**Abstract:** The present application is directed to devices and methods of spacing apart vertebral members. In one embodiment, the device includes a plurality of stackable shims (20) that includes at least a first shim and a second shim. The first shim includes a body with a first portion of a male-female connector, and a removable guide (50) that is attached to the body and extends along at least a portion of the body and outward beyond the body. The second shim includes a second portion of the male-female connector, and a longitudinal passage (40) that extends through the body and is sized to receive the guide. The second shim is moveable relative to the first shim with the guide disposed in the passage between a disengaged position and an engaged position. In the engaged position, the first shim is stacked on the second shim.
STACKABLE INTERVERTEBRAL DEVICES AND METHODS OF USE

Background
The present application is directed to an interbody device to space vertebral members and, more particularly, to devices constructed of a plurality of shims that are individually inserted between the vertebral members.

The spine is divided into four regions comprising the cervical, thoracic, lumbar, and sacrococcygeal regions. The cervical region includes the top seven vertebral members identified as C1-C7. The thoracic region includes the next twelve vertebral members identified as T1-T12. The lumbar region includes five vertebral members L1-L5. The sacrococcygeal region includes nine fused vertebral members that form the sacrum and the coccyx. The vertebral members of the spine are aligned in a curved configuration that includes a cervical curve, thoracic curve, and lumbosacral curve. Intervertebral discs are positioned between the vertebral members and permit flexion, extension, lateral bending, and rotation.

Various conditions may lead to damage of the intervertebral discs and/or the vertebral members. The damage may result from a variety of causes including a specific event such as trauma, a degenerative condition, a tumor, or infection. Damage to the intervertebral discs and vertebral members can lead to pain, neurological deficit, and/or loss of motion.

Various procedures include replacing the entirety or a section of a vertebral member, the entirety or a section of an intervertebral disc, or both. One or more replacement implants may be inserted to replace the damaged vertebral members and/or discs. The implants may reduce or eliminate the pain and neurological deficit, and may increase the range of motion.

Summary
The present application is directed to a devices and methods of spacing apart vertebral members. In one embodiment, the device includes a plurality of stackable shims that includes at least a first shim and a second shim. The first shim includes a body with a first portion of a male-female connector, and a removable guide that is attached to the body and extends along at least a portion of the body and outward beyond the body. The second shim includes a second portion of the male-female connector, and a longitudinal
passage that extends through the body and is sized to receive the guide. The second shim is moveable relative to the first shim with the guide disposed in the passage between a disengaged position and an engaged position. In the engaged position, the first shim is stacked on the second shim.

One method of spacing apart first and second vertebral members includes inserting a first shim into an intervertebral spaced formed between the first and second vertebral members. A first side of the first shim may be positioned towards the first vertebral member and a second side may be positioned towards the second vertebral member. An elongated guide attached to the first shim may be positioned to extend outward beyond the intervertebral space. The guide may be inserted into a passage in a second shim, and the second shim may be laterally moved along the guide and into the intervertebral space. The first and second shims may be positioned in a stacked orientation with the second shim in the intervertebral space and positioned between the first shim and the second vertebral member. In one embodiment, the guide is removed from the first shim after the first and second shims are engaged together.

**Brief Description of the Drawings**

Figure 1 is a perspective view of a device with attached guides according to one embodiment.

Figure 2 is a perspective view of a shim with an attached guide according to one embodiment.

Figure 3 is an end view of the shim and attached guide of Figure 2.

Figure 4 is a perspective view of a shim with an attached guide according to one embodiment.

Figure 5 is a perspective view of an end shim with an attached guide according to one embodiment.

Figure 6 is an end view of the end shim and the attached guide of Figure 5.

Figure 7 is a perspective view of an intervertebral space formed between vertebral members according to one embodiment.

Figure 8 is a perspective view of an end shim being inserted into an intervertebral space according to one embodiment.

Figure 9 is a perspective view of an end shim in an intervertebral space according to one embodiment.
Figure 10 is a perspective view of a second shim being inserted into an intervertebral space according to one embodiment.

Figure 11A is a side view of a second shim being inserted into an intervertebral space according to one embodiment.

Figure 11B is an end view of the second shim and the end shim of Figure 11A.

Figure 12A is a side view of a second shim being inserted into an intervertebral space according to one embodiment.

Figure 12B is an end view of the second shim and the end shim of Figure 12A.

