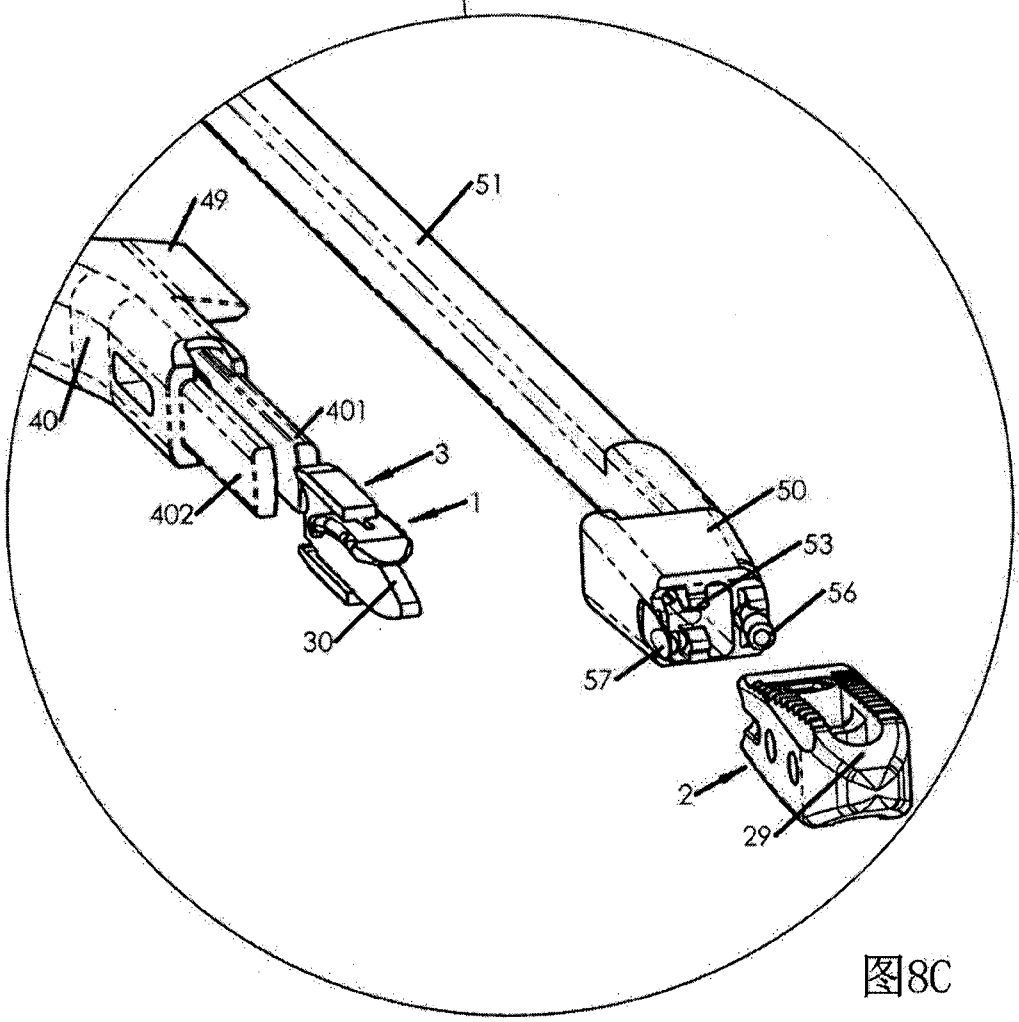
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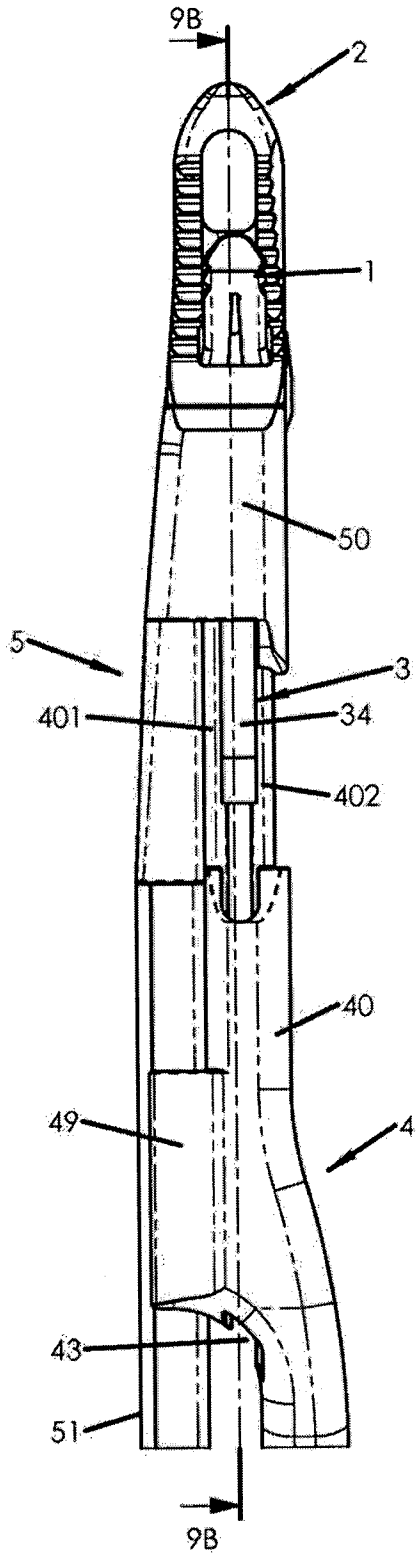
图8C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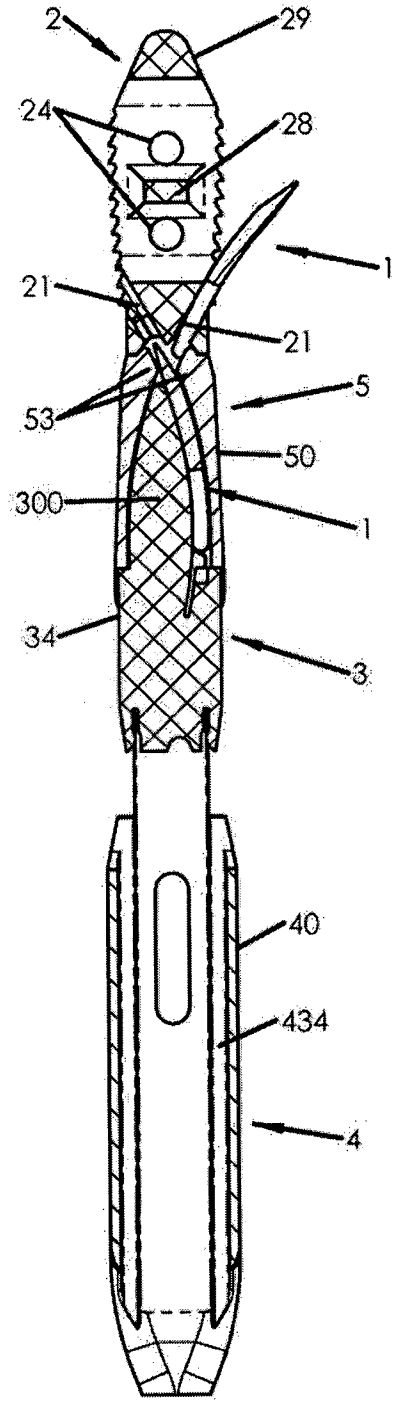
43
51
9B

