Espacenet

EP1316294A2 Fastener assembly for securing a rod-shaped element in a retaining element connected to a shaft

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Abstract: Fastener assembly for securing a rod-shaped element in a retaining element connected to a shaft
A slit (14) extends in axial direction through a locking component (8) having a hollow cylindrical shape, with an axis of rotation, an outer thread (9) and an inner thread (10).

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(54) **Verschlusseinrichtung zum Sichern eines stabförmigen Elements in einem mit einem Schaft verbundenen Halteelement**

Fastener assembly for securing a rod-shaped element in a retaining element connected to a shaft

Dispositif de fixation pour sécuriser un élément en forme de barre dans un élément de retenue relié à une tige

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Beschreibung

[0001] Die Erfindung betrifft eine in der Wirbelsäulen- bzw. Unfallchirurgie zu verwendende Verschlußeinrichtung zum Sichern eines stabförmigen Elements in einem mit einem Schaft verbundenen Halteelement. Ferner betrifft die Erfindung ein Element mit einem Schaft und einem damit verbundenen Halteelement zum Verbinden mit einem Stab mit einer derartigen Verschlußeinrichtung.

[0002] Aus der WO 95/01132 und der US 6,224,598 B1 ist jeweils ein Wirbelsäulenimplantat mit einem Aufnahmeteil mit einer U-förmigen Ausnehmung zur Aufnahme eines Stabes bekannt, wobei die durch die U-förmige Ausnehmung gebildeten freien Schenkel ein Innengewinde aufweisen. Zur Fixierung des Stabes ist ein zwischen die Schenkel einschraubbares Verschlußelement mit einem Außengewinde, einer zentralen Bohrung mit Innengewinde und eine in das Verschlußelement einschraubbare Innenschraube vorgesehen. Bei der aus der WO 95/01132 bekannten Vorrichtung wird zum Vermeiden des Aufspreizens der Schenkel eine die Schenkel von außen umfassende Sicherheitshülse verwendet.

[0003] Aufgabe der Erfindung ist es, eine Verschlußeinrichtung der eingangs beschriebenen Art zu schaffen, welche eine verbesserte Sicherung gegen Lockerung oder Lösen der Verschlußelemente gewährleistet und gleichzeitig kompakt gebaut und einfach herzustellen ist.

[0004] Diese Aufgabe wird durch die in Patentanspruch 1 gekennzeichnete Verschlußeinrichtung bzw. durch das in Patentanspruch 5 gekennzeichnete Element gelöst. Weiterbildungen der Erfindung sind in den Unteransprüchen gegeben.

[0005] Die Erfindung ist sowohl für monoaxiale als auch für polyaxiale Knochenschrauben geeignet, da sie es erlaubt, daß die Fixierung des Stabes bzw. des Stabes und des Kopfes der Knochenschraube im endgültigen Zustand so zusammenwirken, daß ein sicheres Verblokken gegen Lockern oder Lösen des Verschlußmechanismus besteht.

[0006] Weitere Merkmale und Zweckmäßigkeiten der Erfindung ergeben sich aus der Beschreibung von Ausführungsbeispielen anhand der Figuren. Von den Figuren zeigen:

Fig. 1: eine erste Ausführungsform in perspektivischer Explosionsdarstellung;

Fig. 2a: eine schematische Darstellung der auf das Verschlußelement von Fig. 1 wirkenden Kräfte vor dem Einschrauben der Innenschraube;

Fig. 2b: eine schematische Darstellung der auf das Verschlußelement von Fig. 1 wirkenden Kräfte nach dem Einschrauben der Innenschraube;

Fig. 3: eine Schnittansicht einer zweiten Ausführungsform;

Fig. 4: eine Schnittansicht einer dritten Ausführungsform;

Fig. 5: eine Schnittansicht eines Details einer vierten Ausführungsform;

Fig. 6: eine Schnittansicht eines Details einer fünften Ausführungsform;

Fig. 7: eine Schnittansicht eines Details einer sechsten Ausführungsform; und

Fig. 8: eine Schnittansicht eines Details einer siebten Ausführungsform.

[0007] Das erfindungsgemäße Element ist in der in der in den Figuren Fig. 1 dargestellten Ausführungsform als Monoaxial-Knochenschraube ausgebildet. Diese weist einen Schaft 1 mit einem Knochengewindeabschnitt und ein damit starr verbundenes Aufnahmeteil 2 zur Aufnahme eines die Knochenschraube mit weiteren Knochenschrauben verbindenden Stabes 100 auf. Hierzu ist das Aufnahmeteil mit einer Ausnehmung 3 mit einem U-förmigen Querschnitt versehen, die gerade so groß bemessen ist, daß der Stab 100 einlegbar ist und in den Grund der Ausnehmung passt. Durch die U-förmige Ausnehmung 3 sind zwei freie Schenkel 4, 5 mit jeweils einem freien Ende 6 gebildet, welches den oberen Rand des Aufnahmeteils 2 bildet. Angrenzend an das freie Ende 6 weisen die Schenkel 4, 5 ein Innengewinde 7 auf.

[0008] Zum Verschließen des Stabes 100 in der Ausnehmung 3 ist ein zwischen die Schenkel 4, 5 einschraubbares muffen- bzw. mutterartiges Verschlußelement 8 mit einem mit dem Innengewinde 7 der Schenkel zusammenwirkenden Außengewinde 9 und einem Innengewinde 10 vorgesehen. Das Verschlußelement 8 weist ein erstes stirnseitiges Ende 11 und diesem gegenüberliegend ein zweites Ende 12 auf. Zum Ineingriffbringen mit einem Einschraubwerkzeug sind an dem ersten stirnseitigen Ende 11 radial verlaufende Einschnitte 13 vorgesehen. Einer der Einschnitte erstreckt sich durch das gesamte Verschlußelement 8 in axialer Richtung und bildet somit einen Schlitz 14 derart, daß das Verschlußelement nach Art eines Spannrings eine gewisse Elastizität aufweist. Die Länge des Verschlußelements 8 in axialer Richtung ist derart bemessen, daß das Verschlußelement vollständig zwischen die Schenkel 4, 5 einschraubbar ist.

[0009] Ferner ist eine in das Verschlußelement einschraubbare Innenschraube bzw. Klemm- oder Setzschraube 15 vorgesehen, deren Außengewinde 16 mit dem Innengewinde 10 des Verschlußelements 8 zusammenwirkt. Die Innenschraube 15 weist an ihrem einen Ende eine Ausnehmung 17 zum Ineingriffbringen mit einem Schraubwerkzeug auf.

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[0010] Bei der in Fig. 1 gezeigten Ausführungsform sind das Innengewinde 7 der Schenkel, daß Außengewinde 9 des Verschlußelements, sowie das Innengewinde 10 des Verschlußelements und das Außengewinde 16 der Innenschraube 15 als metrische Gewinde ausgebildet.

[0011] Im Betrieb wird die Knochenschraube zuerst in den Knochen eingeschraubt und anschließend der Stab 100 eingelegt. Dann wird das Verschlußelement 8 mit bereits eingeschraubter, aber noch nicht mit ihrer Unterseite den Stab berührender Innenschraube 15 eingeschraubt, wodurch der Stab zunächst nur am Herauskippen gehindert wird, aber noch verschiebbar ist. Beim Einschrauben des Verschlußelements 8 kommt es aufgrund der geschlitzten und damit elastischen Ausbildung desselben nicht zu einem Aufspreizen der Schenkel 4, 5, sondern, wie in Fig. 2a gezeigt ist, setzen die Schenkel dem geschlitzten Verschlußelement einen Widerstand entgegen, der es versucht zusammenzudrücken, was durch die nach innen gerichteten Pfeile veranschaulicht ist. Anschließend wird die Innenschraube 15 so eingeschraubt bis sie mit ihrer Unterseite auf den Stab drückt und diesen fixiert. Durch das Festziehen der Innenschraube 15 wirkt auf das Verschlußelement 8 wie in Fig. 2b durch die Pfeile dargestellt ist, eine nach radial nach außen gerichtete Kraftkomponente, wodurch das Außengewinde 9 des Verschlußelements in das Innengewinde 7 der Schenkel gedrückt wird und sich dort verblockt. Damit ist ein gegen Lockerung gesicherter Verschluß gewährleistet.

