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WEBER(10) **Pub. No.: US 2007/0123907 A1**(43) **Pub. Date: May 31, 2007**(54) **SURGICAL INSTRUMENT FOR THE
INTRODUCTION OF A MULTI-COMPONENT
INTERVERTEBRAL PROSTHESIS****Publication Classification**(51) **Int. Cl.***A61F 2/00* (2006.01)(52) **U.S. Cl.** **606/99; 623/17.11**(75) Inventor: **HELMUT WEBER,**
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ABSTRACT(73) Assignee: **Weber Instrumente GmbH,** Emmingen-
Liptingen (DE)(21) Appl. No.: **11/669,796**(22) Filed: **Jan. 31, 2007****Related U.S. Application Data**(63) Continuation-in-part of application No. 10/900,647,
filed on Jul. 28, 2004.

A surgical instrument for the introduction of an intervertebral prosthesis (10) including at least three components, namely, two prosthesis plates (14, 16) and a prosthesis core (12). The surgical instrument can include a U-shaped holder (30) at the distal end of a gripping element (20) into which the intervertebral prosthesis (10) with all the components can be detachably introduced, whereby the individual components are aligned with respect to one another in a fixed manner, wherein the two holder elements (50, 52) of the U-shaped holder (30) are connected via a parallel guidance, which can be opened as well as closed via an elbow or bell-crank lever (70).