Figure 13A is a side view of a second shim seated with a first shim in an intervertebral space according to one embodiment.

Figure 13B is an end view of the second shim and the end shim of Figure 13A.

Figure 14 is a perspective view of a third shim inserted in an intervertebral space according to one embodiment.

Figure 15 is a perspective view of a second end shim inserted in an intervertebral space according to one embodiment.

Figure 16 is a perspective view of a subsequent shim being inserted in an intervertebral space according to one embodiment.

Figure 17 is a perspective view of a device in an intervertebral space according to one embodiment.

Figure 18 is a perspective view of a pair of devices in an intervertebral space according to one embodiment.

**Detailed Description**

The present application is directed to an intervertebral device 10 to space apart vertebral members. Figure 1 illustrates one embodiment of the device that includes two or more shims 20 placed together in a stacked configuration in an intervertebral space 101. The stacked configuration gives the device 10 an overall height H to space apart the vertebral members 100. The shims 20 are aligned relative to each other with a passage 40 of a second shim 20 engaging a guide 50 of a first shim 20. The shims 20 are individually inserted into the intervertebral space 101 and stacked together to attain the desired height H for spacing the vertebral members 100. Once the desired height H is attained, the guides 50 may be removed, with only the shims 20 remaining in the intervertebral space 101 (see Figure 17).
One embodiment of a shim 20 with an attached guide 50 is illustrated in Figures 2 and 3. Shim 20 includes first and second ends 21, 22, first and second sides 23, 24, and lateral sides 25. In this embodiment, shim 20 includes an elongated, narrow shape with a major axis extending through the first and second ends 21, 22, and a minor axis extending through the lateral sides 25. The first end 21 may include a rounded shape to facilitate insertion through soft tissue and into the intervertebral space 101. The shim 20 further includes a height h’ measured between the first and second sides 23, 24.

The first side 23 includes a substantially flat contact surface 26 positioned between a pair of rails 27. Rails 27 extend beyond the contact surface 26 and together form a portion of a male-female connector to receive an adjacent shim 20 as will be explained in detail below. Rails 27 may extend along the entirety or discrete sections of the first side 23. Figure 2 illustrates the rails 27 extending along discrete sections of the first side 23 with the rails 27 beginning at a point spaced away from the second end 22 and extending a limited length towards the first end 22. Ramps 28 may be positioned at the end of the rails 27. Ramps 28 may include an angled surface that facilitates engagement with a subsequent shim 20. The first and second sides 23, 24 are also constructed to prevent lateral movement or tipping of the shim 20 within the intervertebral space 101. In one embodiment, ends of the first and second sides 23, 24 include enlarged widths to increase the contact area with adjacent shims 20 or the vertebral members 100.

The first side 23 further includes an engagement block 29 configured to receive and engage with the guide 50. The engagement block 29 extends upward above the contact surface 26. An opening 30 is formed in the engagement block 29 to receive the guide 50. In one embodiment, both the opening 30 and guide 50 are threaded. Guide 50 may attach to the shim 20 at a variety of different locations. In the embodiment of Figure 2, the guide 50 attaches at the first end 21. In another embodiment, the guide 50 attaches at the second end 22.

The second side 24 is configured to engage with the first side 23 of an adjacent shim 20. A contact surface 31 is substantially flat and configured to engage with the contact surface 26. Tabs 32 extend outward and forms gaps 33 sized to engage with the rails 27.

In one embodiment as illustrated in Figures 2 and 3, the first and second sides 23, 24 are substantially parallel. The shims 20 may also come in different heights that may be used in a variety of combinations to build the overall height H of the device 10. By way
of example, a first shim 20 may include a height of about 10mm, and another shim 20 may include a height of about 25mm. In one embodiment, the sides 23, 24 are positioned at an angle to match the curvature of the spine. In one specific embodiment, the angle matches the lordotic curvature of the spine. Further, the height h’ of the shim 20 may be substantially constant or may vary along the length.

In one embodiment, the shim 20 is adjustable to set the height h’ as necessary for the specific use. The shim 20 may include an adjustment mechanism, such as a threaded connection between first and second sections, or a ratcheting mechanism. The adjustment mechanism may provide for setting the height h’ either prior to or after insertion into the intervertebral space 101.