[0012] In der in Fig. 3 gezeigten Ausführungsform ist das erfindungsgemäße Element als Polyaxialschraube ausgebildet, die ein Schraubenelement mit einem Gewindeschaft 1 mit einem Knochengewinde und einem kugelsegmentförmigen Kopf 20 aufweist, der mit einem Aufnahmeteil 21 verbunden ist Das Aufnahmeteil 21 hat an seinem einen Ende eine axialsymmetrisch ausgerichtete erste Bohrung 22, deren Durchmesser größer als der des Gewindeabschnitts des Schafts 1 und kleiner als der des Kopfs 20 ist. Ferner weist das Aufnahmeteil 21 eine koaxiale zweite Bohrung 23 auf, die auf dem der ersten Bohrung 22 gegenüberliegenden Ende offen ist und deren Durchmesser so groß ist, daß das Schraubenelement durch das offene Ende mit seinem Gewindeabschnitt durch die erste Bohrung 22 hindurch und mit dem Kopf 20 bis zum Grund der zweiten Bohrung 23 führbar ist. Zwischen der ersten und der zweiten Bohrung ist ein kleiner koaxialer Abschnitt 24 vorgesehen, der unmittelbar an die erste Bohrung 22 angrenzt und zum offenen Ende hin sphärisch ausgebildet ist, wobei der Radius im wesentlichen gleich dem kugelsegmentförmigen Abschnitts des Kopfs 20 ist. Das Aufnahmeteil 21 weist ebenso wie das Aufnahmeteil 2 der ersten Ausführungsform eine zur Mitte des Teiles symmetrisch angeordnete U-förmige Ausnehmung 25 auf, deren Grund zur ersten Bohrung 22 hin gerichtet ist und durch die zwei freie Schenkel 26, 27 gebildet sind, deren freies Ende 28 den oberen Rand des Aufnahmeteils 21 bilden. In einem Bereich angrenzend an das freie Ende 28 weisen die Schenkel 26, 27 ein Innengewinde 29 auf.

[0013] Es ist ferner ein Druckelement 30 vorgesehen, das so ausgebildet ist, daß es an seiner dem Kopf 20 zugewandten Seite eine sphärische Ansenkung 31 aufweist, deren Radius im wesentlichen gleich dem Radius des kugelsegmentförmigen Abschnitts des Kopfes 20 ist. Der Außendurchmesser des Druckelements ist so gewählt, daß das Druckelement in dem Aufnahmeteil 21 eine Gleitbewegung durchführen kann, also zu dem Kopf 20 hin verschiebbar ist. Das Druckelement weist ferner eine koaxiale Bohrung 32 für den Zugriff auf eine Ausnehmung 33 in dem Schraubenkopf 20 zum Ineingriffbringen mit einem Eindrehwerkzeug auf.

[0014] Die Ausbildung des Verschlußelements 8 und der Innenschraube 15 ist wie bei der ersten Ausführungsform.

Im Betrieb wird das Schraubenelement nach Einsetzen in das Aufnahmeteil 21 in den Knochen eingeschraubt. Dann werden nacheinander das Druckelement 30 und der Stab 100 eingesetzt. In diesem Stadium ist der Schraubenkopf 20 noch verschwenkbar. Durch Einschrauben des Verschlußelements 8 und der Innenschraube 15 in derselben Weise wie bei der ersten Ausführungsform werden das Schraubenelement und das Aufnahmeteil 21 zueinander und damit auch der Stab 100 fixiert.

[0015] Die in Fig. 4 dargestellte dritte Ausführungsform zeigt ebenfalls eine Polyaxial-Knochenschraube. Der zweiten Ausführungsform entsprechende Teile sind mit denselben Bezugszeichen versehen. Die dritte Ausführungsform unterscheidet sich von der zweiten Ausführungsform im wesentlichen durch die Ausbildung des Druckelements 40.

[0016] Das Druckelement 40 dieser Ausführungsform ist im wesentlichen zylindrisch ausgebildet mit einem Außendurchmesser, der so gewählt ist, dass das Druckelement 40 in der zweiten Bohrung 23 des Aufnahmeteils 21' gleiten kann. An seinem einen Ende ist eine sich zu dem Ende hin erweiternde kugelsegmentförmige Ausnehmung 41 vorgesehen, deren Kugelradius so gewählt ist, dass er in einem in das Aufnahmeteil eingesetzten Zustand den Kopf 20 des Schraubenelements teilweise umfasst. Ein wesentlicher Unterschied zu dem Druckelement 30 der zweiten Ausführungsform besteht darin , daß das Druckelement40 der dritten Ausführungsform in Richtung des freien Endes 28 der Schenkel verlängert ist. Dazu weist es an seinem der kugelsegmentförmigen Ausnehmung 41 gegenüberliegenden Ende eine U-förmige Ausnehmung 42 auf, wobei die Abmessungen der U-förmigen Ausnehmungen des Druckelements so bemessen sind, dass in den dadurch gebildeten Kanal der Stab 100 eingelegt werden kann. Die in Richtung der Zylinderachse des Aufnahmeteils 21' gesehene Tiefe der U-förmigen Ausnehmung 42 ist größer als der Durchmesser des aufzunehmenden Stabs 100, so dass das Druckelement 40 mit seitlichen Schenkeln 43 über den eingelegten Stab 100 nach oben hervorsteht. Das Druk-

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kelement 40 weist ferner eine zentrale Bohrung 44 auf, die sich durch dieses hindurch erstreckt. Der Durchmesser der zentralen Bohrung 44 ist gerade so groß bemessen, dass ein Schraubwerkzeug zum Ineingriffbringen mit der in dem Kopf 20 vorgesehenen Ausnehmung 33 hindurchführbar ist.

[0017] Die Ausbildung des Verschlußelements 8 und der Innenschraube 15 ist wie bei der ersten und zweiten Ausführungsform.

[0018] Im Betrieb unterscheidet sich die in Fig. 4 gezeigte dritte Ausführungsform von der in Fig. 3 gezeigten zweiten Ausführungsform darin, daß über das Verschlußelement 8 zuerst der Kopf 20 in seiner Stellung blockiert wird, in dem das Verschlußelement 8 auf die verlängerten Schenkel 43 des Druckelements 40 drückt und damit auf den Kopf 20. Durch Festziehen der Innenschraube 15 wird dann der Stab 100 unabhängig von dem Kopf 20 fixiert. Die Verschließwirkung durch das Zusammenwirken von Verschlußelement 8 und Innenschraube 15 ist im übrigen wie bei der ersten und zweiten Ausführungsform.

[0019] Die in den Figuren 5 bis 7 gezeigten Ausführungsformen unterscheiden sich von der in Fig. 4 gezeigten dritten Ausführungsform durch die Art des Innengewindes 7 der Schenkel 26, 27 des Aufnahmeteils 21' und das entsprechende Außengewinde 9 des Verschlußelements 8. Das Innengewinde 10 des Verschlußelements 8 und das Außengewinde 16 der Innenschraube sind bei diesen Ausführungsformen jeweils als metrische Gewinde ausgebildet.

[0020] In der in Fig. 5 gezeigten Ausführungsform ist das Innengewinde 29 der Schenkel 26, 27 so ausgebildet, daß die dem freien Ende abgewandte Flanke 29a mit einer zur Mittenachse M des Aufnahmeteils senkrecht verlaufenden Ebene einen negativen Winkel α einschließt. Entsprechend schließt die in eingeschraubtem Zustand dem freien Ende abgewandte Flanke 9b des Außengewindes 9 des Verschlußelements 8 mit einer zur Schraubenachse S horizontal verlaufenden Ebene einen negativen Winkel ein. Die Maße von Innengewinde der Schenkel und Außengewinde des Verschlußelements sind derart, daß in unbelastetem Zustand zwischen den genannten Flanken 29a und 19b ein Zwischenraum ist.

[0021] Im Betrieb erfahren die Schenkel 26, 27 durch den negativen Flankenwinkel beim Festziehen des Verschlußelements 8 wobei, daß die Flanken 29a und 10b aufeinandergelangen eine radial nach innen gerichtete Kraftkomponente, so daß die Schenkel etwas zusammengezogen werden. Damit erfolgt eine zuverlässige Blockierung des Kopfes 20 über das Druckelement 40. Beim Einschrauben der Innenschraube spreizt sich das Verschlußelement 8 aufgrund der dann radial nach außen wirkenden Kraftkomponente und wirkt somit der Kraft, die die Schenkel zusammenzieht entgegen. Der Stab wird fixiert und gleichzeitig erfolgt ein gegeneinander Blockieren von Verschlußelelement 8 und Schenkel.

[0022] Die in Fig. 6 gezeigte Ausführungsform unterscheidet sich von der in Fig. 5 gezeigten Ausführungsform durch die Ausbildung der Gewinde 29, 9 als Sägengewinde mit einer horizontal zur Mittenachse M bzw. Schraubenachse S verlaufenden Lastflanke 29a bzw. 19b. Auch damit ist die erfindungsgemäße Funktion des Verschlußelements gegeben.

[0023] Die in Fig. 7 gezeigte Ausführungsform unterscheidet sich von der in Fig. 5 bzw. 6 gezeigten Ausführungsform dadurch, daß das Innengewinde 29 der Schenkel und das Außengewinde 9 des Verschlußelements als Flachgewinde ausgebildet sind. Dieses weist zwei horizontal zur Mittenachse M bzw. Schraubenachse S verlaufende Flanken 29a, 29b bzw. 9a, 9b auf. Der Gewindequerschnitt ist im wesentlichen rechteckig ausgebildet. Auch damit ist die erfindungsgemäße Funktion des Verschlußelements gegeben.