图 9A


2
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21
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53
50
300
1
34
3
40
434
4

图 9B

Anchoring device and system for an intervertebral implant, intervertebral implant and implantation instrument

ABSTRACT

The present invention relates to various embodiments of anchoring devices for intervertebral implants, intervertebral implant and implantation of instrumentation, sharing the characteristic to cooperate with the anchoring device (1) comprising a body comprising at least one curve, rigid plate (10) elongated along a longitudinal axis (L) so that its front end enters at least one vertebra while its rear end remains in the passage (21) of the implant (2) by pressing said implant (2) against said vertebra with at least one retaining stop (14), the device (1) being characterized in that the plate (10) comprises at least one longitudinal slot (11) separating at least one posterior portion of the plate (10) into two branches (12, 13) which at least one comprises at least one withdrawal stop (15) configured to retain the device (1) in the implant (2).

用于椎间植入物的锚定装置和系统、椎间植入物以及植入仪器

摘要

本发明涉及一种用于椎间植入物的锚定装置、椎间植入物和仪器植入的各种实施例，共享该特征以与锚定装置(1)配合，该锚定装置(1)包括主体，其包括至少一个弯曲且刚性的板(10)，该主体沿纵向轴线(L)伸长，使得其前端进入至少一根椎骨，而其后端通过用至少一个保持止动件(14)按压所述植入物(2)靠着所述椎骨保持在植入物(2)的通道(21)中，该装置(1)的特征在于板(10)包括至少一个纵向狭槽(11)，该至少一个纵向狭槽(11)分离所述板(10)的至少一个后面部分为两个分支(12、13)，所述两个分支中的至少一个包括至少一个经配置保持装置(1)在植入物(2)中的撤回止动件(15)。