INTERSPINAL RETRACTOR DEVICE

Abstract: An interspinal retractor device (1) comprises: - a first and a second portion (2, 3) movable along an expansion axis (Y) between a resting position in which the said portions are close together and an expanded position in which the said portions have been moved apart from each other; - expansion means (10) associated with the first and second portions (2, 3) and selectively operable by a user to move them to and from the resting position, and - at least one pair of centring and holding wings (7, 8) which are arranged on opposite sides of the device and which are movable by the said expansion means between a non-operative position, in which the wings are at a distance from a transverse centre plane (B) of the device substantially parallel with the expansion axis (Y), and an operative position in which the wings are close to the transverse centre plane (B) and protrude from the first or second portion. The expansion means are further arranged to move at least partially the pair of wings from the non-operative position before the first and second portions are moved from the resting position.
Interspinal retractor device

DESCRIPTION

Technical field

The present invention relates to an interspinal retractor device having the features set out in the preamble of the main claim.

Technological background

During treatment of pathologies connected with the reduction of the intervertebral spaces, it is known to use distractor devices which are more commonly known in the field as "retractors" and which are advantageously inserted between two adjacent vertebrae, more specifically at the spinal processes, so as to keep them adequately spaced apart.

Typically, those devices which are inserted between the vertebrae by means of surgical operations which are more or less invasive have fixed dimensions which cannot be adjusted and the device having the most appropriate thickness is selected by the surgeon from a kit formed by similar retractors having different dimensions.

The international patent application published under the number 2009/101539 discloses an expandable intervertebral retractor which allows continuous adjustment of the thickness of the device once it has been positioned between the vertebrae to be retracted, thereby allowing precise and reversible adjustment in situ of the separation distance of the vertebrae.

That expandable device comprises a first and a second portion which can be moved apart from each other by means of an expansion mechanism which is actuated directly by a screw.

In spite of the obvious advantages resulting from that device over
conventional devices having fixed dimensions, the retractor device described in the above-mentioned application also fails to achieve some objects.

The first of those objects which is particularly apparent in the field relates to the possibility of ensuring the correct and optimum positioning of the device between the two vertebrae and ensuring retention of that correct position during and after the expansion phase of the device.

Other expandable retractor devices are known from US 5,658,335 and US 6,176,882.

International patent application WO 2004/080356 sets out a retractor device which is provided with continuously expandable anchorage spines which are fixed directly to the adjacent vertebrae in order to fix the device in position. However, that solution involves loss of relative mobility between the two vertebrae in question because both are securely fixed to the retractor device interposed between them.

Another disadvantage encountered in interspinal retractor devices of the expandable type is that the shapes and dimensions thereof make them only slightly or not at all suitable for being introduced via the endoscopic route, making it necessary for the surgeon and patient to be subjected to a more complex "open" operation which has more obvious consequences, including aesthetic consequences.

WO 2007/075788 describes some examples of retractor devices which are provided with a pair of wings, which are provided at the opposite longitudinal ends of the devices themselves, so as to pivot towards the centre plane thereof at the same time as a central body expands.

However, that configuration does not allow effective correction of any off-
centre positioning of the retractor device between the spinal processes before
starting the expansion phase.

Summary of the invention
The problem addressed by the present invention is to provide an interspinal
retractor device which is structurally and functionally configured to comply
with the demands set out above and to overcome the limitations set out above
with reference to the cited prior art.

That problem is solved by the present invention by means of an interspinal
retractor device which is constructed in accordance with the appended claims.

Brief description of the drawings
The features and advantages of the invention will be better appreciated from
the detailed description of one preferred embodiment thereof which is
illustrated by way of non-limiting example with reference to the appended
drawings, in which:

- Figure 1 is a schematic perspective view of an interspinal retractor device
  constructed according to the present invention in a first operative
  configuration;
- Figures 2 to 4 are schematic perspective views of the device of Figure 1 in
  various operative configurations;
- Figures 5 to 7 are schematic longitudinal sections of the device in the
  operative configurations of Figures 1, 2 and 4, respectively;
- Figure 8 is a schematic, perspective, exploded view of the device of Figure 1;
- Figure 9 is a schematic, perspective, exploded view of a construction variant
  of the device of Figure 1;
- Figure 10 is a schematic, perspective vertical section of part of an instrument
for introducing the device of Figure 1;
- Figure 11 is a view, drawn to an enlarged scale, of a detail of Figure 10, indicated XI, showing the connection between the device of Figure 1 and the introduction instrument thereof.