[0024] Auch bei den in Fig. 6 und 7 gezeigten Gewindeformen ist ein Flankenspiel derart vorgesehen, daß das Verblocken des Verschlußelements nach Einschrauben der Innenschraube möglich ist.

[0025] In der in Fig. 8 gezeigten Ausführungsform ist das Verschlußelement 80 mit einem ringförmigen Ansatz 81 an seinem stirnseitigen, die Einschnitte 13 aufweisenden Ende versehen. Der Schlitz 14 erstreckt sich in diesem Fall wie bei dem Verschlußelement 8 wenigstens durch den axialen Abschnitt, in dem das Außengewinde 9 vorgesehen ist, jedoch nicht durch den Ansatz 81. Der Schlitz 14 ist ferner in Umfangsrichtung so angeordnet, daß er sich in einen der Einschnitte 13 erstreckt.

[0026] Im Betrieb bildet der Ansatz 81 beim Einschrauben des Verschlußelements einen Anschlag, der die Kraft auf das Druckelement auf einen vorbestimmten Wert begrenzt.

[0027] Weitere Ausführungsformen der Erfindung ergeben sich durch das Vorsehen der Gewindearten gemäß den Ausführungsformen nach Fig. 5 bis 6 und/oder des Verschlußelements nach Fig. 8 bei einer Monoaxialschraube gemäß der ersten Ausführungsform nach Fig. 1 oder der Polyaxialschraube gemäß der zweiten Ausführungsform nach Fig. 3.

[0028] Anstelle der oben beschriebenen Ausführungen, bei denen der das Aufnahmeteil mit einer Knochenschraube verbunden ist, kann das Aufnahmeteil auch mit einem Haken verbunden sein, wie er in der Wirbelsäulenchirurgie zum Einhaken hinter Knochenvorsprüngen der Wirbelsäule verwendet wird.

[0029] In einer weiteren Abwandlung der polyaxialen Ausführungsformen ist anstelle des Gewindeschaftes 1 oder des Hakens eine Stange oder ein stabförmiges Element vorgesehen, das an beiden Enden einen kugelsegmentförmigen Kopf hat, der mit einem Aufnahmeteil der beschriebenen Art verbunden ist. Damit kann ein solches Element als Verbindungselement zwischen zwei Stäben 100 verwendet werden.

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Patentansprüche

1. Verschlußeinrichtung zum Sichern eines stabförmigen Elements in einem mit einem Schaft (1) verbundenen Halteelement (2; 21; 21') zum Einsatz in der Wirbelsäulen- oder Unfallchirurgie, mit einem Verschlußelement (8; 80) mit einer im wesentlichen hohlzylindrischen Form mit einer Rotationsachse, einem Außengewinde (9) und einem Innengewinde (10)
gekennzeichnet durch einen sich in axialer Richtung **durch** das Verschlußelement (8) erstreckenden Schlitz (14).

2. Verschlußeinrichtung nach Anspruch 1, **gekennzeichnet durch** eine in das Verschlußelement (8; 80) einschraubbare Innenschraube (15).

3. Verschlußeinrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, daß** das Innengewinde (10) als metrisches Gewinde ausgebildet ist.

4. Verschlußeeinrichtung nach einem der Ansprüche 1 bis 3,
dadurch gekennzeichnet, daß das Außengewinde (9) als metrisches Gewinde oder als Gewinde mit horizontalem oder negativem Winkel der Lastflanke oder als Flachgewinde mit zwei horizontalen Flanken ausgebildet ist.

5. Element mit einem Schaft (1) und einem damit verbundenen Halteelement (2; 21; 21') zum Verbinden mit einem Stab (100), wobei das Halteelement (2; 21; 21') eine einen U-förmigen Querschnitt aufweisende Ausnehmung zur Aufnahme des Stabes mit zwei an einem Ende (6; 28) freien Schenkeln (4, 5; 26, 27) und einem Innengewinde (7; 29) an den freien Schenkeln aufweist und mit einem Verschlußelement (8; 80) mit einem Außengewinde (9) in wenigstens einem Abschnitt seiner Außenwand, wobei das Außengewinde (9) mit dem Innengewinde (7; 29) der Schenkel zusammenwirkt und wobei das Verschlußelement eine zentrale Bohrung aufweist,
dadurch gekennzeichnet, daß das Verschlußelement (8, 80) einen sich im wesentlichen in axialer Richtung durch seine Außenwand erstreckenden Schlitz (14) aufweist.

6. Element nach Anspruch 5, **dadurch gekennzeichnet, daß** das Verschlußelement (8, 80) ein Innengewinde (10) aufweist und eine Innenschraube (15) zum Einschrauben in das Verschlußelement vorgesehen ist.

7. Element nach Anspruch 5 oder 6, **dadurch gekennzeichnet, daß** das Innengewinde (10) des Verschlußelements (8; 80) und das damit zusammenwirkende Außengewinde (16) der Innenschraube (15) als metrische Gewinde ausgebildet sind.

8. Element nach einem der Ansprüche 5 bis 7, **dadurch gekennzeichnet, daß** das Innengewinde (7) der Schenkel (4, 5; 26, 27) als metrisches Gewinde ausgebildet sind.

9. Element nach einem der Ansprüche 5 bis 7, **dadurch gekennzeichnet, daß** das Innengewinde (7) der Schenkel (4, 5; 26,a b) als Gewinde mit einem negativen Flankenwinkel der Lastflanke ausgebildet ist.

10. Element nach einem der Ansprüche 5 bis 7, **dadurch gekennzeichnet, daß** das Innengewinde (7) der Schenkel (4, 5; 26, 27) als Sägengewinde mit einem im wesentlichen horizontalen Winkel der Lastflanke (29a) ausgebildet ist.

11. Element nach einem der Ansprüche 5 bis 7, **dadurch gekennzeichnet, daß** das Innengewinde (7) der Schenkel (4, 5; 26, 27) als Flachgewinde zwei horizontale Flanken (29a, 29b) ausgebildet ist.

12. Element nach einem der Ansprüche 5 bis 11, **dadurch gekennzeichnet, daß** das Außengewinde (9) des Verschlußelements (8, 80) mit einem zu dem Innengewinde (7; 29) der Schenkel (4, 5; 26, 27) passenden Gewindetyp ausgebildet ist.

13. Element nach einem der Ansprüche 5 bis 12, **dadurch gekennzeichnet, daß** das Verschlußelement (80) einen Anschlag (81) aufweist.

14. Element nach einem der Ansprüche 5 bis 13, **dadurch gekennzeichnet, daß** der Schaft (1) und das Halteelement (2) monoaxial verbunden sind.

15. Element nach einem der Ansprüche 5 bis 13, **dadurch gekennzeichnet, daß** der Schaft (1) und das Halteelement (21; 21') polyaxial verbunden sind.

16. Element nach Anspruch 15, **dadurch gekennzeichnet, daß** ein in dem Halteelement (21') vorgesehenes Druckelement (40) vorgesehen ist, auf welches das Verschlußelement (8, 80) zum Fixieren der Winkelstellung des Schafts (1) einwirkt.

17. Element nach Anspruch 16, **dadurch gekennzeichnet daß** die Winkelstellung des Schafts über das Verschlußelement (8, 80) und der Stab über die Innenschraube (15) fixierbar sind.

Claims

1. Fastener assembly for securing a rod-shaped element in a retaining element (2; 21; 21') connected

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to a shaft (1), for use in spinal surgery or accident and emergency surgery, with a fastener element (8; 80) of substantially hollow cylindrical shape with a rotation axis, an outer thread (9) and an inner thread (10), **characterized by** a slit (14) extending in the axial direction through the fastener element (8).

2. Fastener assembly according to Claim 1, **characterized by** an inner screw (15) that can be screwed into the fastener element (8; 80).

3. Fastener assembly according to Claim 1 or 2, **characterized in that** the inner thread (10) is designed as a metric thread.

4. Fastener assembly according to one of Claims 1 to 3, **characterized in that** the outer thread (9) is designed as a metric thread or as a thread with a horizontal or negative angle of the load-bearing flank or as a flat thread with two horizontal flanks.

5. Element with a shaft (1), and with a retaining element (2; 21; 21') which is connected to the latter and which serves for connection to a rod (100), the retaining element (2; 21; 21') having a recess with a U-shaped cross section for receiving the rod and with two free legs (4, 5; 26, 27) at one end (6; 28) and an inner thread (7; 29) on the free legs, and with a fastener element (8; 80) which has an inner thread (9) in at least one portion of its outer wall, the outer thread (9) cooperating with the inner thread (7; 29) of the legs, and the fastener element having a central bore, **characterized in that** the fastener element (8, 80) has a slit (14) extending substantially in an axial direction through its outer wall.