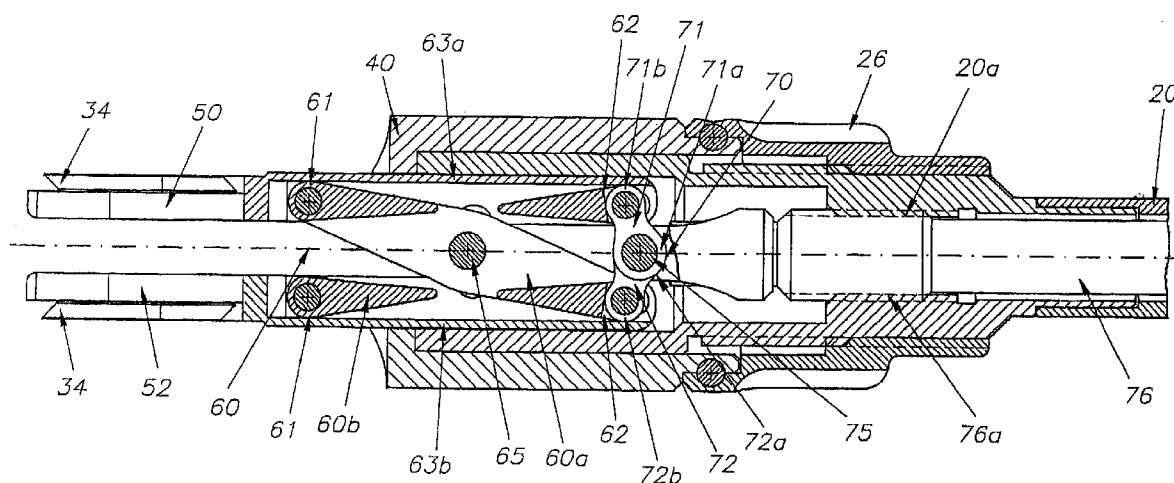


Fig. 1a

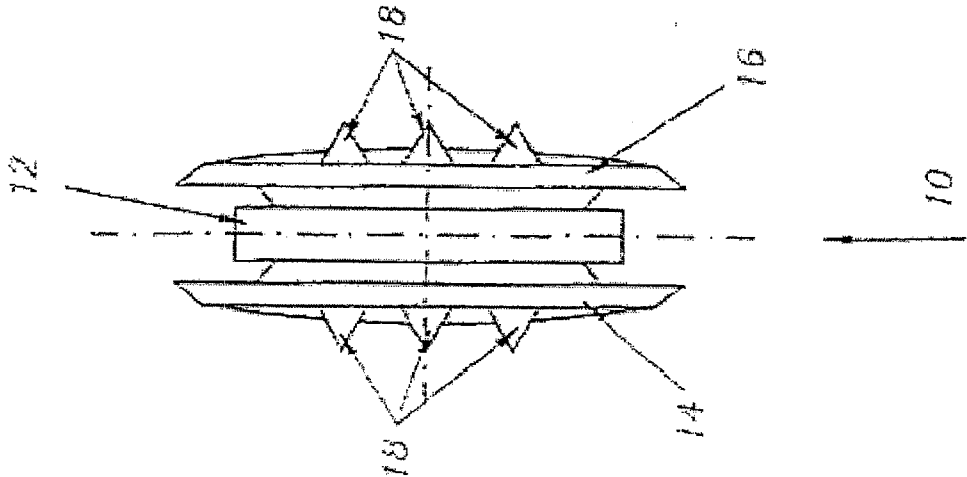


Fig. 1b

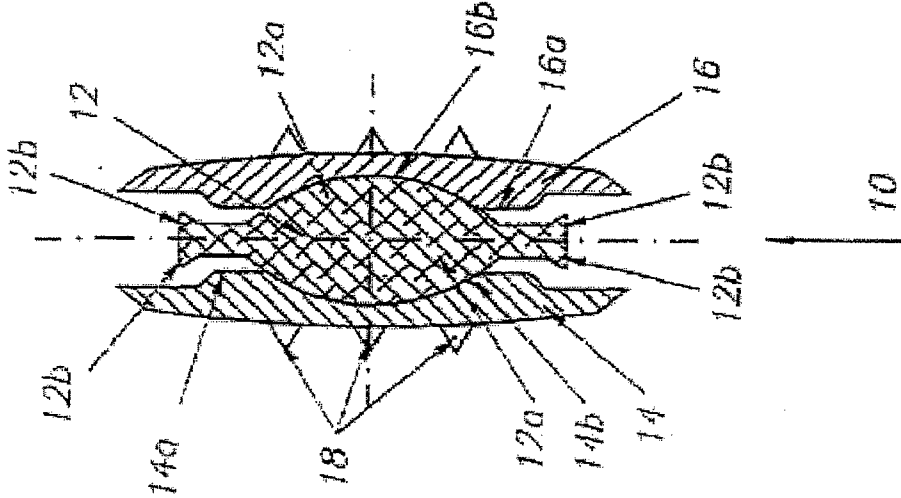
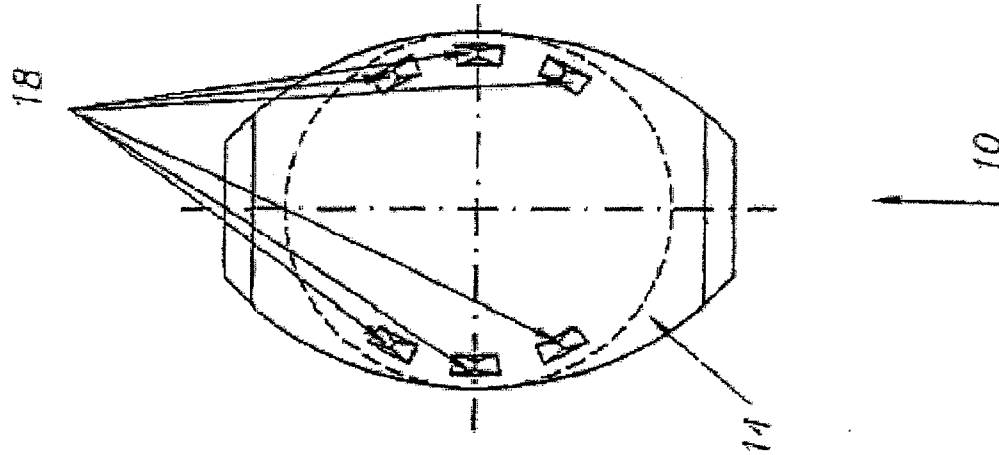
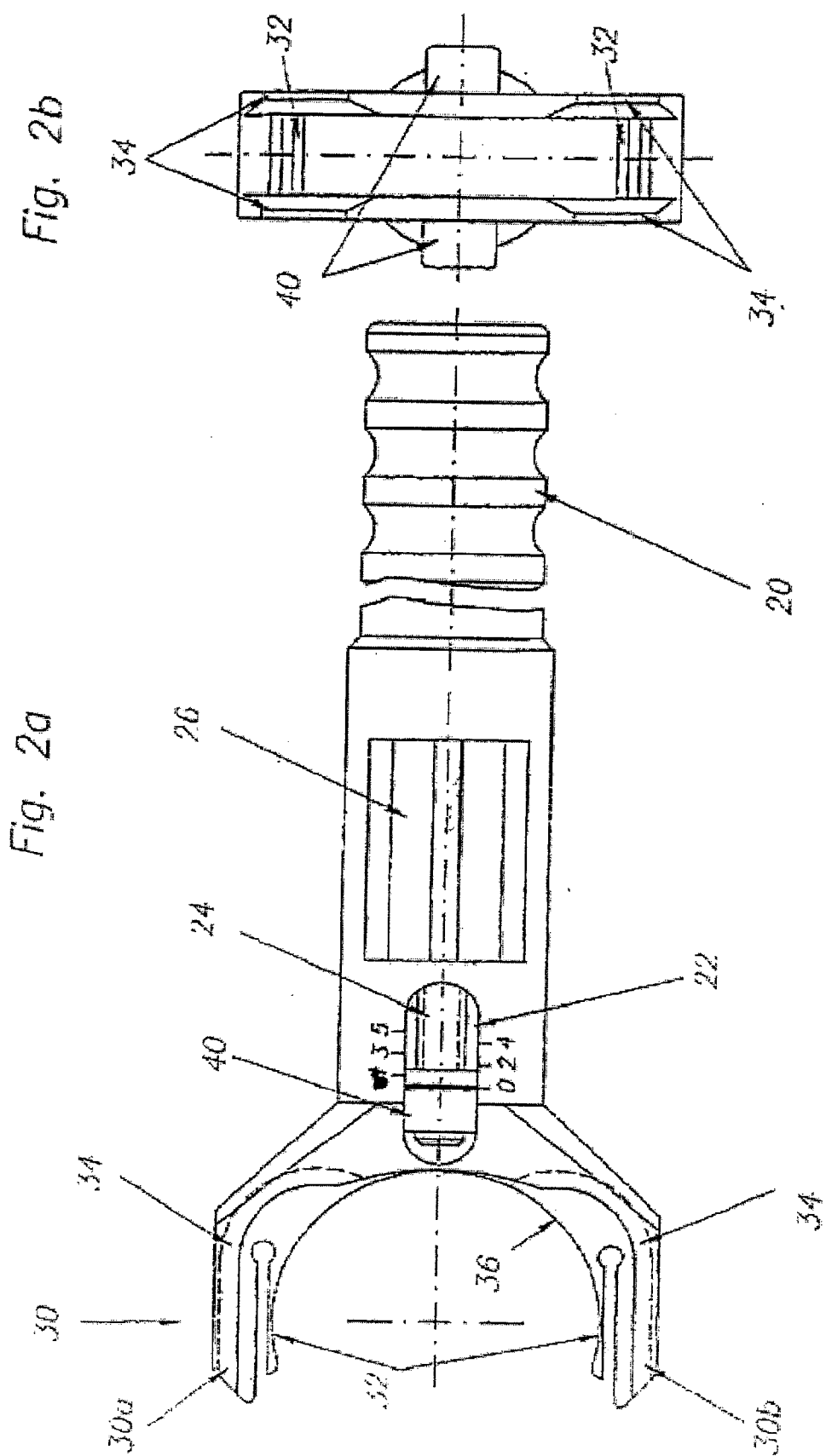