Best mode for carrying out the invention

In the Figures, an interspinal retractor device constructed according to the present invention is generally designated 1.

The device 1 is particularly suitable for endoscopic operations involving spinal retraction at the lumbar level.

The device 1 comprises a first and a second portion which are designated 2 and 3, respectively, and which can be moved along an expansion axis Y between a resting position, which is illustrated in Figures 1 and 2 and in which the portions 2, 3 are close together, substantially in contact with each other, and an expanded position, which is illustrated in Figure 4 and in which the portions 2, 3 are moved apart from each other.

The first and the second portions 2 and 3 are formed in a mutually identical manner and are arranged symmetrically with respect to a longitudinal centre plane A extending through the device 1.

Each portion 2 or 3 extends parallel with a longitudinal axis X of the device 1, substantially perpendicular to the expansion axis Y, and comprises a central body 4, from which extend, on longitudinally opposite sides, pairs of arms 5 and 6 which are parallel with and at a distance from each other.

A transverse centre plane B of the device 1 further extends through the central bodies 4 and is substantially perpendicular to the longitudinal axis X and therefore substantially parallel with the expansion axis Y.
According to a first aspect of the present invention, the device 1 comprises for each portion 2 and 3 a pair of wings which are designated 7 and 8, respectively, and which are provided for centring and holding the device 1 in the correct intervertebral position.

The wings 7 are provided on longitudinally opposite sides of the device 1 and are movable with respect to the first portion 2 between a non-operative position, in which the wings 7 are at a distance from the transverse centre plane B (see Figure 1) and an operative position (see Figure 4), in which the wings 7 are close to the transverse centre plane B and protrude from the first portion 2.

In a completely similar manner, the wings 8 can be moved with respect to the second portion 3 between a corresponding non-operative position and a corresponding operative position in a position symmetrical relative to the wings 7 with respect to the longitudinal centre plane A.

The device 1 further comprises expansion means which are generally designated 10 and which are arranged to move in a continuous, adjustable and reversible manner the first and second portions 2 and 3 between the resting position and the expanded position and the wings 7 and 8 between the non-operative position and the operative position.

The expansion means 10 comprise a pair of sliders 11, 12 which can be moved along the longitudinal axis X between a position of maximum separation (Figure 1), in which the sliders are positioned at the longitudinally opposite ends of the device 1, and a position of maximum proximity (Figure 4), in which the sliders abut each other at the transverse centre plane B.

During the movement thereof from the position of maximum separation, the
sliders 11, 12 are slidingly accommodated between the arms 5 and 6 of the first and second portions 2, 3.

Advantageously, there are further provided on the first and second portions 2, 3 means for guiding and limiting the travel of the sliders 11, 12 in order to guide the movement thereof and to stop it at a desired distance in the position of maximum separation. In particular, the guiding and travel limiting means comprise pins 17 which are fixed to the first and second portions 2, 3 and which protrude therefrom in order to be received in engagement in blind channels 18 which are formed in the sides of the sliders 11, 12.

The channels 18 have a first longitudinal rectilinear portion and a second inclined portion in order to allow movement of the first and second portions 2, 3 (to which the pins 17 are fixed) along the expansion axis Y with respect to the sliders 11 or 12.

The movement of the sliders 11, 12 is controlled by a screw 13 which extends longitudinally through the device 1 and with which both the sliders 11, 12 are engaged in a threaded manner. In particular, there are defined on the screw 13 a first threaded section 14, with which the slider 11 is engaged, and a second threaded section 15, with which the slider 12 is engaged, having a thread which is reversed with respect to the first threaded section 14. In that manner, the rotation in one direction of the screw 13 involves symmetrical movement of the sliders 11, 12 towards each other whilst rotation in the opposite direction brings about symmetrical movement thereof away from each other.