6. Element according to Claim 5, **characterized in that** the fastener element (8, 80) has an inner thread (10), and an inner screw (15) for screwing into the fastener element is provided.

7. Element according to Claim 5 or 6, **characterized in that** the inner thread (10) of the fastener element (8; 80) and the outer thread (16) of the inner screw (15) cooperating therewith are designed as metric threads.

8. Element according to one of Claims 5 to 7, **characterized in that** the inner thread (7) of the legs (4, 5; 26, 27) is designed as a metric thread.

9. Element according to one of Claims 5 to 7, **characterized in that** the inner thread (7) of the legs (4, 5; 26,a b) is designed as a thread with a negative flank angle of the load-bearing flank.

10. Element according to one of Claims 5 to 7, **characterized in that** the inner thread (7) of the legs (4, 5; 26, 27) is designed as a buttress thread with a substantially horizontal angle of the load-bearing flank (29a).

11. Element according to one of Claims 5 to 7, **characterized in that** the inner thread (7) of the legs (4, 5; 26, 27) is designed as a flat thread with two horizontal flanks (29a, 29b).

12. Element according to one of Claims 5 to 11, **characterized in that** the outer thread (9) of the fastener element (8, 80) is designed with a thread type corresponding to the inner thread (7; 29) of the legs (4, 5; 26, 27).

13. Element according to one of Claims 5 to 12, **characterized in that** the fastener element (80) has a limit stop (81).

14. Element according to one of Claims 5 to 13, **characterized in that** the shaft (1) and the retaining element (2) are connected monoaxially.

15. Element according to one of Claims 5 to 13, **characterized in that** the shaft (1) and the retaining element (21; 21') are connected multiaxially.

16. Element according to Claim 15, **characterized in that** a pressure element (40) provided in the retaining element (21') is provided, on which the fastener element (8, 80) acts in order to fix the angle position of the shaft (1).

17. Element according to Claim 16, **characterized in that** the angle position of the shaft can be fixed via the fastener element (8, 80), and the rod via the inner screw (15).

Revendications

1. Dispositif de fixation pour sécuriser un élément en forme de barre dans un élément de retenue (2 ; 21 ; 21') relié à une tige (1), pour utilisation dans la chirurgie de la colonne vertébrale ou des accidents, avec un élément de fixation (8 ; 80) ayant une forme sensiblement cylindrique creuse, avec un axe de rotation, un filetage extérieur (9) et un filetage intérieur (10),
caractérisé par une fente (14) s'étendant en direction axiale à travers l'élément de fixation.

2. Dispositif de fixation selon la revendication 1, **caractérisé par** une vis intérieure (15) susceptible d'être vissée dans l'élément de fixation (8 ; 80).

3. Dispositif de fixation selon la revendication 1 ou 2, **caractérisé en ce que** le filetage intérieur (10) est

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réalisé sous la forme de filetage métrique.

4. Dispositif de fixation selon l'une des revendications 1 à 3, **caractérisé en ce que** le filetage extérieur (9) est réalisé sous la forme de filetage métrique ou de filetage à angle horizontal ou négatif du flanc de charge, ou sous forme de filetage plat avec deux flancs horizontaux.

5. Elément avec une tige (1) et un élément de retenue (2 ; 21 ; 21') lui étant relié, pour assurer la liaison à une barre (100), l'élément de retenue (2 ; 21 ; 21') présentant un évidement à section transversale en forme de U pour recevoir la barre, avec deux branches (4, 5 ; 26, 27) libres, à une extrémité (6 ; 28), et un filetage intérieur (7 ; 29) sur les branches libres; et avec un élément de fixation (8 ; 80) ayant un filetage extérieur (9) en au moins un tronçon de sa paroi extérieure, le filetage extérieur (9) coopérant avec le filetage intérieur (7 ; 29) des branches, et l'élément de fixation présentant un perçage central, **caractérisé en ce que** l'élément de fixation (8, 80) présente une fente (14) s'étendant sensiblement en direction axiale à travers sa paroi extérieure.

6. Élément selon la revendication 5, **caractérisé en ce que** l'élément de fixation (8 ; 80) présente un filetage intérieur (10) et une vis intérieure (15), pour vissage dans l'élément de fixation.

7. Élément selon la revendication 5 ou 6, **caractérisé en ce que** le filetage intérieur (10) de l'élément de fixation (8 ; 80) et le filetage extérieur (16), coopérant avec lui, de la vis intérieure (15) sont réalisés sous forme de filetage métrique.

8. Élément selon l'une des revendications 5 à 7, **caractérisé en ce que** le filetage intérieur (7) des branches (4, 5 ; 26, 27) est réalisé sous la forme de filetage métrique.

9. Élément selon l'une des revendications 5 à 7, **caractérisé en ce que** le filetage intérieur (7) des branches (4, 5 ; 26, a b) est réalisé sous la forme de filetage, avec un angle de flanc négatif du flanc de charge.

10. Élément selon l'une des revendications 5 à 7, **caractérisé en ce que** le filetage intérieur (7) des branches (4, 5 ; 26, 27) est réalisé sous la forme de filetage en dents de scie, avec un angle sensiblement horizontal du flanc de charge (29a).

11. Élément selon l'une des revendications 5 à 7, **caractérisé en ce que** le filetage intérieur (7) des branches (4, 5 ; 26, 27) est réalisé sous forme de filetage plat à deux flancs horizontaux (29a, 29b).

12. Élément selon l'une des revendications 5 à 11, **caractérisé en ce que** le filetage extérieur (9) de l'élément de fixation (8. 80) est réalisé avec un type de filetage s'ajustant au filetage intérieur (7 ; 29) des branches (4, 5 ; 26, 27).

13. Élément selon l'une des revendications 5 à 12, **caractérisé en ce que** l'élément de fixation (80) présente une butée (81).

14. Élément selon l'une des revendications 5 à 13, **caractérisé en ce que** la tige (1) et l'élément de retenue (2) sont reliés de façon monoaxiale.

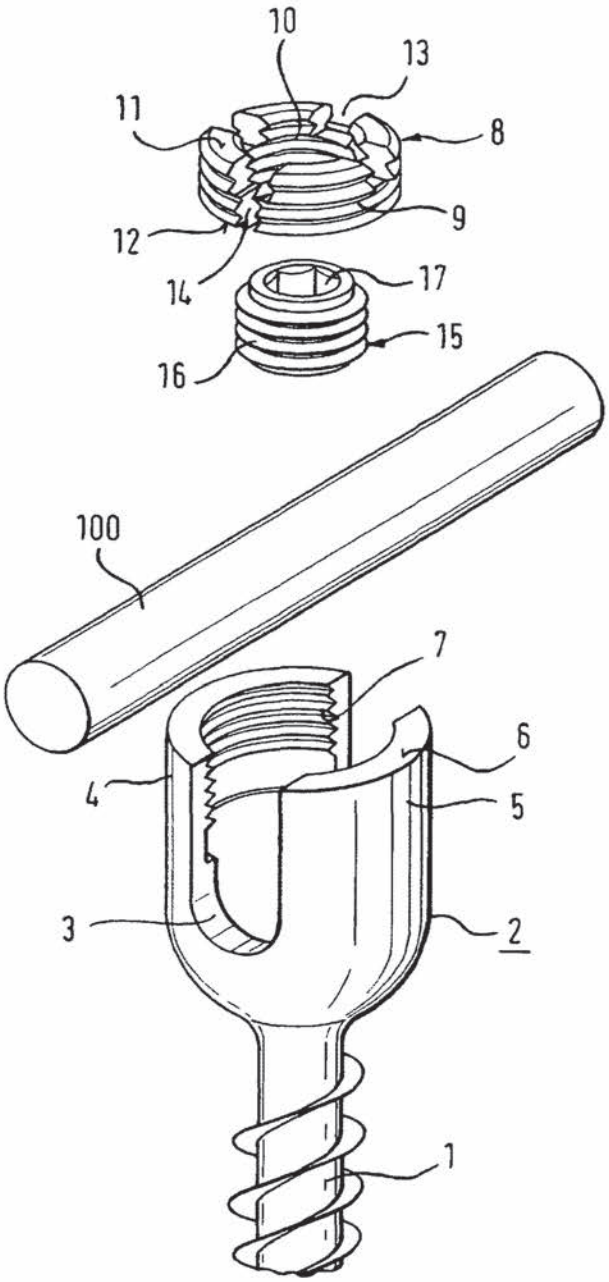
15. Élément selon l'une des revendications 5 à 13, **caractérisé en ce que** la tige (1) et l'élément de retenue (21 ; 21') sont reliés de façon polyaxiale.