The passage 40 extends through the shim 20 and is sized to receive the guide 50 of an adjacent shim 20. The passage 40 generally extends between the first and second ends 21, 22. The passage 40 may extend through an entire length of the shim 20 from the first end 21 to the second end 22, or may extend through a limited length. In one embodiment, the passage 40 is substantially parallel with the contact surfaces 26, 31. Figure 3 illustrates an embodiment of the passage 40 with an enlarged section 41 with a first width and a reduced section 42 with a smaller width. Other embodiments feature the passage 40 with a variety of shapes including but not limited to circular, oval, and rectangular.

The guide 50 is attached to and extends outwardly from the shim 20. Guide 50 provides a structure for aligning shims 20 subsequently introduced into the intervertebral space 101 with a previously introduced shim 20. As illustrated in Figure 2, guide 50 includes an elongated shape. The size and shape of the guide 50 may be substantially constant along the length, or may vary. In one embodiment, the length of the guide 50 is greater than the shim 20. A first end 51 of the guide 50 is removably attached to the shim 20. Various methods for attachment may be used, including but not limited to threads 52 that engage with the threaded opening 30 on the shim 20, a friction fit, and a ball-and-detent arrangement. The removable attachment allows for the guide 50 to be removed from the shim 20 after insertion into the intervertebral space 101. In another embodiment, the guide 50 is cut away from the shim 20 after being inserted into the intervertebral space 101. In this embodiment, a portion of the guide 50 may remain attached to the shim 20 and permanently remain within the intervertebral space 101. In one embodiment as illustrated in Figures 2 and 3, the guide 50 is positioned above the contact surface 26 such
that a space is formed between the guide 50 and surface 23. In another embodiment as illustrated in Figure 4, guide 50 is positioned at the contact surface 26.

Guide 50 may be constructed from a variety of materials, including but not limited to stainless steel, titanium, Nitinol, and polymers. In one embodiment, guide 50 is rigid and able to support the shim 20. Guide 50 forms a handle for the surgeon to grasp to manipulate to insert the shim 20 into the intervertebral space 101 in addition to providing an alignment path for subsequent shims 20. In one embodiment, the guide 50 includes a rectangular cross-sectional shape. This shape allows rotational stability during insertion and prevents buckling of the guide 50 when used as an insertion tool for positioning the shim 20 within the intervertebral space 101. In another embodiment, guide 50 is constructed of a flexible material that is not adequate to support the shim 20 during insertion into the intervertebral space 101.

Shims 20 may include a variety of shapes and sizes. Figure 4 illustrates an embodiment with the shim 20 including a substantially rectangular shape. Guide 50 is positioned in a cut-out 34 in the superior side 23. The passage 40 on the inferior side 24 is partially exposed to receive the guide 50.

One type of shim 20 is an end shim 20a illustrated in Figures 5 and 6. End shims 20 are positioned in the intervertebral space 101 and directly contact one of the vertebral members 100. End shims 20a include a keel 35 on the second side 24. The keel 35 provides additional engagement and stability between the shim 20a and the vertebral member 100. Keel 35 may extend the entire length of the shim 20, or a limited distance along the length. The keel 35 is sized to fit in a trough 102 formed in the vertebral member 100 as will be explained below. In one embodiment, the keel 35 may include a sharpened leading edge and/or outer edge that acts as a cutting instrument to form the trough 102 in the vertebral member 100. The end shims 20a may also be used for distraction and manipulation of the vertebral members 100.

A support surface 37 is spaced from the outer edge of the keel 35. Support surface 37 contacts against the vertebral member 100 when the keel 35 is in the trough 102. The first side 23 is configured to engage with shims 20 in a stacked orientation. First side 23 may include various connectors, including rails 27 and a contact surface 26 as illustrated in Figures 5 and 6. In one embodiment, a height of the end shims 20a is less than a height of the intermediate shims 20.
Figures 7 - 17 illustrate one method of inserting the device 10 into the intervertebral space 101 between the vertebral members 100. In this embodiment, a corpectomy procedure has been performed to form the intervertebral space 101. Initially, troughs 102 may be formed in one or both of the vertebral members 100. Troughs 102 extend across a section or entirety of the vertebral members 100 and are sized to receive the keels 35 on the end shims 20a.