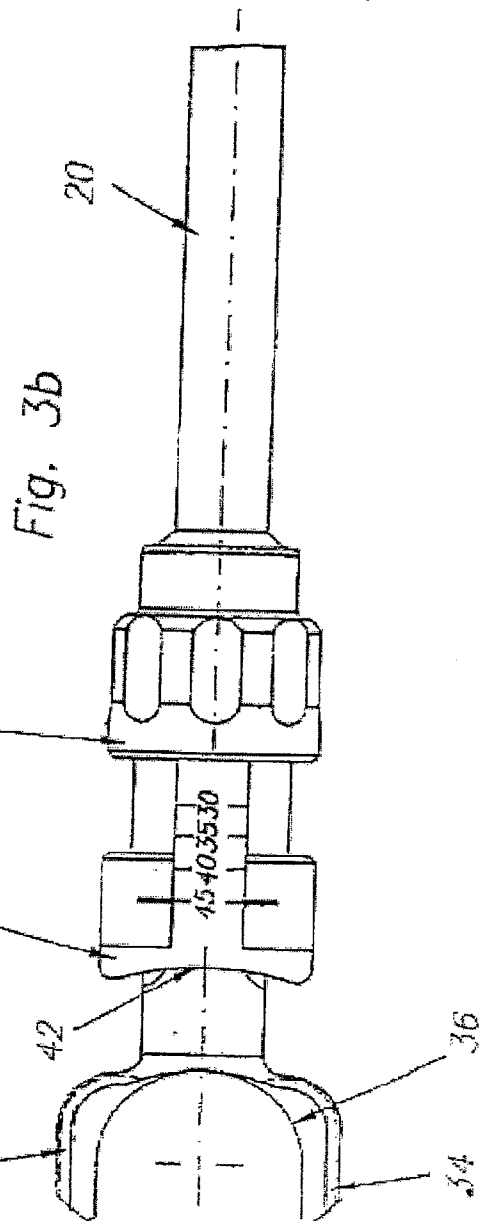
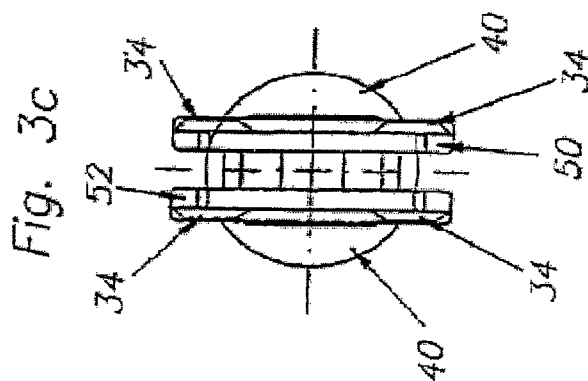
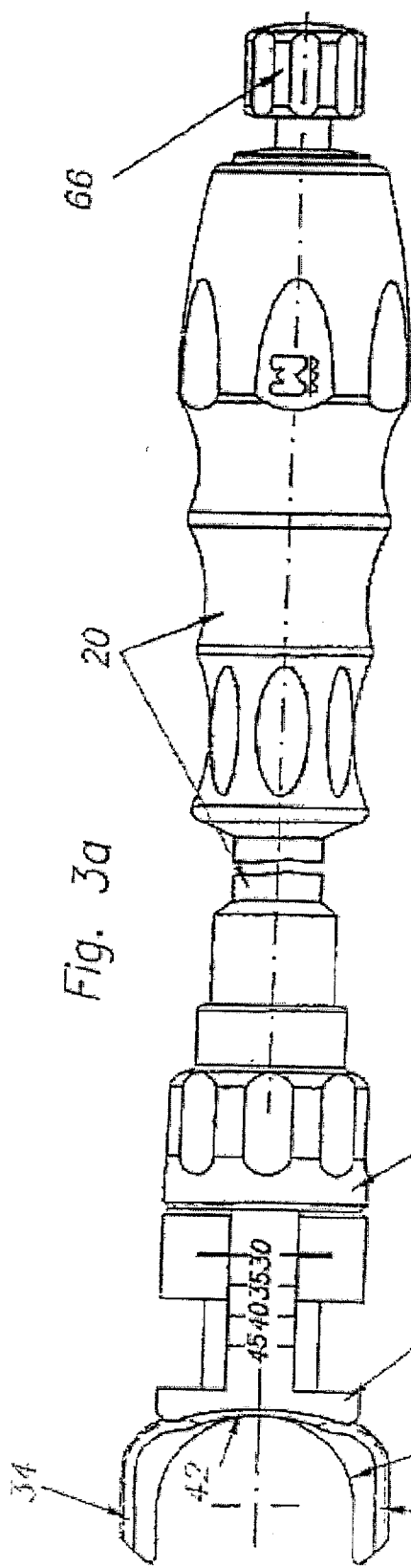
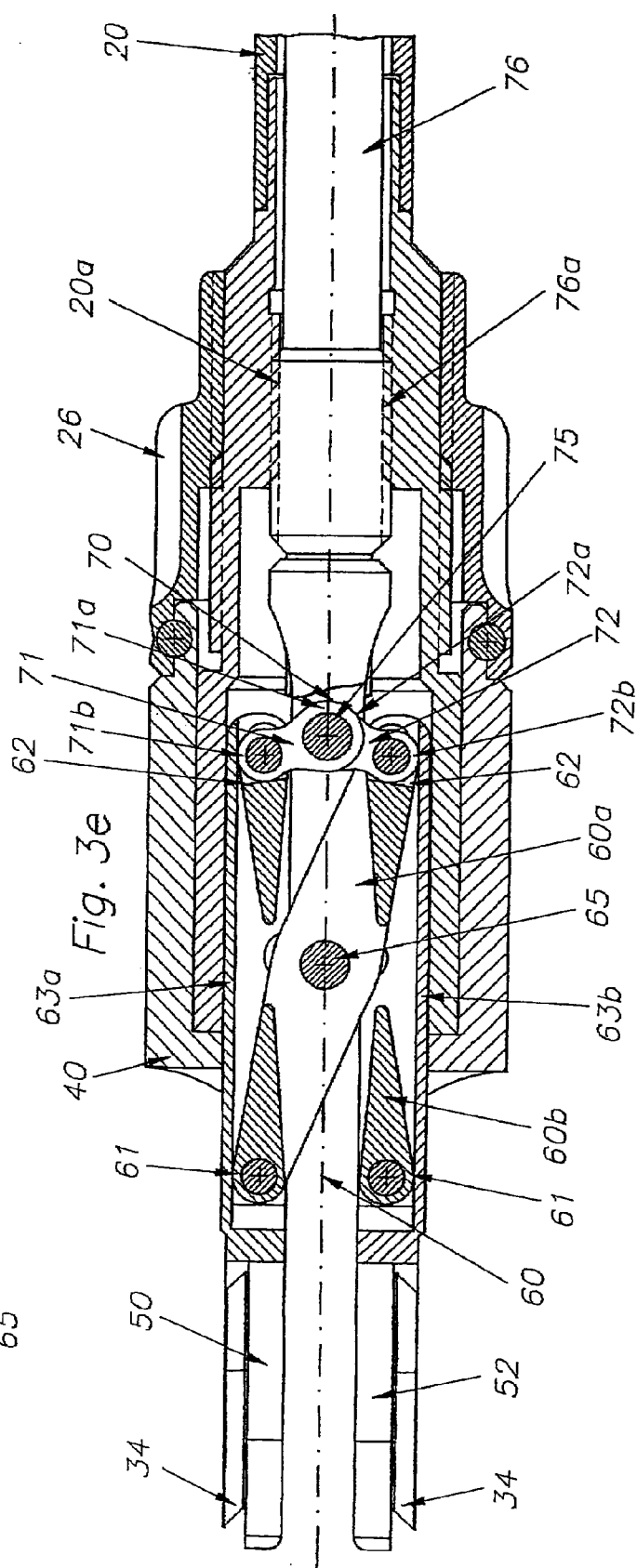
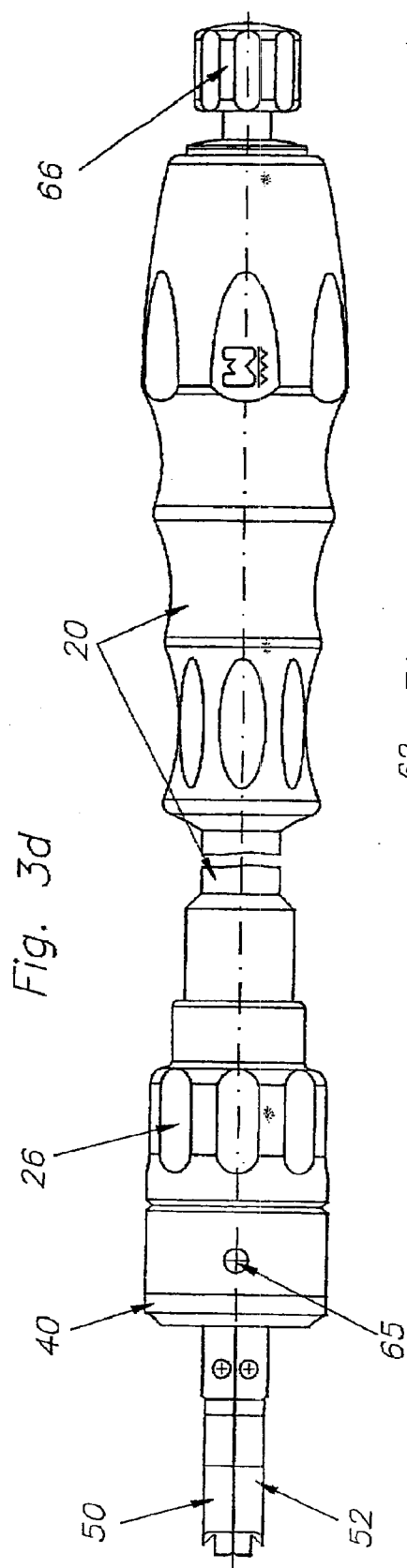