16. Élément selon la revendication 15, **caractérisé en ce qu'**un élément de pressage (40) prévu dans l'élément de retenue (21') est prévu sur lequel l'élément de fixation (8, 80) agit pour la fixation de la position angulaire de la tige (1).

17. Élément selon la revendication 16, **caractérisé en ce que** la position angulaire de la tige est susceptible d'être fixée par l'intermédiaire de l'élément de fixation (8, 80). et la barre est susceptible d'être fixée par l'intermédiaire de la vis intérieure (15).

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FIG. 1



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FIG. 2a

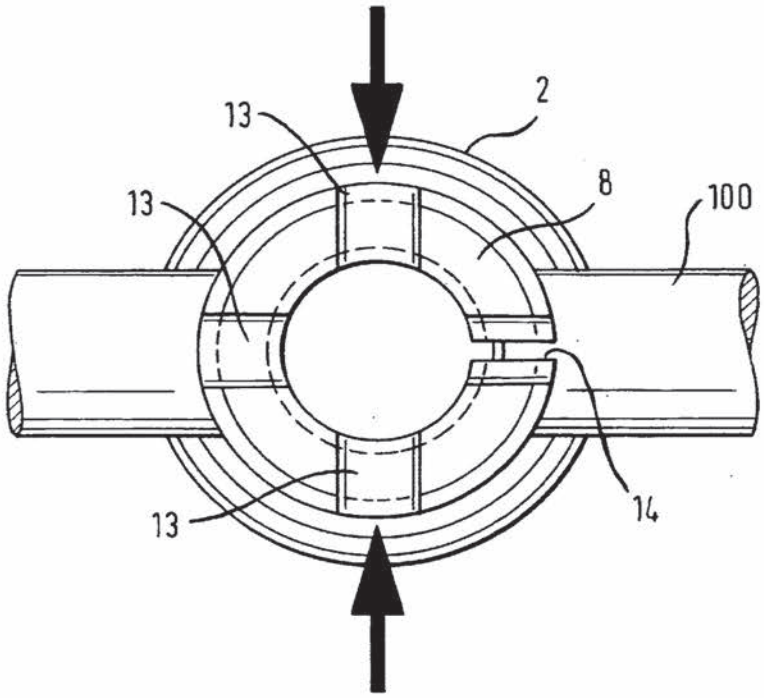
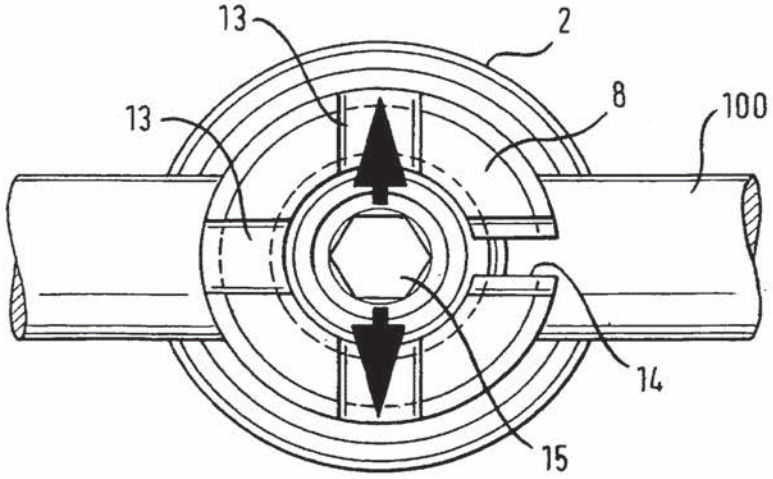


FIG. 2b



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FIG. 3

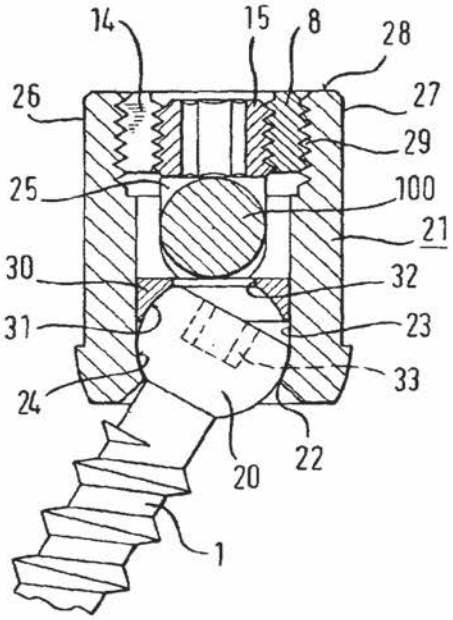
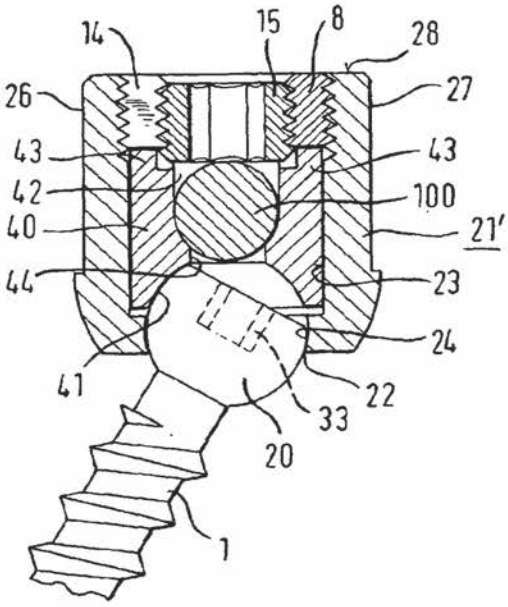


FIG. 4



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FIG. 5

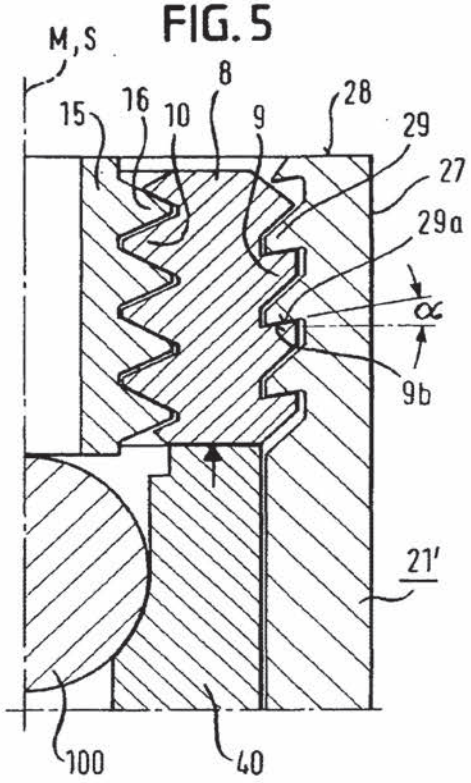


FIG. 6

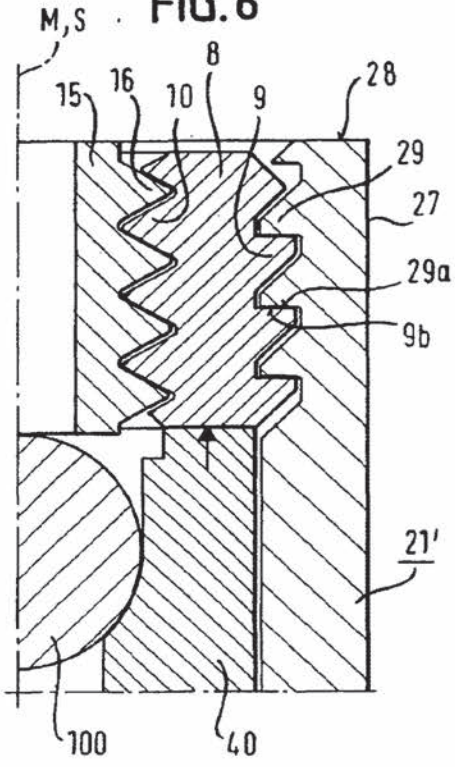
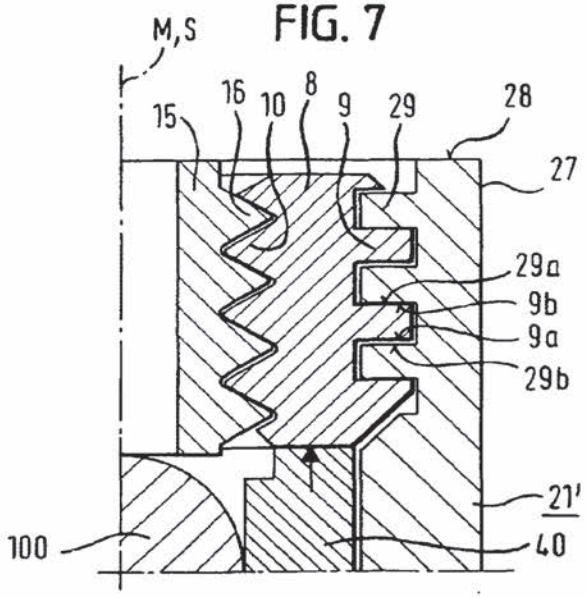
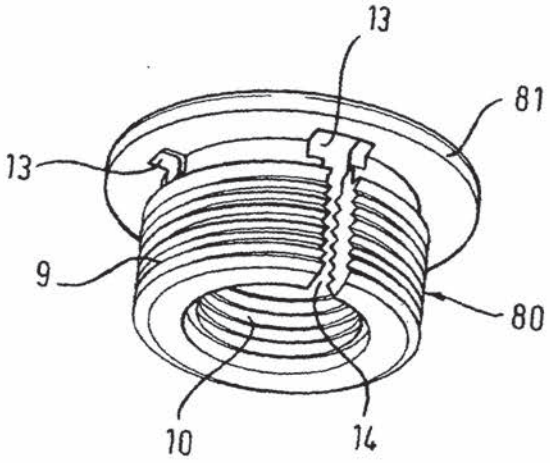