At an axial end of the screw 13 there is formed a head 16 with a polygonal external cross-section and an internal thread in order to allow connection to an
instrument for introducing the device 1 directly actuated by the operator and described in greater detail above. A threaded hole 16a is further formed axially in the head 16.

The device 1 has a specific longitudinal orientation with a rear longitudinal end lb in which the head 16 of the screw 13 is provided and an opposite front longitudinal end la.

The movement of the first and second portions 2, 3 is brought about by the thrust action of the sliders 11, 12 which, during their movement towards the position of maximum proximity, become interposed between the central bodies 4 of the portions 2 and 3.

The expansion axis Y is substantially perpendicular to the longitudinal axis X so that, in order to allow and promote the above-mentioned thrust action, there are defined on the sliders 11, 12 and the first and second portions 2, 3 mutual contacting surfaces which are inclined with respect to both the longitudinal axis X and the expansion axis Y.

In particular in the first and second portions 2 and 3, the inclined contacting surfaces which are designated 20 and 21 are formed in the region of the central bodies 4, respectively, whilst corresponding surfaces 22, 23 which are equally inclined are formed on the sliders 11, 12 in the region of the mutually facing longitudinal ends, respectively.

The inclined portion of the channels 18 has an inclination corresponding to that of the surfaces 22, 23.

The inclined contacting surfaces 20, 21 are arranged on each central body 4 so as to define a wedge-shaped formation with a vertex directed towards the other central body 4.
In this preferred embodiment, the contacting surfaces between sliders and the first and second portions are both inclined and have the same gradient but it is further possible for the inclined contacting surfaces to be provided only on the sliders or only on the first and second portions.

In order to promote the correct movement away from and towards the expanded position of the first and second portions 2, 3, there are provided guide means which comprise four pairs of sleeves 24 and pins 25 which are fixed in the region of the arms 5 and 6 of the first and second portions 2, 3.

In particular, a sleeve 24 which is fixed to an arm 5 or 6 of a portion corresponds to a pin 25 fixed to the corresponding arm of the other portion. Each pin and sleeve of the same pair extend towards each other and are aligned parallel with the expansion axis Y so that the pin 25 is slidingly received inside the sleeve 24.

Preferably, when the sliders 11, 12 are in the position of maximum separation, they project longitudinally from the first and the second portions 2, 3, determining the total longitudinal dimension (length) of the device 1. During the movement thereof towards the position of maximum proximity, the sliders 11, 12 are received between the arms 5 and 6 of the first and second portions 2, 3 so that the total length of the device 1 is thereby defined.

In that manner, the expansion of the device 1 in the expansion axis Y advantageously also involves the total length of the device 1 being reduced.

Preferably, when the sliders 11, 12 are in a position of maximum separation and therefore the portions 2 and 3 are in a resting position and the wings 7, 8 are in a non-operative position, the device 1 has a length between 40 and 50 mm, more preferably of approximately 45 mm, a thickness measured along
the expansion axis Y in the region of the central bodies 4 of approximately 9 mm and a depth of approximately 12 mm.

When the sliders 11, 12 are in a position of maximum proximity and therefore the portions 2 and 3 are in an expanded position and the wings 7, 8 are in an operative position, however, the device 1 has a length between 30 and 40 mm, more preferably of approximately 35 mm, a thickness measured along the expansion axis Y in the region of the central bodies 4 of approximately 15 mm, with the depth dimension being kept unchanged.

The wings 7 and 8 are all secured in articulation in the region of a first end 31 thereof facing the transverse centre plane B of the device 1.

In greater detail, each wing 7, 8 is articulated to a pin 30 which extends between the arms 5 or 6 both of the first portion 2 and the second portion 3, in the region of the central body 4, respectively.

In that manner, the wings 7 and 8 can be pivoted about the pin 30 and the second ends 32, opposite the first ends 31, are moved by the first or second portion 2 towards the transverse centre plane B and vice versa, respectively.

The movement of the wings 7, 8 is brought about by the expansion means 10 which comprise, for each wing, a linkage 33 which is articulated at its opposite ends to the slider 11 or 12 and to a central zone of the wing itself by means of pins 34 and 35, respectively.