Fig. 1c









SURGICAL INSTRUMENT FOR THE INTRODUCTION OF A MULTI-COMPONENT INTERVERTEBRAL PROSTHESIS

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation-in-part application of U.S. patent application Ser. No. 10/900,647, filed Jul. 28, 2004, the entirety of which is herein incorporated by reference.

FIELD OF THE INVENTION

[0002] The invention concerns a surgical instrument for the introduction of a multi-component intervertebral prosthesis.

BACKGROUND OF THE INVENTION

[0003] Various instruments are known for the introduction of multi-component, especially three-component, intervertebral prosthesis, which consist of two prosthesis plates, each of which is joined to a vertebral body, and a prosthesis core arranged between them.

[0004] A surgical instrument for the introduction of intervertebral prosthesis is known from EP 0 333 990 A2 which consists of expanding tongs that have a holder for a prosthesis plate on the front end on each jaw. The two prosthesis plates can be first made to come very close to the expanding tongs in order to introduce them into the space between the neighboring vertebrae. Then the expanding tongs are spread out in order to be able to introduce the prosthesis core between the prosthesis plates.

[0005] DE 299 16 078 U1 discloses a surgical instrument for the introduction of intervertebral implants, which has two guide tracks that are supported pivotably at the back end, and each of which has a holding device for a prosthesis plate on their free end. A longitudinal guide for the prosthesis core is arranged between the two arms. First the two prosthesis plates are introduced into the intervertebral space in the closed position, and then the two prosthesis holders are spread apart whereby, at the same time, the prosthesis core is pushed to the distal end of the instrument until it reaches the desired end position between the prosthesis plates.

[0006] DE 102 25 703 A1 discloses an instrument for the introduction of an intervertebral prosthesis which has two prosthesis holders for a pair of prosthesis plates, the holders being joined through a parallel guide and can be separated from one another, where all parts joining the two prosthesis holders are arranged outside a middle entry opening running in the longitudinal direction of the instrument, the width of which corresponds at least to the transverse measurements of the prosthesis core to be introduced between the prosthesis plates and to the prosthesis core holder provided for this. Again, first the two prosthesis plates are introduced with the aid of the instrument, in order to then spread apart the prosthesis plates and introduce the prosthesis core.

[0007] In particular, the known instruments respectively comprise two grip elements in the form of scissors or pliers grips, which must be pressed together under force, in order to bring about a spreading apart of the two prosthesis holders. This type of grip is cumbersome and can impede

access to the operation area. Particularly, this type of grip elements can be urged together only under application of high force, in order to spread the prosthesis holders apart, wherein force must be exerted to counter that of the adjacent vertebra. A controllable moving together of the two prosthesis holders is generally not possible.

[0008] On the surfaces facing each other, the prosthesis plates have concave recesses between which the prosthesis core is set, which has similarly formed convex protrusions. The bowed surfaces of the prosthesis plates and the prosthesis core can slide on one another within certain limits and thus permit tilting and rotation of the upper prosthesis plate with respect to the lower one, as a result of which the mobility of the spinal column section in which the intervertebral prosthesis is introduced, is ensured.

[0009] Therefore, in order to be able to introduce the prosthesis core between the two prosthesis plates, the prosthesis plates have to be spread apart relatively far so that the convex protrusions of the prosthesis core are able to slide in over the edge of the concave recesses in the prosthesis plates. Such a large spreading of the intervertebral space should, however, be avoided as much as possible in order to be able to exclude damage to the spinal column and to the vertebrae. Furthermore, the prosthesis core is usually introduced in such a way that the intervertebral space is not completely spread apart, in order to be able to introduce the prosthesis core without any expenditure of force, but that the prosthesis core is driven into a smaller intermediate space between the prosthesis plates, in which case the intervertebral space is spread especially widely only in the instant in which the convex protrusions of the prosthesis core slide over the edge of the concave recesses in the prosthesis plates. However, in this case, the prosthesis core is exposed to large loads since the force that spreads the intervertebral space acts on it so that the surface of the prosthesis core can become damaged.

SUMMARY OF THE INVENTION

[0010] Therefore, the task of the invention is to provide a surgical instrument for the insertion of intervertebral prosthesis, an instrument which is easier to handle and at the same time permits as protective insertion of the intervertebral prosthesis as possible, protecting both the patient as well as the prosthesis core.

[0011] The task according to the invention is solved by a surgical instrument as set forth herein.

[0012] Advantageous embodiments and further developments of the invention are given forthwith.

[0013] The surgical instrument for the introduction of an at least three-part intervertebral prosthesis according to the invention has a U-shaped holder at the distal end of a grip element into which the intervertebral prosthesis, consisting of two prosthesis plates and a prosthesis core, can be inserted removably with all the components, where the individual components are aligned to one another in a fixed manner.

[0014] With the surgical instrument according to the invention, the intervertebral prosthesis is introduced together with all the components into the intervertebral space, which is held separated with the aid of another instrument and is kept open. The advantage is first of all that

the prosthesis core is already introduced between the two prosthesis plates so that subsequent introduction of the prosthesis core between the prosthesis plates is not needed and thus increased spreading of the intervertebral space is avoided. Another advantage lies in the fact that all components of the intervertebral prosthesis are kept aligned with respect to one another so that it is ensured that, even when inserted into the intervertebral space, no tilting or twisting of the prosthesis plates against one another is possible. The U-shaped holder of the instrument according to the invention ensures that the intervertebral prosthesis is safely introduced between the vertebrae from the access side and then can be removed again, without twisting or unnecessarily moving the intervertebral prosthesis.