FIG. 7



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FIG. 8



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IN DER BESCHREIBUNG AUFGEFÜHRTE DOKUMENTE

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In der Beschreibung aufgeführte Patentdokumente

- WO 9501132 A **[0002] [0002]**
- US 6224598 B1 **[0002]**

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Espacenet

EP1570796A1 Bone fixing element and stabilising device comprising one such bone fixing element
Applicants: BIEDERMANN MOTECH GMBH [DE]
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IPC ***A61B17/70;*** *A61B17/86;* (IPC1-7): A61B17/70;

CPC **A61B17/7032 (EP);A61B17/7035 (EP);A61B17/7037 (EP);A61B17/7059 (EP);**A61B17/8605 (EP);

Application number: EP05004677A
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Priority date: 2004-03-03
Published as: **DE102004010382A1; DE102004010382B4;** EP1570796A1;**EP1570796B1; ES2286728T3; US2005216003A1; US7591839B2**
Abstract: Bone fixing element and stabilising device comprising one such bone fixing element
The device comprises a first element with a threaded shaft (1, 2, 3) and a first semispherical head segment (4) accommodated inside a second head segment (10) and held in place by an elastic element (20). The second head segment (10) is inserted into a spherical space underneath a pressure element (50) inside a cylindrical case (40). The unit is secured to a transversal rod (100) with a first wider screw (60) with an outer and an inner thread and a smaller screw (70) inserted into the threaded bore at the wider screw (60).

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(54) **Knochenverankerungselement und Stabilisierungseinrichtung mit einem solchen Knochenverankerungselement**

Bone fixing element and stabilising device comprising one such bone fixing element

Elément d'ancrage osseux et dispositif de stabilisation comprenant un tel élément d'ancrage osseux

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(56) Entgegenhaltungen:
EP-A- 1 273 269
US-A- 6 022 350
WO-A-98/34554

Anmerkung: Innerhalb von neun Monaten nach der Bekanntmachung des Hinweises auf die Erteilung des europäischen Patents kann jedermann beim Europäischen Patentamt gegen das erteilte europäische Patent Einspruch einlegen. Der Einspruch ist schriftlich einzureichen und zu begründen. Er gilt erst als eingelegt, wenn die Einspruchsgebühr entrichtet worden ist. (Art. 99(1) Europäisches Patentübereinkommen).

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Beschreibung

[0001] Die Erfindung betrifft ein Knochenverankerungselement zur Verankerung in einem Knochen oder einem Wirbel und eine Stabilisierungseinrichtung mit einem solchen Knochenverankerungselement.

[0002] Zur Fixierung von Knochenfrakturen oder zur Stabilisierung der Wirbelsäule sind Fixations- und Stabilisierungseinrichtungen bekannt, die aus wenigstens zwei im Knochen bzw. Wirbel verankerten und über eine Platte oder einen Stab verbundenen Knochenschrauben bestehen. Derartige starre Systeme erlauben keine Bewegung der relativ zueinander fixierten Knochenteile oder Wirbel.

[0003] Für bestimmte Indikationen ist jedoch eine dynamische Stabilisierung wünschenswert, bei der die zu stabilisierenden Knochenteile oder Wirbel eine kontrollierte begrenzte Bewegung zueinander ausführen können. Eine Realisierungsmöglichkeit für eine dynamische Stabilisierungseinrichtung besteht in der Verwendung eines beweglichen Elements anstelle eines die Knochenverankerungselemente verbindenden starren Stabes, wie es beispielsweise in der EP 0 669 109 B1 oder in der US 2003/0109880 A1 beschrieben ist.

[0004] Bei diesen bekannten Systemen kann häufiger das Problem auftreten, dass eine Übertragung der aus der Bewegung resultierenden Momente auf den im Knochen oder Wirbel verankerten Schaft der Verankerungselemente stattfindet, was aufgrund der dauernden zyklischen Teilbelastung des Knochenverankerungselements zur Lockerung des Schafts in dem umgebenden Knochenmaterial und damit zum Lösen der Verankerung führen kann.

[0005] Es besteht daher das Bedürfnis, die Bewegung der Knochen bzw. Wirbel von der Schaftverankerung weitgehend abzukoppeln, um der Forderung gerecht zu werden, dass das Implantat oft ein Leben lang sicher im Körper des Patienten verankert bleiben muss. Ferner soll aber bei einer Entkopplung der Bewegung der Knochen bzw. Wirbel von der Schaftverankerung trotzdem die Möglichkeit bestehen, das Verankerungselement relativ zu einem mehrere solcher Elemente verbindenden Stab oder zu einer solchen Platte optimal positionieren zu können, wie es z.B. von den herkömmlichen Polyaxialschrauben bekannt ist.

[0006] Die US 6,022,350 offenbart eine Knochenbefestigungsvorrichtung mit einem länglichen Verbindungsmittel, das eine durch eine Öffnung in dem Verbindungsmittel hindurch geführte Knochenbefestigungsschraube aufnimmt. In dem Boden des Verbindungsmittels ist eine Lagerungsfläche mit im Wesentlichen kreisförmigem Querschnitt vorgesehen und der Kopf der Schraube beinhaltet eine im Wesentlichen kugelförmige Oberfläche, die sich an der Lagerungsfläche abstützt. Bei einer Ausführungsform sind in der Öffnung in dem Verbindungsmittel ferner zwei O-Ringe aus z.B. Silikon vorgesehen.

[0007] Aus der US 5,474,555 ist ferner ein Knochenverankerungselement in Form einer Polyaxial-Knochenschraube mit einem Schraubenelement und einem Aufnahmeteil zur Verbindung mit einem Stab bekannt, bei der das im Knochen zu verankernde Schraubenelement mit dem Aufnahmeteil derart verbunden ist, daß Schwenkbewegungen zwischen dem Schraubenelement und dem Aufnahmeteil möglich sind. Die beschriebene Lösung erlaubt jedoch keine Stabilisierung der Knochenteile untereinander mit einer kontrollierten Teilbewegung.

[0008] Es ist Aufgabe der Erfindung ein Knochenverankerungselement und eine Stabilisierungseinrichtung für Knochen bzw. Wirbel mit einem solchen Knochenverankerungselement bereitzustellen, das bzw. die eine kontrollierte Teilbewegung der zu stabilisierenden Knochenteile oder Wirbel bei gleichzeitig hoher Sicherheit der Verankerung erlaubt und dabei optimal positionierbar ist.

[0009] Die Aufgabe wird gelöst durch ein Knochenverankerungselement zur Verankerung in einem Knochen oder in einem Wirbel nach Patentanspruch 1 und durch eine Stabilisierungseinrichtung mit einem solchen Knochenverankerungselement nach Patentanspruch 15.

[0010] Weiterbildungen der Erfindung sind in den Unteransprüchen angegeben.

[0011] Die Erfindung weist den Vorteil auf, daß das Knochenverankerungselement aufgrund seiner elastischen Verbindung von erstem und zweitem Kopfteil axiale Kräfte in Richtung seiner Schaftachse, Biegekräfte und Torsionskräfte aufnimmt. Damit wird eine durch die rücktreibende Kraft begrenzte Bewegung des Knochenteils oder Wirbels, in dem es verankert ist, erlaubt und die bei der Bewegung auf den Schaft wirkenden Momente werden reduziert, so dass ein Lösen der Verbindung durch dauernde zyklische Teilbelastung der Verankerung unterbleibt.

[0012] Die Erfindung weist weiterhin den Vorteil auf, dass eine gewünschte Ruhewinkelstellung zwischen dem Schaft und dem Aufnahmeteil wie bei einer herkömmlichen Polyaxialschraube justierbar ist.