According to another aspect of the present invention, each wing 7, 8 has a curved profile, whose concavity faces the opposite side to the transverse centre plane B when the wings are in an operative position.

In that manner, the possibility of engaging and moving any ligaments, nerves or other tissue present between the vertebrae during pivoting of the wings 7
or 8 towards the operative position is limited. Conversely, the curved profile facilitates the sliding of any tissue present in a trajectory towards the exterior of the wings during pivoting.

In the non-operative position, the second ends 32 of the wings 7, 8 are accommodated in channelled seats 36 which are formed in the sliders 11 and 12 whilst the central zone thereof, owing to the curved profile of the wings, projects slightly in the direction of the expansion axis Y from the profile of the arms 5, 6 of the first or second portion 2, 3. In that manner, the general profile of the device 1 in the non-operative position of the wings 7, 8 has a depression between the wings 7 and 8, in which the central body 4 is confined.

When they are in the non-operative position, the wings 7, 8 project along the expansion axis Y by approximately from 0.8 to 1.0 mm with respect to the central body 4.

That specific saddle-like configuration confers on the device 1 the advantageous possibility of obtaining more precise positioning of the device 1 when it is inserted between the spinal processes to be retracted. In fact, after initial slight resistance to insertion has been overcome corresponding to the passage of the greater section relative to the two wings 7, 8 which are present in the region of the front longitudinal end 1a, the operator can "feel" that the device 1 is centred between the two spinal processes in the region of the smaller section of the two central bodies 4, further avoiding overcoming second resistance corresponding to the other two wings 7, 8 which are present in the region of the rear longitudinal end 1b.

In the non-operative position, the linkages 33 are received between a pair of prongs 37 of the wings 7 and 8.
According to another aspect of the invention, the above-described expansion means are provided for moving at least partially the pairs of wings 7, 8 from the non-operative position thereof towards the operative position thereof, before the first and second portions 2, 3 have been moved from the resting position thereof towards the expanded position.

This effect is achieved by causing the sliders 11, 12, starting from the position of maximum separation, to abut the central bodies 4 of the first and second portions 2, 3 in the region of the inclined contacting surfaces 20, 21 and 22, 23 only after being moved with a first free section.

Naturally, in this free section, the movement of the sliders 11, 12 brings about the movement of the linkages 33 and the pivoting of the wings 7, 8 from the non-operative position towards the operative position, away from the portion 2 or 3, respectively.

The successive configurations of the device 1 after the movement of the sliders 11, 12 from the position of maximum separation to the position of maximum proximity are illustrated in Figures 1 to 4.

In particular Figure 2 illustrates the configuration in which the sliders 11, 12, after completing the movement of the free section, abut the central bodies 4 in the region of the inclined contacting surfaces. It will be appreciated that the wings 7, 8 are already pivoted in extension through a minimum angle of approximately 30° and preferably between 40° and 60°, in a more preferable manner through approximately 45°, whilst the portions 2 and 3 are still in mutual contact, in a resting position.

The device 1 with the sliders 11, 12 in a position of maximum separation has a generally cylindrical formation, which is longitudinally elongate so as to
promote the introduction thereof via the endoscopic route.
In particular, the slider corresponding to the front longitudinal end la, in this example the slider 11, has an advantageously rounded formation of the side thereof projecting from the first and second portions 2, 3.