[0015] The U-shaped holder comprises two components, wherein the two holder elements of the U-shaped holder are connected via a parallel guidance and are spreadable as well as closeable. A design of this type of the U-shaped holder makes it possible, with one and the same instrument, to insert and hold in place intervertebral prosthesis of varying heights. Therewith it is not necessary to utilize various surgical instruments adapted for the varying heights of intervertebral prosthesis as needed to fit the varying vertebral morphology of various patients.

[0016] Further, the parallel guidance, which is actuated via an elbow or bell-crank lever, enables a controlled opening and closing of the parallel guidance, so that, in particular upon closing, both prosthesis plates are clamped under pressure between the two prosthesis holders and are securely held there.

[0017] Preferably the elbow lever is associated with a threaded rod extending through the grip, which is operatable via a rotatable knob located at the proximal end of the grip element. Thereby a particularly space-saving arrangement of the actuating element for spreading and closing of the parallel guidance is made possible, since no grips in the manner of a scissors or pliers are required, rather actuation occurs via the rotatable knob and the threaded rod. This is possible in particular since with the present instrument it is not necessary to spread apart the two adjacent vertebrae with the instrument in inserted position, in order to be able to insert the intervertebral prosthesis, which spreading forces do need to be exerted in the case of the pliers type grip elements. In the present case it is merely necessary that the intervertebral prosthesis is securely clamped between the two holder elements, in order then to be inserted in the space between the two vertebra. For this it is however necessary, to be able to exercise a controlled force during closing, which is ensured by the threaded rod, which can exercise pressure on the elbow lever and therewith on the parallel guidance, depending upon the direction of rotation.

[0018] Preferably the U-shaped holder has clamping elements for the intervertebral prosthesis. In this case, the intervertebral prosthesis can be introduced into the intervertebral space with the surgical instrument, whereupon the spreading of the intervertebral space is eliminated. The teeth arranged outside the prosthesis plates engage into the neighboring vertebrae. This engagement is sufficient to overcome the clamping of the intervertebral prosthesis in the U-shaped holder when the surgical instrument is removed so that no additional mechanism is needed for separating the prosthesis.

[0019] In an advantageous further development of the invention, the clamping elements are designed as two leaf springs running on the inside along the leg of the U-shaped holder. The leaf springs are especially simple to manufacture and also can be molded in one piece against the U-shaped holder.

[0020] Preferably the clamping elements hold the prosthesis core. Especially in combination with an aligning device for the prosthesis plates, this is sufficient to safely fix the intervertebral prosthesis.

[0021] In an advantageous further development of the invention, the inner contour of the U-shaped holder is designed corresponding to the outside contour of the prosthesis core. In this way, it is ensured that the prosthesis core is held especially securely.

[0022] Preferably, the inner contour of the U-shaped holder is designed as a circular arc of about 200°. The inner contour of the U-shaped holder thus surrounds slightly more than half of the circular prosthesis core, and has an opening between the legs of the U-shaped holder, which is smaller than the diameter of the prosthesis core. In this way, clamping of the prosthesis core is achieved reliably.

[0023] In an advantageous further development of the invention, two guide tracks are formed in the plane of each of the U-shaped holders on the inside of the leg of the U-shaped holder for holding the prosthesis plates. The prosthesis plates can thus be inserted in the guide tracks as an individual element without resistance. Holding the intervertebral prosthesis is achieved by the fact that the convex protrusions of the prosthesis core engage in the concave recesses of the prosthesis plates and thus the prosthesis plates are also securely held in the U-shaped holder, although the prosthesis plates are not clamped. Furthermore, the guide tracks for holding the prosthesis plates provide alignment of the prosthesis plates with respect to the prosthesis core and to one another. For this purpose, preferably the guide tracks for holding the prosthesis plates are arranged parallel to one another. Preferably for this purpose, furthermore, the guide tracks are arranged on both sides of the leaf springs running along the legs of the U-shaped holder.

[0024] Preferably, connected to the U-shaped holder a stop is present which can be moved along the axis of the grip elements. This stop serves to define when the intervertebral prosthesis has reached the desired end position as is introduced into the intervertebral space. As a rule, the intervertebral space, which is formed during surgery after removal of the defective disk, is probed with a control prosthesis in order to determine the preferred size of the intervertebral prosthesis and accurate positioning of it. In order to see, correspondingly, on the surgical instrument according to the invention for introduction of the intervertebral prosthesis, how far the instrument with the intervertebral prosthesis must be introduced into the intervertebral space in order to position the intervertebral prosthesis optimally, the value determined with the control prosthesis can be adjusted at the moveable stop. As soon as the stop encounters the outside contour of the neighboring vertebra, the optimum position for the intervertebral prosthesis is reached.

[0025] For this purpose, the stop is arranged preferably perpendicularly to the plane of the U-shaped holder in order to provide a defined stop point.

[0026] Preferably, the stop meets the grip element perpendicularly and projects on both sides of the grip element. In this way, it ensures that the operator can see the stop independently of whether the surgical instrument is rotated by 180° around the longitudinal axis or not.

[0027] Preferably, a thread engages in the stop, this thread runs along the axis of the grip element and can be adjusted with the aid of a screw element. This makes it possible to move the stop simply along the longitudinal axis of the grip element and also ensures that when the stop reaches the vertebral body, the stop cannot be displaced along an axis parallel to the longitudinal axis of the grip element by a pressure on the stop.

[0028] Preferably the two elements of the U-shaped holder each have on the inside of the legs facing away from one another a guide track for holding the prosthesis plate. Since as a rule the height of the intervertebral prosthesis varies according to the height of the prosthesis core, it is ensured that the intermediate space between the clamped prosthesis plates in the U-shaped holder can be varied.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The invention will be explained in detail with the aid of the following figures. The following are shown:

[0030] FIG. 1a is a side view of a three-part intervertebral prosthesis,

[0031] FIG. 1b is an axial section through the intervertebral prosthesis according to FIG. 1a,

[0032] FIG. 1c is a top view onto the intervertebral prosthesis according to FIG. 1a,

[0033] FIG. 1d is an axial section through a second practical example of an intervertebral prosthesis,

[0034] FIG. 2a is a top view on a first practical example of a surgical instrument for introducing an intervertebral prosthesis,

[0035] FIG. 2b is a view axially from the top onto the practical example according to FIG. 2a,

[0036] FIG. 3a is a top view onto a second practical example of a surgical instrument for introducing an intervertebral prosthesis,

[0037] FIG. 3b is a top view onto the practical example according to FIG. 3a with the stop set back,

[0038] FIG. 3c is a view axially from the top onto the practical example according to FIG. 3a,

[0039] FIG. 3d is a side view of the practical example according to FIG. 3a,

[0040] FIG. 3e is an axial section through the practical example according to FIG. 3a in the spread-apart state,

[0041] FIG. 3f is an axial section through the practical example according to FIG. 3a in the closed state.