Figure 8 illustrates a first end shim 20a being inserted into the intervertebral space 101 in the direction of arrow A. During insertion, the keel 35 at the first end 21 is initially aligned with the trough 102 with the support surface 37 abutting against the face of the vertebral member 100. Figure 9 illustrates the end shim 20a fully inserted in the intervertebral space 101. The end shim 20a is positioned with the first side 23 faces away from the inferior vertebral member 10 and into the intervertebral space 101 in a position to engage a subsequent shim. Further, the guide 50 remains affixed to the end shim 20a and extends outward from the intervertebral space 101 to receive and align the subsequent shim.

Figure 10 illustrates the subsequent shim 20 or second shim being inserted into the intervertebral space 101. During insertion, the guide 50 of the end shim 20a is received in the passage 40 on the second shim 20 while the second shim 20 remains away from the intervertebral space 101. The second shim 20 is moved in the direction of arrow A with the passage 40 sliding along the guide 50.

Figure 11A illustrates a side view and Figure 11B an end view of the second shim 20 partially engaged with the end shim 20a. As the shim 20 begins to overlap shim 20a, engagement mechanisms on each begin to interlock the shims 20, 20a. Specifically, the tabs 32 and gaps 33 on the second side 22 of the second shim 20 engage the rails 27 on the end shim 20a. As illustrated in Figure 11B, the contact surface 31 on the second shim 20 remains spaced away from the contact surface 26 on end shim 20a.

Figures 12A and 12B illustrates the second shim 20 more fully engaged with the end shim 20a. Second shim 20 has moved laterally a further amount in the direction of arrow A. Further, the tabs 32 on the second shim 20 continue to slide along the rails 27 on the end shim 20a. In this embodiment, rails 27 include a downward slope such that the further lateral movement of the second shim 20 relative to end shim 20a closes the gap between the contact surfaces 26, 31. As illustrated in Figure 12B, the gap between the surfaces 26, 31 has been reduced from the previous size of Figure 11B. Further, guide 50
of end shim 20a begins to move out of the reduced section 42 of passage 40 and into the
enlarged section 41 as the second shim 20 moves towards closer proximity with shim 20a.

The lateral movement of the shim 20 may result in axial movement of the shim 20 in
the intervertebral space 101. The amount of axial movement may be coordinated to
control the overall height H of the device 10. In one embodiment, the rails 27 include a
downward slope such that the shim 20 moves downward during insertion. In another
embodiment, the shim 20 may move away from the shim 20a during insertion. In both of
these embodiments, the shim 20 provides distraction of the intervertebral space 101. In
another embodiment, the shim 20 is structured for the lateral movement into the
intervertebral space 101 to cause substantially parallel movement of the shim 20 relative to
shim 20a (i.e., no downward movement of shim 20 towards shim 20a). An instrument (not
illustrated) may also be used to facilitate insertion of the shim 20 into the intervertebral
space 101.

Figures 13A and 13B illustrate the second shim 20 fully engaged and interlocked
with the end shim 20a. The contact surfaces 26, 31 are in contact with no spaces formed
therebetween. Further, the guide 50 is fully positioned in the enlarged section 41 of
passage 40. In one embodiment, the engagement mechanisms of the shims 20, 20a include
a locking structure to prevent further lateral movement of shim 20 relative to shim 20a. In
one embodiment, second shim 20 includes a face 36 that abuts against the engagement
block 29 on the end shim 20a to prevent further lateral movement in the direction of arrow
A. Further movement in the direction opposite to arrow A may be prevented by a variety
of structures including but not limited to the indents on the rails 27 that engage with the
tabs 32, and a ball-and-detent mechanism on the shims 20, 20a, a one-way ratchet, lateral
locking tabs, and friction clutches.

Figure 14 illustrates another subsequent shim 20, referred to as third shim 20,
interlocked in a stacked orientation with the previously-inserted second shim 20 and the
end shim 20a. The third shim 20 is inserted along the guide 50 of the second shim 20 in a
similar manner as previously explained above. Further, the locking mechanisms of the
second and third shims 20 engage together as the third shim 20 is moved laterally into the
intervertebral space 101 relative to the second shim 20. Once positioned in the stacked
orientation, the end shim 20a, and second and third shims 20 are locked together.