With reference to Figures 10 and 11, the introduction of the device 1 between the two vertebrae to be retracted is carried out by means of an introduction instrument which is generally designated 50. The introduction instrument 50 comprises a guide cannula 51 which is preferably curved so as to be able to act laterally with respect to the spinal column, though approaching from the back of the patient, and via which it is possible to introduce various members such as probes, optical fibres, catheters, fixed dilators and the like which may be advantageous for the purpose.
In particular via the guide cannula 51, it is possible to introduce the device 1, advantageously fixed to a control mandrel 52 which allows it to be moved from the outside by acting on a handle 53.
Inside the control mandrel 52 there can slide a rod 54, a first end of which is connected to a handle 55, which is external with respect to the guide cannula 51 and the control mandrel 52, and the opposite end of which is threaded so as to be engaged in a threaded manner in the threaded hole 16a so as to retain the device 1 in a coupled state.
The control mandrel 52 is connected to the device 1 in the region of the rear longitudinal end lb thereof, externally engaging the head 16 of the screw 13 with a first cannula 56 which is internal whilst a second external cannula 57 is coaxial with respect to the first cannula and abuts the slider 12, engaging it in longitudinal recesses 58, respectively. In order to engage the head 16, the
first cannula 56 has, at the end thereof opposite the handle 53, a seat 56a which is formed axially therein. Advantageously, the seat 56a has such an axial dimension that it allows relative axial movement between the control mandrel 52 and the screw 13.

The control mandrel 52 is capable of being moved in rotation about its own longitudinal axis in order to rotate the screw 13.

A resilient element 59 for moving the handles 53 and 55 apart from each other is preferably active between the handle 53 of the control mandrel 52 and the handle 55 connected to the rod 54. In that manner, the control mandrel 52 is constantly urged against the slider 12 so as to follow it during its longitudinal movement relative to the screw 13.

This allows, by a suitable marking which is visible through a window provided with a graduated scale provided on the control mandrel 52 being applied to the rod 54, the relative axial movement to be visualized between the control mandrel 52 and the rod 54 and therefore the whole of the movement of the portions 2, 3 along the expansion axis Y to be determined.

Before the introduction operation, the device 1 having wings 7, 8 in a non-operative position and portions 2 and 3 in a resting position is connected to the rod 54 in order to be screwed into the threaded hole 16a of the head 16 and the head 16 is inserted in the seat 56a of the first cannula 56 of the control mandrel 52.

The device 1 is therefore introduced along the guide cannula 51, which is positioned beforehand in the patient, and urged between the two spinal processes to be retracted until the central bodies 4 are positioned therebetween. That positioning is facilitated by the warning of the first
"passage" of the wings 7, 8 corresponding to the front longitudinal end la.
The rounded end of the slider 11 projecting from the first portion 2 facilitates the insertion of the device 1 between the vertebrae and any interposed tissue. After the device 1 has been correctly positioned, the handle 53 of the control mandrel 52 is rotated about its own axis so as to cause corresponding rotation of the screw 13 which begins to move the sliders 11, 12 from the position of maximum separation towards the position of maximum proximity. Owing to the resilient means 59, the control mandrel 52 remains in abutment against the slider 12 whilst the rod 54 remains fixedly joined to the screw 13, thereby bringing about the relative movement between the rod 54 and the control mandrel 52.

Therefore, the wings 7 and 8 move in a pivoting manner, and are lifted from the first and second portions 2, 3.
The pivoting movement of the wings 7 and 8 optionally allows the spinal processes to be brought together, by moving the device 1 with respect thereto so as to centre it accurately and to align the central bodies 4 with the spinal processes.

After the sliders 11, 12 have travelled over the first free section, they are encountered by the central bodies 4 of the portions 2 and 3 which are consequently moved along the expansion axis Y towards the expanded position. The pivoting of the wings 7, 8 continues at the same time.
The expansion movement of the portions 2 and 3 involves the resultant retraction of the spinal processes, which are supported directly on the central bodies 4, as far as a distance considered appropriate by the operator.

It will be appreciated that the expansion movement of the device according to
the invention is continuous so as to be able to be stopped in any intermediate position between the resting position and the expanded position and is completely reversible, by means of simple rotation of the screw 13 in the opposite direction.

It will further be noted that, in that manner, the device 1 is engaged securely, by means of the wings 7 and 8, with the two spinal processes to be retracted, preventing subsequent relative movement in translation and/or in rotation in the plane defined by the axes X and Y. Advantageously, however, that holding action is carried out by the wings 7 and 8 only by means of lateral clamping of the spinal processes so as to allow articular mobility thereof with respect to the device 1 about an axis parallel with the longitudinal axis X of the device 1.

Therefore, the device 1 is securely held on the two spinal processes but without completely preventing relative movement of the two vertebrae.