DETAILED DESCRIPTION OF THE INVENTION

[0042] FIGS. 1a, 1b and 1c show an intervertebral prosthesis 10 consisting of a prosthesis core 12 and two prosthesis plates 14, 16, which enclose the prosthesis core 12.

The prosthesis core 12 consists of a circular disk which has on both sides an axially arranged spherical segment 12a and a ring land 12b protruding axially and running at the outer edge.

[0043] The two prosthesis plates 14 and 16 are designed identically and consist of an ellipsoidal disk, the main vertices of which are flattened and where a circular torus 14a, 16a is arranged on one side of the disk, and this torus has a recess 14b, 16b having the shape of a spherical shell. In the composed state of the intervertebral prosthesis 10, the spherical segments 12a of the prosthesis core 12 lie in the recesses having the shape of a spherical shell 14b, 16b of the prosthesis plates 14, 16. On the side of the prosthesis plates 14, 16 away from the prosthesis core 12 there are several teeth 18 arranged, in this case six, which anchor the prosthesis plates 14, 16 in the neighboring vertebra. In the present practical example, the sides of the prosthesis plates 14, 16 away from the prosthesis core 10 are designed to be flat. In order to be able to adapt the prosthesis plates 14, 16 to the slopes of the neighboring vertebrae, the side of the prosthesis plates 14, 16 facing away from the prosthesis core 10 can be inclined to the plane of prosthesis plate 14, 16.

[0044] FIG. 1d shows an axial section through another embodiment of the intervertebral prosthesis 10, consisting of the two prosthesis plates 14, 16 and a three-part prosthesis core 13. Here the prosthesis core 13 is designed so that a recess 13b having the shape of a spherical shell is formed in a disk-shaped middle element 13a on both sides and a sliding element 13c is set in each one of these, consisting of two spherical segments of the same diameter. The spherical segment of the sliding element 13c facing the middle element 13a is thus arranged so that it can slide in the recesses 13b, having the shape of a spherical shell, of the middle element 13a, while the spherical segment of the sliding element 13c facing away from middle element 13a lies in the spherical-shell-shaped recesses 14b, 16b of prosthesis plate 14, 16 and is arranged in these so that it can slide. A prosthesis core 13 made of several parts make additional degrees of freedom of the movement of the two prosthesis plates 14, 16 with respect to one another possible, as a result of which the mobility of the spinal column section into which the intervertebral prosthesis 10 was implanted is further enhanced.

[0045] FIGS. 2a and 2b show two views of a first practical example of a surgical instrument for introducing a multi-component intervertebral prosthesis 10, consisting of a grip element 20 which has a U-shaped holder 30 on its distal end. The axis of the grip element 20 lies in the plane fixed by the U-shaped holder 30. The U-shaped holder 30 has two legs 30a, 30b and a leaf spring 32 is arranged on the inside of each of these parallel to legs 30a, 30b. The inner contour 36 of the U-shaped holder 30, formed essentially by the two leaf springs 32, is designed as a circular arc of about 200°. In this way, the opening between the distal ends of the leaf springs 32 is slightly smaller than the maximum diameter of the circular arc. Thus, when the disk-shaped prosthesis core 12 with its circular outer contour is introduced between the two leaf springs 32, the leaf springs 32 first slightly relax and lie against the outer contour of prosthesis core 12. In this way, secure clamping of the prosthesis core 12 between the leaf springs 32 is ensured.

[0046] On the inside of legs 30a, 30b of the U-shaped holder 30, on both sides, along the leaf springs 32, guide

tracks **34** are made to hold prosthesis plates **14**, **16**. Here, the distances between the two legs **30a**, **30b** corresponds to the length of the main axis of the essentially ellipsoidal disk of the prosthesis plates **14**, **16**. The guide tracks **34** run on each leg **30a**, **30b** parallel to one another, in order to provide a parallel alignment of the prosthesis plates **14**, **16**. The distance between the guide tracks **34** on each of legs **30a**, **30b** corresponds to the distance of the prosthesis plates **14**, **16** in the assembled state of the intervertebral prosthesis **10**. When the intervertebral prosthesis **10** is placed into the U-shaped holder **30**, only the prosthesis core **12** is held by clamping. In principle, the prosthesis plates **14**, **16** can move in the guide tracks without any resistance. However, due to the insertion of the spherical segments **12a** of the prosthesis core **12** into the spherical-shell-shaped recesses **14b**, **16b** and the exact parallel alignment of the prosthesis plates **14**, **16** to one another, they are also held safely in the U-shaped holder **30**.

[0047] Following the U-shaped holder **30**, in grip element **20**, a stop **40** is arranged which can be moved along the axis of grip element **20**. The stop **40** goes through the grip element in a radial opening **22** and protrudes out of the grip element **20** on both sides. The stop is perpendicular to the axis of the grip element and perpendicular to the plane of the U-shaped holder **30**. A thread **24** goes through stop **40** along the axis of grip element **20** and this thread can be rotated with the aid of a screwing element **26**. Since stop **40** cannot be rotated in the radial opening **22**, stop **40** moves along the axis of grip element **20** when the screwing element **26** and thus thread **24** are turned. When stop **40** is moved as far as possible in the direction of the distal end of the surgical instrument, the intervertebral prosthesis **10** is not introduced as far into the intervertebral space as when the stop **40** is removed as far as possible away from the distal end of the surgical instrument, and thus, when introducing the instrument into the intervertebral space, it will meet the neighboring vertebra later.

[0048] FIG. **2b** shows an axial top view onto the first practical example in which especially the parallel guide tracks **34** intended for holding the prosthesis plates **14**, **16** can be seen clearly. Furthermore, FIG. **2b** shows the intermediate space between the leaf springs **32** and the guide tracks **34** into which the prosthesis core **12** can be inserted and in which it is fixed by the leaf springs **32** removably.

[0049] FIGS. **3a** to **3f** show a second practical example of a surgical instrument for the introduction of the intervertebral prosthesis **10**. The second practical example of the surgical instrument according to the invention has a U-shaped holder consisting of two holding elements **50**, **52**. Each element **50**, **52** is essentially identical to the U-shaped holder **30**, but only one guide track **34** is arranged in each of holding elements **50**, **52**. The two holding elements **50**, **52** are arranged at the distal end of grip element **20** in such a way that the sides of the holding elements **50**, **52**, which have the guide tracks **34**, lie on the sides away from one another, while the sides of the holding elements **50**, **52** which have no guide tracks are facing one another. When the two holding elements **50**, **52** lie directly on one another, as shown in FIG. **3d**, essentially the U-shaped holder **30** is obtained, which was symmetrically separated by the plane placed through the U.

[0050] The two holding elements **50**, **52** are connected through a parallel guide **60** and can be spread apart. FIGS.

3e and **3f** each show an axial section through the second practical example of the instrument according to the invention with two different positions of the parallel guide **60**.