[0013] Die elastischen Eigenschaften des Knochenverankerungselements können bei der Herstellung auf einfache Art durch Ändern der Dimensionen von erstem Kopfteil, zweitem Kopfteil und elastischem Druckelement und/oder des verwendeten Materials für das elastische Druckelement verwirklicht werden. Das Knochenverankerungselement ist mit den bekannten Verbindungselementen wie Platten und Stäben verwendbar. Somit kann eine dynamische Stabilisierungseinrichtung mit einer gewünschten Bewegungsbegrenzung durch Auswahl von Knochenverankerungselementen mit geeigneten elastischen Eigenschaften unter Verwendung von herkömmlichen Platten oder Stäben bereitgestellt werden.

[0014] Weitere Merkmale und Zweckmäßigkeiten der Erfindung ergeben sich aus der Beschreibung von Ausführungsbeispielen anhand der Figuren.

[0015] Von den Figuren zeigen:

Fig. 1 eine teilgeschnittene Darstellung eines

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Knochenverankerungselements nach einer ersten Ausführungsform;

Fig. 2 eine teilgeschnittene Explosionsdarstellung des Knochenverankerungselements der ersten Ausführungsform;

Fig. 3a bis 3c teilgeschnittene Darstellungen, die eine elastische Auslenkung des Knochenverankerungselements der ersten Ausführungsform aus der Ruhewinkelstellung schematisch darstellen.

Fig. 4 eine teilgeschnittene Darstellung eines Knochenverankerungselements nach einer zweiten Ausführungsform;

Fig. 5 eine teilgeschnittene Darstellung eines Knochenverankerungselements nach einer dritten Ausführungsform; und

Fig. 6 eine teilgeschnittene Darstellung eines Knochenverankerungselements nach einer vierten Ausführungsform.

Erste Ausführungsform

[0016] Ein Knochenverankerungselement nach der in den Fig. 1 und 2 gezeigten ersten Ausführungsform ist als Polyaxial-Knochenschraube zum Verbinden mit einem Stab 100 ausgebildet. Die Polyaxial-Knochenschraube weist ein im Knochen zu verankerndes Schraubenelement 1 mit einem Schaft 2 mit einem Knochengewinde 3 und mit einem mit dem Schaft 2 in diesem Ausführungsbeispiel einstückig verbundenen ersten Kopfteil 4 auf. Desweiteren weist die Polyaxial-Knochenschraube ein hülsenförmiges zweites Kopfteil 10 zur Aufnahme des ersten Kopfteils 4 und ein Aufnahmeteil 40 zur Aufnahme des zweiten Kopfteiles 10, eines auf dieses einwirkenden zweiten Druckelements 50 und des Stabes 100, sowie eine erste und eine zweite Sicherungsschraube 60, 70 auf.

[0017] Das erste Kopfteil 4 des Schraubenelements 1 weist angrenzend an den Schaft 2 einen kugelsegmentförmigen Abschnitt 5 mit einem Durchmesser auf, der größer ist als der Schaftdurchmesser. Auf der dem Schaft 3 abgewandten Seite ist ein verbreiterter Rand 6 bzw. Kragen vorgesehen, wodurch eine kreisförmige Fläche 7 gebildet ist, die im Wesentlichen glatt ist und in der sich koaxial zur Schaftachse eine Ausnehmung 8 zum Eingreifen mit einem Schraubwerkzeug befindet. In Fig.1 ist eine sechskantförmige Ausnehmung 8 für einen Inbusschlüssel dargestellt.

[0018] Es ist jedoch auch eine andere Ausnehmung, wie z.B. ein Kreuzschlitz, zum Eingreifen mit einem Einschraubwerkzeug möglich.

[0019] Das hülsenförmige zweite Kopfteil 10 ist kugelsegmentförmig mit einer sphärischen Außenfläche 11 und zwei gegenüberliegenden ebenen Enden 12, 13 ausgebildet. Von dem einen Ende 12 erstreckt sich eine koaxiale erste Bohrung 15 mit einem Durchmesser, der größer ist als der Außendurchmesser des verbreiterten Rands 6 des Schraubenelementes 1. Angrenzend an die erste Bohrung 15 erstreckt sich eine koaxiale zweite Bohrung 16 deren Durchmesser angrenzend an das zweite Ende 13 kleiner ist als der Kugeldurchmesser des ersten Kopfteils 4 aber größer als der Durchmesser des Schafts 2, so daß dieser hindurchgeführt werden kann. Die zweite Bohrung 16 erweitert sich ferner ausgehend vom zweiten Ende 13 bis zur ersten Bohrung 15 hin sphärisch mit einem Kugelradius, der so bemessen ist, daß das zweite Kopfteil 4 daran anliegt. Angrenzend an die erste Bohrung 15 ist der Durchmesser der zweiten Bohrung kleiner als der Kugelradius des Kopfteils 4.

[0020] Das Schraubenelement 1 ist derart in das zweite Kopfteil 10 eingesetzt, dass der Schaft 2 durch das Ende 13 angrenzend an die Bohrung 16 hindurchgeführt ist und der kugelsegmentförmige Abschnitt 5 des ersten Kopfteils 4 in der zweiten Bohrung 16 des zweiten Kopfteils 10 gehalten ist.

[0021] Auf der von dem verbreiterten Rand 6 des ersten Kopfteils 4 gebildeten Fläche 7 ist ein elastisches erstes Druckelement 20 angeordnet, das bevorzugt aus einem Elastomer ausgebildet ist. Das erste Druckelement 20 weist die Form einer Scheibe mit kreisförmigem Querschnitt und einer vorbestimmten Dicke auf und besitzt eine koaxiale Bohrung 21, die ein Hindurchgreifen mit dem Schraubwerkzeug in die Ausnehmung 8 der von dem verbreiterten Rand 6 gebildeten Fläche 7 ermöglicht. Der Außendurchmesser des ersten Druckelements 20 ist so gewählt, dass es in die erste Bohrung 15 des zweiten Kopfteils 10 einführbar ist. Vorzugsweise ist zwischen Druckelement 20 und der Seitenwand der Bohrung ein Freiraum 22 vorgesehen, so dass das Druckelement bei elastischer Deformation ausweichen kann.

[0022] Auf der dem Rand 6 des ersten Kopfteils 4 abgewandten Seite des ersten Druckelements 20 ist eine starre Befestigungskappe 30 angeordnet. Die Befestigungskappe 30 weist die Form einer kreisförmigen Scheibe mit einer koaxialen Bohrung 31 auf, die ein Hindurchgreifen mit dem oben genannten Schraubwerkzeug ermöglicht.

[0023] Der Außendurchmesser der Befestigungskappe 30 entspricht in einem dem ersten Druckelement 20 zugewandten Abschnitt 32 dem Innendurchmesser der ersten Bohrung 15 in dem zweiten Kopfteil 10 bzw. ist um soviel kleiner, dass ein Einsetzen und Fixieren z.B. mit Presspassung in dem zweiten Kopfteil 10 ermöglicht ist.

[0024] In einem in eingesetztem Zustand dem ersten Druckelement 20 abgewandten Abschnitt 33 weist die Befestigungskappe 30 einen verbreiterten Außendurchmesser auf, der beim Einsetzen in das zweite Kopfteil 10 durch Zusammenwirken mit dem ersten Ende 12 des zweiten Kopfteils 10 einen Anschlag bildet. Die Außenfläche des Abschnitts 33 ist derart sphärisch ausgebildet,

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dass sie im eingesetzten Zustand der Befestigungskappe 30 eine Fortführung der sphärischen Außenfläche 11 des zweiten Kopfteils 10 bildet.

[0025] Die Dicke des ersten Druckelements 20 ist so gewählt, dass es, wenn die Befestigungskappe 30 in das zweite Kopfteil eingesetzt ist, unter Vorspannung gesetzt ist und Druck auf die von dem verbreiterten Rand 6 des ersten Kopfteils 4 gebildete Fläche 7 ausübt, so dass das erste Kopfteil 4 gegen die zweite Bohrung 16 des zweiten Kopfteils 10 gedrückt wird und das Schraubenelement 1 elastisch in dem zweiten Kopfteil 10 gehalten ist. Vorteilhafterweise ist die Lagerung des ersten Kopfteils 4 in der zweiten Bohrung 16 durch Einbringen einer speziellen Gleitbeschichtung, einer Gleitfolie oder eines Gleitringes im Hinblick auf minimale zwischen dem kugelsegmentförmigen Abschnitt 5 und der zweiten Bohrung 16 wirkende Reibungskräfte optimiert.

[0026] Das Aufnahmeteil 40 ist im Wesentlichen zylindrisch ausgebildet. Ausgehend von seinem ersten Ende 41 ist in dem Aufnahmeteil 40 eine koaxiale erste Bohrung 48 vorgesehen, deren Durchmesser größer ist, als der Außendurchmesser des zweiten Kopfteils 10. Angrenzend an das andere Ende 49 des Aufnahmeteils 40 ist eine koaxiale zweite Bohrung 47 vorgesehen, deren Durchmesser sich vom Durchmesser der ersten Bohrung 48 gegen das zweite Ende 49 hin sphärisch verjüngt. Dadurch ist das zweite Kopfteil 10 in dem Aufnahmeteil 40 gehalten und um einen vorbestimmten Winkelbereich schwenkbar.