It will further be appreciated that this centring and holding function is also performed by the wings 7, 8 in the case in which no expansion of the two portions 2, 3 is required and the device 1 is in its configuration with minimal thickness.

Another advantage afforded by the retractor device according to the invention is that, at the same time as the pivoting of the wings 7, 8, the total length of the device 1 is reduced as a result of the sliders 11, 12 moving towards each other.

If the device 1 were to abut a ligament, nerve or any other organ following the introduction thereof between the vertebrae, it would thereby be advantageously moved away from the relevant organ, avoiding possible pain
or lesions.
Once the device 1 is expanded to the desired extent, it is disengaged from the
rod 54 by means of rotation of the handle 55 so that the rod 54 and the
control mandrel 52 can be withdrawn from the guide cannula 51, leaving the
device 1 in position.
In a construction variant of the device 1, illustrated in Figure 9, the portions 2
and 3 can be surrounded, in the region of the central bodies 4, by a ring 4a of
elastomer material which can advantageously act as a shock absorber for the
support of the spinal processes to be retracted and, at the same time, also as
a guide during the movement of the portions 2 and 3 away from and towards
the resting position, co-operating with the guide means 24, 25.
In a form which is not illustrated, there is provision for each central body to be
surrounded by a ring of elastomer material, thereby obtaining only the shock-
absorbing function.
In the variant illustrated in Figure 9, the guide means for the movement of the
first and second portions 2, 3 comprise a pair of pins 26 which extend between
the central bodies 4 parallel with the movement axis Y. Preferably, the pins 26
engage the screw 13 at the diametrically opposed sides at a central region 27
thereof interposed between the first and second threaded portions 14, 15. In a
more preferable manner, the central region has a cross-section smaller than
the threaded portions 14 and 15, for example, by a circumferential slot being
provided, so that the pins 26 prevent any movement of the screw 13 in the
longitudinal centre plane A, in particular along the longitudinal axis X.
Each pin 26 is fixed in one of the two portions 2, 3 and is accommodated in
the other in a sliding manner. Preferably, a pin 26 is fixed in the first portion 2
and the other pin 26 is fixed in the second portion 3.

The provision of the pins 26 is preferably an alternative to the provision of the pairs of pins and sleeves 24, 25 described above.

Therefore, the present invention solves the problem set out above with reference to the cited prior art, at the same time affording a number of other advantages.
Claims

1. An interspinal retractor device (1) comprising:
   - a first and a second portion (2, 3) movable along an expansion axis (Y) between a resting position in which the said portions are close together and an expanded position in which the said portions have been moved apart from each other;
   - expansion means (10) associated with the said first and second portions (2, 3) and selectively operable by a user to move the said first and second portions to and from the said resting position,
   - at least one pair of centring and holding wings (7; 8) which are arranged on opposite sides of the said device and which are movable by the said expansion means between a non-operative position, in which the said wings are at a distance from a transverse centre plane (B) of the said device substantially parallel with the said expansion axis (Y), and an operative position in which the said wings are close to the said transverse centre plane (B) and protrude from the said first and second portions, and characterised in that the said expansion means are arranged to move the said pair of wings at least partially from the said non-operative position, before the said first and second portions are moved from the said resting position.

2. A device according to claim 1, wherein the said expansion means comprise a pair of sliders (11, 12) which are movable between a position of maximum separation and a position of maximum proximity along a longitudinal axis (X) of the said device, the said sliders being associated with the said first and second portions in such a manner that
a movement of the said sliders corresponds to a movement of the said first and second portions along the said expansion axis (Y).

3. A device according to claim 2, wherein the said longitudinal axis (X) is substantially perpendicular to the said expansion axis (Y) and to the said transverse centre plane (B).

4. A device according to claim 3, wherein there are defined on the said sliders and/or on the said first and second portions, mutually contacting surfaces (20, 21; 22, 23) which are inclined with respect both to the said longitudinal axis (X) and to the said expansion axis (Y) in such a manner that the movement of the said sliders along at least one section of the said longitudinal axis corresponds to a movement of the said first and second portions along the said expansion axis.