Figure 15 illustrates a second end shim 20a inserted into the intervertebral space
101 to contact the superior vertebral member (for clarity, the superior vertebral member is
removed in Figure 15). The second end shim 20a includes a first side with a keel 35 that fits in a trough in the superior vertebral member. The second end shim 20a further includes a second side that faces inward into the intervertebral space 101 and towards the first vertebral member 100. A guide 50 is attached to the second end shim 20a. The guide 50 includes a length to extend outward from the intervertebral space 101. Once inserted, a gap is formed between the second end shim 20a and the third shim 20. Further, two guides 50 are positioned in the gap as a first guide 50 extends outward from the second end shim 20a, and a second guide 50 extends from the third shim 20.

Figure 16 illustrates the next shim 20b being inserted into the intervertebral space 101. The shim 20b includes a pair of passages 40 that extend along at least a section of the length of the shim. The first passage 40 is positioned to receive the guide 50 that extends outward from the second end shim 20a. The second passage 40 is positioned to receive the guide 50 from the third shim 20. During insertion, shim 20b is mounted onto the guides 50 and then laterally moved along the guides 50 and into the intervertebral space 101. A height of the shim 20b is determined to fit in the gap, and for the first side 23 to engage with the second end shim 20a, and the second side 24 to engage with the third shim 20. Further, locking mechanisms may be arranged on the first and second sides 23, 24 to interlock the shim 20b with the second end shim 20a and third shim 20 to prevent further movement. In one embodiment, shim 20b includes a single passage 40 that is sized to receive both guides 50.

The method illustrated in Figures 7-17 include the second end shim 20a being inserted at a time after several intermediate shims 20 are inserted into the intervertebral space 101. In another embodiment, the end shims 20a are each initially inserted into the intervertebral space 101. The intermediate shims 20 are then inserted between the end shims 20a.

Figure 1 illustrates an embodiment with the shim 20b full inserted into the intervertebral space 101 and engaged with the second end shim 20a and third shim 20. The shims 20a, 20, 20b are each in a stacked orientation and extend across the height of the intervertebral space 101. The shims 20a, 20, 20b are interlocked together forming a unitary device 10 with structural integrity to space apart the vertebral members 100.

At some point after the shims 20 are inserted, the guides 50 may be removed. In the methods described above, the guides 50 remain attached to the shims 20a, 20 until each of the device 10 is fully constructed in the intervertebral space 101. The guides 50
are then removed with the shims 20 remaining in the intervertebral space 101 as illustrated in Figure 17.

In one embodiment, the guides 50 are removed from each of the shims 20a, 20 after they have been used to guide the subsequent shim 20 to the intervertebral space 101. By way of example, a guide 50 remains attached to a first shim 20 until the second shim 20 has been inserted. Once inserted, the guide 50 may be removed from the first shim 20. In one embodiment, the guides 50 are attached to the shims 20 after the shims 20 are inserted into the intervertebral space 101.

In the embodiments illustrated in Figures 7-17, the device 10 includes end shims 20a on the outer extents to contact the vertebral members 100. In one embodiment, end shims 20a are not used with the device 10. Rather, the first or second sides 23, 24 of the shims 20 are placed into contact with the vertebral members 100. In one embodiment, one or both of the sides 23, 24 include an enlarged width to increase the contact area between the shims 20 and the vertebral members 100.

The device 10 may include a variety of widths to fit in the intervertebral space 101. In one embodiment as illustrated in Figure 18, a pair of devices 10 are positioned in the intervertebral space 101. The devices 10 are spaced apart with a space 105 formed therebetween. In one embodiment, the space 105 is sized to contain bone-growth material. In one embodiment as best illustrated in Figures 11B, 12B, and 13B, the lateral sides 25 of the shims 20 are scalloped with a central section of the shim 20 including a smaller width than the end sections. This shape provides for additional space to receive bone-growth material. In another embodiment, a single device 10 is positioned in the intervertebral space 101.

The device 10 may further be used as a distraction instrument to space apart the vertebral members 100. The individual shims 20, 20a, 20b may be inserted to increase an overall height H of the device 10 to be greater than the height of the intervertebral space 101. In one embodiment, outer shims 20, 20a may initially be inserted into the intervertebral space 101, and interior shims 20, 20b are subsequently added that expand the height H of the device 10 and the height of the intervertebral space 101 as necessary. In another embodiment, a separate distraction instrument is used to distract the vertebral members 100 prior to insertion of one or more of the shims 20, 20a, 20b into the intervertebral space 101.
In the methods described in Figures 7-17, the intervertebral space 101 is accessed through a posterior approach. Other applications contemplate other approaches, including anterior, posterolateral, antero-lateral and lateral approaches to the spine. Further, the device 10 and methods may be used on various sections of the spine, including the cervical, thoracic, lumbar and/or sacral portions of the spine.