[0051] In the known manner, the parallel guide **60** is designed as a pair of scissors with two scissor members **60a**, **60b**, which are connected to one another so that they can be rotated against one another around their axis of symmetry through an axis **65**. The holding elements **50**, **52** are arranged on the free end **61** of scissor members **60a**, **60b**, these free ends lying on the side of axis **65** facing the distal end of the instrument. The free ends **62** of scissor members **60a**, **60b** lying on the other side of the axis are engaged with a device, an elbow lever **70**, designed in the known manner, which can move these free ends **62** towards and away from each other. The elbow lever **70** includes two lever arms **71**, **72** with respective first ends **71a**, **72a** and second ends **71b**, **72b**, which are mounted rotatably relative to each other on a rotation mount **75**, and of which the second end rotatably engages a free end **62** of the scissors elements **60a**, **60b**.

[0052] This elbow lever can be operated via a knob **66** arranged at the proximal end of the instrument. For this, the elbow lever **70** is connected at its rotation axis with a threaded rod **76**. This connection could be in the form of, for example, that the rotation axis **75** is a not-shown bolt, which can be rotated in a not-shown transverse bore hole extending through the threaded rod **76**. The threaded rod **76** extends in the longitudinal direction through the grip element **20** and protrudes from the grip element **20** at the proximal end of the grip element **20**. The rotatable knob **66** is located at the proximal end of the threaded rod **76**, via which the threaded rod **76** can be rotated about its longitudinal axis. The threaded rod **76** has an external threading **76a**, which engages in an internal threading **20a** of the grip element. Upon rotation of the rotatable knob **66** the threaded rod **76** rotates within the internal threading **20a** and is screwed further into or out of the grip element **20** depending upon direction of rotation. Since there is a connection between the distal end of the threaded rod **76** and the elbow lever **70**, upon movement of the threaded rod **76** the elbow lever **70** is actuated. In FIG. **3e** the threaded rod **76** is screwed comparatively far into the grip element **20**, so that the rotation axis **75** is displaced in the direction towards the distal end of the instrument, whereupon the elbow lever **70** is spread apart and presses apart the two scissors elements **60a**, **60b**. In FIG. **3f** a further position of the elbow lever **70** is shown. The threaded rod was rotated out of the grip element **20** with the help of the rotatable knob **66**, whereupon the rotation axis **75** of the elbow lever had become displaced in the direction of the proximal end of the instrument and the elbow lever **70** has been urged together, wherein via the rotatable connection between the lever arms **71**, **72** to the scissors elements **60a**, **60b** the parallel guidance also is again closed.

[0053] The arrangement of the rotatable knob **66** at the proximal end of the instrument is advantageous because in this way it is outside the surgery area and thus can be operated easily even when the distal end of the instrument is introduced into the surgery area. In particular, the threaded rod **76** in combination with the elbow lever **70** permits the exercising of a force upon the holder elements **50**, **52** during opening as well as during closing of the parallel guidance.

[0054] In addition, the free end **61** of the scissor member **60a**, **60b** is connected to the free end **62** of the other scissor

member 60b, 60a through a connecting element 63a, 63b; the holding elements 50, 52 are arranged in the extension of these to the distal end of the instrument, beyond the free ends 61 of scissor member 60a, 60b. When the free ends 62 are moved away from one another, in particular by screwing in of the threaded rod 76 into the grip element and spreading apart of the elbow lever 70, the holding elements 50, 52, which are rotatably supported at the opposite free ends 61 of the scissor members 60a, 60b, are moved away parallel from one another. With such design of the U-shaped holder 30, it becomes possible to introduce intervertebral prosthesis 10 of different thicknesses into the intervertebral space with the same instrument.

[0055] Thus, having a number of surgical instruments for intervertebral prosthesis 10 with different heights becomes unnecessary.

[0056] In this embodiment of the instrument, no clamping elements are needed which run parallel to the legs of the U-shaped holder and clamp the prosthesis core along its outside contour. The intervertebral prosthesis is held sufficiently by the fact that the two prosthesis plates 14, 16 are inserted in the guide tracks 34, each in a holding element 50, 52, placing the prosthesis core 12 between them and by bringing the holding elements 50, 52 together, thus providing a clamping action.

[0057] FIGS. 3a and 3b show the second practical example in a top view with two different positions of stop 40. The second practical example differs from the first practical example also in the design of stop 40, since the mechanism for displacing the stop 40 is arranged not inside the grip element 20, but outside the grip element 20, since the mechanism of the parallel guide 60 is arranged within the grip element 20.

[0058] The stop 40 of the second practical example has a contact contour 42 which corresponds to the ellipsoidal arc around a conjugate vertex of the essentially ellipsoidal prosthesis plates 14, 16. If the stop 40 is moved as far as possible in the direction of the distal end of the surgical instrument, as shown in FIG. 3a, the contact contour 42 lies on the outside contour of prosthesis plates 14, 16. If the surgical instrument with the stop 40 adjusted in this way is introduced into the intervertebral space, the contact contour 42 contacts the intervertebra[sic] as soon as the outside contour of the prosthesis plates 14, 16 coincides with the outside surface of the vertebra.

[0059] In addition, stop 40 has a marking which can be brought into coincidence with a marking arranged in a fixed manner on grip element 20. The marking gives the distance from the contact contour 42 to the conjugate vertex of prosthesis plates 14, 16, which forms the distal end of the surgical instrument. Here the distance is 30 mm.

[0060] FIG. 3b shows the stop 40 which is moved back as far as possible from the distal end of the surgical instrument, where the marking shows a clearly larger value, namely 45 mm.

[0061] FIG. 3c is a view axially from the top onto the second practical example, in which especially the parallel guide tracks 34 for holding the prosthesis plates 14, 16 can be seen clearly. The prosthesis core 12 is positioned in the intermediate space between the guide tracks 34 and held in a fixed manner by bringing together the two holding elements 50, 52.

[0062] In a surgical procedure, the surgical instrument according to the invention is used as follows: after the access to the spinal column is made and the intervertebral space is freed from the diseased disk and is cleaned out, first the size of the intervertebral space is probed with a control prosthesis. Here, the size of the intervertebral prosthesis to be used, that is, the length of the main axis of the essential ellipsoidal prosthesis plates 14, 16 and the thickness of the intervertebral prosthesis 10, that is, especially the thickness of the prosthesis core 12, are determined. Furthermore, the slope of the vertebral surfaces to one another is determined. This will show if prosthesis plates with a plane or an inclined back surface will be used.

[0063] Using the control prosthesis, it is also determined how far the intervertebral prosthesis 10 has to be introduced into the intervertebral space. The distance between the outside contour of the vertebra and the desired position of the outside contour of the intervertebral prosthesis 10 is adjusted correspondingly at stop 40.