5. A device according to any one of claims 2 to 4, wherein the said first and second portions comprise a central body (4) from which extend, on longitudinally opposite sides, respective pairs of arms (5, 6) which are parallel with and at a distance from each other and between which the said sliders are accommodated in a sliding manner.

6. A device according to claim 5, wherein there are defined on the said central body the said respective inclined surfaces (20, 21) for contact with each of the said sliders, the said surfaces being arranged with respect to each other in such a manner as to define a wedge-shaped formation with the vertex facing the other of the said first and second portions.

7. A device according to any one of claims 4 to 6, wherein the said sliders, starting from the said position of maximum separation, abut the said
inclined surfaces after having been moved along a first free section of their travel so that the movement of the said portions from the said resting position takes place after the movement of the said sliders from the said position of maximum separation.

8. A device according to any one of claims 2 to 7, wherein the said expansion means comprise a screw (13) comprising a first threaded section (14) which is engaged on one of the said pair of sliders, and a second threaded section (15), having the reverse thread to that of the first section, which is engaged on the other of the said pair of sliders, so that the rotation of the said screw in the two directions involves the movement of the said sliders towards or away from each other, respectively.

9. A device according to any one of claims 2 to 8, wherein the said sliders, when in the said position of maximum separation, protrude longitudinally from the said first and second portions, and, when in the said position of maximum proximity, do not protrude longitudinally from the said first and second portions, so that, in the position of maximum separation, the longitudinal dimension of the said device is greater than the dimension of the device in the position of maximum proximity.

10. A device according to any one of claims 2 to 9, wherein means (17) for guiding and limiting the travel of the said sliders (11, 12) are arranged on the said first and/or second portion(s) (2, 3).

11. A device according to any one of the preceding claims, wherein guide means (24, 25; 26) for the said movement along the said expansion axis are provided between the said first and second portions.
12. A device according to claim 11, wherein the said guide means comprise a pair of pins extending between the respective central bodies of the said first and second portions parallel with the said expansion axis, the said pair of pins being engaged in a recess formed in the said screw between the said first and the said second threaded section.

13. A device according to claim 11, wherein the said guide means comprise pairs of pins and sleeves extending between the corresponding arms of the said first and second portions parallel with the said expansion axis, each pin being slidably engaged in a corresponding sleeve of the said pair.

14. A device according to any one of the preceding claims, wherein each of the said wings is attached in an articulated manner at a first end (31) thereof facing the said transverse centre plane (B), so that the movement of the said wing to and from the said operative position involves the pivoting towards and away from the said transverse centre plane of a second end (32) of the said wing remote from the said centre plane.

15. A device according to claim 14, wherein each of the said wings is attached in an articulated manner to the said first or second portion.

16. A device according to any one of the preceding claims, wherein the said first and second portions comprise a central body (4) from which extend, on longitudinally opposite sides, respective pairs of arms (5, 6) which are parallel with and at a distance from each other and wherein each of the said wings, when in the said non-operative position, is at least partly accommodated between one of the said pairs of arms.
17. A device according to any one of the preceding claims, wherein the said wings have a curved profile, the concavity of which, when the wings are in the said operative position, faces the opposite side to the said transverse centre plane.

18. A device according to claim 17, wherein the said wings (7, 8), when in the said non-operative position, protrude partially with their curved profile from the profile of the said first or second portion in such a manner as to define between the said pair of wings a depression in which a central body (4) of the said first or second portion is confined.

19. A device according to any one of claims 14 to 18, wherein the said expansion means comprise, for each of the said wings, a linkage (33) articulated at its opposite ends to the said wing and to one of the said sliders, respectively, so that the movement of the said slider, starting from the said position of maximum separation, along the said first free section of its travel brings about the pivoting of the said wing with respect to the said first or second portion.

20. A device according to one or more of claims 2 to 19, wherein, when in the said non-operative position, the respective second ends (32) of the said wings (7, 8) are accommodated in channelled seats (36) formed in the said sliders (11, 12).
**INTERNATIONAL SEARCH REPORT**

**PCT/IB2011/052051**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A61B17/02 A61B17/70

ADD.

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

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

A61B

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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**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 document but published on or after the international filing date
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