Spatially relative terms such as "under", "below", "lower", "over", "upper", and the like, are used for ease of description to explain the positioning of one element relative to a second element. These terms are intended to encompass different orientations of the device in addition to different orientations than those depicted in the figures. Further, terms such as "first", "second", and the like, are also used to describe various elements, regions, sections, etc and are also not intended to be limiting. Like terms refer to like elements throughout the description.

As used herein, the terms "having", "containing", "including", "comprising" and the like are open ended terms that indicate the presence of stated elements or features, but do not preclude additional elements or features. The articles "a", "an" and "the" are intended to include the plural as well as the singular, unless the context clearly indicates otherwise.

The present invention may be carried out in other specific ways than those herein set forth without departing from the scope and essential characteristics of the invention. The surface of the shims 20, 20a, 20b may include treatments that facilitate and encourage bony ingrowth. Further, openings may extend through the shims 20, 20a, 20b to further facilitate bony ingrowth. The openings may extend cross-wise between the lateral sides 25, between the first and second sides 23, 24, or combinations thereof. In one embodiment, the end shims 20a include teeth to engage with the vertebral members 100. The teeth may be used in combination with the keel 35, or may be used without the keel 35. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.
Claims

What is claimed is:

1. An intervertebral device to space apart vertebral members comprising:
   a plurality of stackable shims comprising at least a first shim and a second shim;
   the first shim comprising a first body with a first portion of a male-female connector, and a guide moveably affixed to the first body and extending along at least a portion of a length of the first body;
   the second shim comprising a second body with a second portion of the male-female connector and a longitudinal passage extending through the body and sized to receive the guide;
   the second shim moveable relative to the first shim with the guide disposed in the passage between a disengaged position and an engaged position;
   the first and second portions of the male-female connector being disengaged in the disengaged position, and being engaged in the engaged position so as to couple together the first and second shims.

2. The device of claim 1, wherein the guide is positioned adjacent to and spaced from the first portion of the male-female connector.

3. The device of claim 1, wherein the guide includes a greater length than the first body and extends longitudinally outward from the first body.

4. The device of claim 1, wherein the second shim further includes a second guide that is substantially identical to the guide, the second guide being positioned on an opposite side of the second body from the second portion of the male-female connector.

5. The device of claim 1, wherein the first shim further includes a second passage that extends in the first body, the second passage being positioned on an opposite side of the first portion of the male-female connector from the guide.

6. The device of claim 1, further comprising a third shim comprising a third body and a pair of longitudinal passages extending through the third body.
7. The device of claim 1, wherein each of the first and second shims include contact surfaces that abut together when the shims are in the engaged position.

8. The device of claim 1, further comprising an end shim with a first side and a second side, the first side configured to engage with the first body of the first shim opposite from the first portion of the male-female connector, and a second side with a keel that mounts in one of the vertebral members.

9. An intervertebral device to space apart vertebral members comprising:

first and second sets of shims;

the first set of shims comprising a first end shim and a second end shim, each of the end shims comprising a contact side with a feature to engage one of the vertebral members and a guide disposed generally opposite the feature;

the second set of shims comprising a plurality of intermediate shims comprising at least a first shim and a second shim;

the first shim comprising a first body with a first guide removably affixed to the first body and extending along at least a portion of a length of the first body and longitudinally extending beyond the first body, the first shim also comprising a first longitudinal passage extending through the first body;

the second shim comprising a second body with a second longitudinal passage extending through the second body;

the first shim slidable along the first end shim, with the guide of the first end shim in the first longitudinal passage of the first shim to interlock the first shim with the first end shim;

the second shim slidable along the first shim, with the first guide of the first shim in the second longitudinal passage of the second shim to interlock the second shim with the first shim;

the first end shim, first shim, and second shim being interlocked and stacked together with the second shim disposed between the first shim and the second end shim.