[0064] Then the intervertebral prosthesis 10 is composed from the selected components, namely the desired prosthesis core 12 and the optimized prosthesis plates 14, 16 and is clamped into the third practical example of the surgical instrument according to the invention according to FIGS. 3a and 3b. The prosthesis core 12 is then held by the leaf springs 32, while the prosthesis plates 14, 16 are placed in the guide tracks 34 and are held by the cooperation of the spherical segments 12a of the prosthesis core 12 and the spherical shell-shaped recesses 14b, 16b of prosthesis plates 14, 16. In order to be able to insert the intervertebral prosthesis 10, the intervertebral space must be made wider with another spreading instrument in such a way that the intervertebral prosthesis 10 including the protruding teeth 18 can be introduced into the intervertebral space. Here the spreading instrument is designed so that the surgical instrument for inserting intervertebral prosthesis according to the invention can be introduced into the intervertebral space without any problems, the valves [sic, "Valven"] of the spreading instrument not causing any disturbance.

[0065] The surgical instrument with the inserted intervertebral prosthesis 10 is now introduced into the intervertebral space until stop 40 contacts the vertebra. The spreading elements are now lowered until the vertebra comes into contact with teeth 18. Then the surgical instrument can be removed without any danger without changing the position of the intervertebral prosthesis 10 since this is held at the vertebrae through teeth 18.

[0066] The advantage of this surgical method lies in the fact that a smaller spreading of the intervertebral space is needed since the introduction of the prosthesis core 12 between the prosthesis plates 14, 16, where the spherical segments 12a have to be pressed over the toruses 14a, 16a in the spherical-shell-shaped recesses 14b, 16b, is omitted. Furthermore, exact positioning of the prosthesis plates 14, 16 and of the prosthesis core 12 to one another is provided automatically. Especially, damage to the surface of the prosthesis core 12 is avoided, since the prosthesis core 12 is introduced simultaneously with prosthesis plates 14, 16 into the intervertebral space and not subsequently into the intermediate space between the two prosthesis plates 14, 16.

REFERENCE LIST

[0067] **10** Intervertebral prosthesis
 [0068] **12** Prosthesis core
 [0069] **12a** Spherical segment
 [0070] **12b** Ring land
 [0071] **13** Prosthesis core
 [0072] **13a** Middle element
 [0073] **13b** Spherical-shell-shaped recess
 [0074] **13c** Sliding element
 [0075] **14** Prosthesis plate
 [0076] **14a** Torus
 [0077] **14b** Spherical-shell-shaped recess
 [0078] **16** Prosthesis plate
 [0079] **16a** Torus
 [0080] **16b** Spherical-shell-shaped recess
 [0081] **18** Teeth
 [0082] **20** Grip element
 [0083] **20a** Internal threading
 [0084] **22** Radial opening
 [0085] **24** Thread
 [0086] **26** Screwing element
 [0087] **30** U-shaped holder
 [0088] **30a** Leg
 [0089] **30b** Leg
 [0090] **32** Leaf spring
 [0091] **34** Guide tracks
 [0092] **36** Inside contour
 [0093] **40** Stop
 [0094] **42** Contact contour
 [0095] **50** Holding element
 [0096] **52** Holding element
 [0097] **60** Parallel guide
 [0098] **60a** Scissor member
 [0099] **60b** Scissor member
 [0100] **61** Free end
 [0101] **62** Free end
 [0102] **63a** Connecting element
 [0103] **63b** Connecting element
 [0104] **65** Axis
 [0105] **66** Rotatable Knob
 [0106] **70** Elbow lever
 [0107] **71** Lever arm
 [0108] **71a** First end

[0109] **71b** Second end
 [0110] **72** Lever arm
 [0111] **72a** First end
 [0112] **72b** Second end
 [0113] **75** Rotation axis
 [0114] **76** Threaded rod
 [0115] **76a** External threading

What is claimed is:

1. A surgical instrument for introduction of an intervertebral prosthesis (**10**) having at least three components, namely two prosthesis plates (**14**, **16**) and a prosthesis core (**12**), the instrument comprising:

a U-shaped holder (**30**) at the distal end of a grip element (**20**), in which the intervertebral prosthesis (**10**) with all its components can be inserted releasably, and where the individual components are arranged fixed in relation to each another;

wherein the U-shaped holder (**30**) is comprised of two holder elements (**50**, **52**); and

wherein the two holder elements (**50**, **52**) of the U-shaped holder (**30**) are connected via a parallel guidance, which can be opened as well as closed via an elbow or bell-crank lever (**70**).

2. The surgical instrument according to claim 1, wherein the elbow or bell-crank lever (**70**) is operably coupled with a threaded rod (**76**) extending through the grip element (**20**), which threaded rod is actuatable via a rotatable knob (**66**) located at the proximal end of the grip element (**20**).

3. The surgical instrument according to claim 1, wherein the U-shaped holder (**30**) has clamping elements for the intervertebral prosthesis (**10**).

4. The surgical instrument according to claim 3, wherein the clamping elements are designed as two leaf springs (**32**) running on the inside along the legs (**30a**, **30b**) of the U-shaped holder (**30**).

5. The surgical instrument according to claim 3, wherein the clamping elements hold the prosthesis core (**12**).

6. The surgical instrument according to claim 1, wherein an inside contour (**36**) of the U-shaped holder (**30**) is designed corresponding to an outside contour of the prosthesis core (**12**).

7. The surgical instrument according to claim 6, wherein the inside contour (**36**) of the U-shaped holder (**30**) is designed as a circular arc of about 200°.

8. The surgical instrument according to claim 4, wherein two guide tracks (**34**) are formed in a plane of the U-shaped holder (**30**) on the inside of each leg (**30a**, **30b**) of the U-shaped holder (**30**) to hold the prosthesis plates (**14**, **16**).

9. The surgical instrument according to claim 8, wherein the guide tracks (**34**) run parallel to one another.

10. The surgical instrument according to claim 8, wherein the guide tracks (**34**) are arranged on both sides of the leaf springs (**32**) running along the legs (**30a**, **30b**) of the U-shaped holder **30**.

11. The surgical instrument according to claim 8, wherein a stop (**40**) is arranged at the end of the U-shaped holder (**30**) and can be moved along the axis of the grip element (**20**).

12. The surgical instrument according to claim 11, wherein the stop (**40**) is arranged perpendicular to the plane of the U-shaped holder (**30**).

13. The surgical instrument according to claim 11, wherein the stop (**40**) of the grip element (**20**) goes perpendicularly and protrudes on both sides of the grip element (**20**).

14. The surgical instrument according to claim 10, wherein a thread (**24**) engages in stop (**40**), which runs along

the axis of the grip element (**20**) and can be adjusted with the aid of a screwing element (**26**).

15. The surgical instrument according to claim 10, wherein the two holding elements (**50**, **52**) of the U-shaped holder (**30**) each have, on their side facing away from each other, a guide track (**34**) on the inside of the legs (**30a**, **30b**) for holding the prosthesis plates (**14**, **16**).

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