10. The device of claim 9, wherein the second shim further includes a second guide removably affixed to the second body and extending along at least a length of the second body and longitudinally extending beyond the second body.
11. The device of claim 10, further comprising a third shim comprising a third body with a third longitudinal passage and a fourth longitudinal passage each extending through at least a portion of the third body, the third longitudinal passage being spaced away from the fourth longitudinal passage.

12. The device of claim 9, wherein the end shims include a smaller height than the intermediate shims.

13. The device of claim 9, wherein the intermediate shims include a scalloped lateral side with a width being less in a central section that at outer ends.

14. The device of claim 9, wherein the first body includes a contact surface that contacts against the second shim, the first body also including an engagement block that extends outward above the contact surface and is configured to receive the first guide and position the first guide away from the contact surface.

15. The device of claim 9, wherein the first shim includes a first portion of a male-female connector and the second shim includes a second portion of the male-female connector, the portions engaging together when the first shim is interlocked to the second shim.

16. An intervertebral device to space apart vertebral members comprising:

   first and second shims each including an elongated body with a major axis and a minor axis and a superior side and an inferior side, each of the pair of shims including a passage positioned between the superior and inferior sides and extending along the major axis, and each of the pair of shims also including a guide extending along the major axis and being substantially parallel with the passage and extending outward beyond the body;

   the first and second shims being stackable with the superior side of the first shim configured to engage with the inferior side of the second shim with the guide of the first shim positioned in the passage of the second shim.

17. A method of spacing apart first and second vertebral members comprising:

   inserting a first shim into an intervertebral space formed between the first and second vertebral members;
positioning a first side of the first shim towards the first vertebral member and positioning a second side of the first shim towards the second vertebral member; extending an elongated guide attached to the first shim outward beyond the intervertebral space; inserting the guide into a passage in a second shim; laterally moving the second shim along the guide and into the intervertebral space; engaging together locking features on the first and second shims; positioning the second shim in a stacked orientation with the first shim with the second shim in the intervertebral space and positioned between the first shim and the second vertebral member; and removing the guide from the first shim after engaging together the locking features on the first and second shims.

18. The method of claim 17, wherein the step of inserting the first shim between the first and second vertebral members includes contacting a keel on the first side of the first shim against the first vertebral member.

19. The method of claim 17, further comprising removing a second guide attached to the second shim after the second shim is positioned in the intervertebral space.

20. The method of claim 17, further comprising laterally moving a third shim along a second guide on the second shim and engaging the third shim with the second shim and positioning the first, second, and third shims in the stacked orientation in the intervertebral space.

21. The method of claim 17, further comprising increasing an overall height of an implant comprising at least the first and second shims and distracting the first and second vertebral members.

22. The method of claim 17, wherein the step of laterally moving the second shim along the guide and into the intervertebral space further comprises axially moving the second shim in a coordinated manner within the intervertebral space.
23. A method of spacing apart first and second vertebral members comprising:
   inserting a first shim in an intervertebral space between the first and second vertebral members;
   positioning a first guide fixedly attached to the first shim to extend outward beyond the intervertebral space;
   attaching a second shim to the first guide and moving the second shim along the first guide and into the intervertebral space;
   stacking the second shim onto the first shim in the intervertebral space and increasing an overall height of the device;
   positioning a second guide attached to the second shim to extend outward beyond the intervertebral space;
   attaching a third shim to the second guide and moving the third shim along the second guide and into the intervertebral space;
   stacking the third shim onto the second shim in the intervertebral space and increasing the overall height of the device;
   removing the first guide from the first shim after positioning the second shim in the intervertebral space; and
   removing the second guide from the second shim after positioning the third shim in the intervertebral space.

24. The method of claim 23, further comprising positioning a keel of the first shim against the first vertebral member.
FIG. 17
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A61F2/44

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

**B. DOCUMENTS 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 practical, search terms used)

EPO-Int

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C.

Date of actual completion of the international search

17 March 2009

Date of mailing of the international search report

26/03/2009

Authorized officer

Buchmann, Gerhard
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**INTERNATIONAL SEARCH REPORT**

**International application No.**
PCT/US2008/084480

**Box No. II Observations where certain claims were found unsearchable**
(Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. **[Y]** Claims Nos.: 17-24
   - because they relate to subject matter not required to be searched by this Authority, namely:
     - Rule 39.1(Iv) PCT - Method for treatment of the human or animal body by surgery

2. [ ] Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. [ ] Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking**
(Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable

2. [ ] As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.: 

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2005)
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