[0027] Ausgehend von seinem einen ersten Ende 41 ist ferner eine Ausnehmung 42 mit einem U-förmigen Querschnitt vorgesehen, die gerade so groß bemessen ist, dass der Stab 100 einlegbar ist. Durch die U-förmige Ausnehmung 42 sind zwei freie Schenkel 44, 45 gebildet, die angrenzend an ihr freies Ende ein Innengewinde 46 aufweisen, welches mit einem entsprechenden Außengewinde 61 der zwischen die Schenkel 44, 45 einzuschraubenden ersten Sicherungsschraube 60 zusammenwirkt.

[0028] Auf der der zweiten Bohrung 47 abgewandten Seite befindet sich in dem Aufnahmeteil 40 ein auf das zweite Kopfteil 10 einwirkendes zweites Druckelement 50. Das zweite Druckelement 50 ist im Wesentlichen zylindersymmetrisch mit einem Außendurchmesser, der kleiner ist, als der Innendurchmesser der ersten Bohrung 48, dass das Druckelement in die erste Bohrung 48 einsetzbar ist. Die dem zweiten Kopfteil 10 zugewandte Stirnseite 51 des zweiten Druckelements 50 ist konkav sphärisch ausgebildet, wobei der Radius dem Radius der sphärischen Außenfläche 11 des zweiten Kopfteils 10 und der daran befestigten Befestigungskappe 30 entspricht. Auf der dem zweiten Kopfteil 10 abgewandten Seite weist das zweite Druckelement 50 eine Ausnehmung 52 mit U-förmigem Querschnitt auf, deren Grund 53 einen Radius aufweist, der etwas größer als der Radius des Stabes 100 ist und in die der Stab 100 eingreift.

[0029] Das zweite Druckelement 50 weist ferner eine koaxiale Bohrung zum Hindurchgreifen mit einem Schraubwerkzeug auf.

[0030] In Richtung der Zylinderachse des Aufnahmeteils 40 ist die Höhe des zweiten Druckelements 50 gerade so gewählt, dass durch Anziehen der ersten Sicherungsschraube 60 derart Druck auf das zweite Druckelement 50 ausgeübt werden kann, dass das zweite Kopfteil 10 in dem Aufnahmeteil 40 in einer zu dem Zeitpunkt des Anziehens der Sicherungsschraube 60 eingestellten Winkelstellung vorfixierbar ist, die nachfolgend als Ruhewinkelstellung bezeichnet ist.

[0031] Mit dieser Anordnung wird erreicht, dass das zweite Kopfteil 10 relativ zu dem Aufnahmeteil 40 ausgerichtet und anschlie-ßend in dieser Ausrichtung vorfixiert werden kann.

[0032] Die erste Sicherungsschraube 60 weist eine Bohrung 62 auf, die mit einem Innengewinde 63 versehen ist, das mit einem Außengewinde 71 der zweiten Sicherungsschraube 70 zusammenwirkt. Desweiteren weist die Sicherungsschraube 60 auf ihrer dem Druckelement 50 abgewandten Seite nicht dargestellte Ausnehmungen zum Eingreifen mit einem Schraubwerkzeug auf.

[0033] Die zweite Sicherungsschraube 70 weist an ihrer Oberseite eine Ausnehmung 72 zum Eingreifen mit einem Schraubwerkzeug auf. In Fig.1 ist eine sechskantförmige Ausnehmung 72 für einen Inbusschlüssel dargestellt. Es ist jedoch auch eine andere Ausnehmung, wie z.B. ein Kreuzschlitz, zum Eingreifen mit einem Einschraubwerkzeug möglich.

[0034] Durch Anziehen der zweiten Sicherungsschraube 70 wird der Stab 100 gegen den Grund 53 der Ausnehmung 52 gedrückt und damit Druck auf das zweite Druckelement 50 und damit auf das zweite Kopfteil 10 ausgeübt, um ein optimales Fixieren der Ruhewinkelstellung zu erzielen. Der Stab 100 wird dabei durch die zweite Sicherungsschraube 70 und den Grund 53 in der U-förmigen Ausnehmung 42 des Aufnahmeteils fixiert.

[0035] Im Betrieb wird das Schraubenelement 1 zuerst mit dem Schaft 2 durch die Bohrungen 15, 16 in dem zweiten Kopfteil 10 hindurchgeführt, sodass das erste Kopfteil 4 in der zweiten Bohrung 16 gehalten wird. Anschließend wird das erste Druckelement 20 in das zweite Kopfteil 10 eingeführt und durch Einsetzen der Befestigungskappe 30 in das zweite Kopfteil 10 gegen die Fläche 7 des ersten Kopfteils 4 gedrückt und in diesem vorgespannten Zustand über die eingesetzte Befestigungskappe 30 gehalten. Dann wird das aus Schraube 1 und zweitem Kopfteil 10 gebildete Element in das Aufnahmeteil 40 eingebracht und anschließend das zweite Druckelement 50 in das Aufnahmeteil 40 eingesetzt. Dann wird das Schraubenelement 1 durch Hindurchgreifen durch die koaxialen Bohrungen des zweiten Druckelements 50, der Befestigungskappe 30 und des ersten Druckelements 20 und Eingreifen in die Ausnehmung 8 des Schraubenelements mit einem Schraubendreher in den Knochen oder Wirbel eingeschraubt. Anschließend wird der Stab eingelegt, wobei die Stellung des Aufnahmeteils 40 relativ zu dem zweiten Kopfteil 10 justiert wird.

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Diese Stellung, die die gewünschte Ruhewinkelstellung ist, wird durch die erste Sicherungsschraube 60, die auf das zweite Druckelement 50 drückt, vorfixiert.

[0036] Bei dem Vorfixieren der Ruhewinkelstellung wird die Befestigungskappe 30 durch Zusammenwirken ihrer sphärischen Außenfläche mit der sphärischen Ausnehmung der Stirnseite 51 des zweiten Druckelements 50 gegen das erste Druckelement 20 gedrückt und somit gegen Lösen gesichert.

[0037] Der Stab 100 wird anschließend durch Einschrauben der zweiten Sicherungsschraube 70 gegen den Grund 53 gedrückt und dadurch fixiert. Gleichzeitig wird durch das Anziehen der zweiten Sicherungsschraube 70 über den Stab 100 auf das zweite Druckelement 50 und damit auf das zweite Kopfteil 10 Druck ausgeübt, sodass damit eine zusätzliche Fixierung der Ruhewinkelstellung erzielt wird.

[0038] Das Vorsehen der beiden Sicherungsschrauben 60, 70 führt dazu, dass das zweite Kopfteil 10 und der Stab 100 unabhängig voneinander fixierbar sind.

[0039] In den Fig. 3a bis 3c ist schematisch die Auslenkbarkeit des Schraubenelementes 1 relativ zu dem zweiten Kopfteil 10 dargestellt. In Fig. 3a ist eine voreingestellte Ruhewinkelstellung gezeigt, die Fig. 3b und 3c zeigen jeweils eine Auslenkung aus dieser Ruhewinkelstellung in unterschiedliche Richtungen, wobei der Pfeil die Auslenkungsrichtung bezeichnet.

[0040] Wie in Fig. 3a gezeigt ist, weist das erste Druckelement 20 in der Ruhewinkelstellung eine gleichmäßige Dicke auf. In Fig. 3b ist schematisch dargestellt, dass ein Auslenken des Schraubenelements dazu führt, dass eine Seite 22 des Druckelements komprimiert wird, wohingegen die gegenüberliegende Seite 23 entspannt wird. Das Verformen des elastischen ersten Druckelementes 20 führt zum Aufbau internen Spannungen in diesem, die eine der Auslenkung entgegenwirkende rücktreibende Kraft ausüben, sodass das Schraubenelement 1 in die Ruhewinkelstellung zurückgedrängt wird.

[0041] Die Größe der rücktreibenden Kraft kann dabei zum Einen durch die Dicke des ersten Druckelements 20 beeinflusst werden, die die Vorspannung des ersten Druckelements 20 im eingebauten Zustand bestimmt. Desweiteren kann die Größe der rücktreibenden Kraft auch durch die Materialwahl für das erste Druckelement 20, wobei unterschiedlichste Elastizitäten und Kompressibilitäten möglich sind, und durch die genaue Formgebung des ersten Druckelements 20 eingestellt werden, so dass eine gewünschte Steifigkeit des Knochenverankerungselements gegenüber axialen Kräften, Biegekräften und Torsionskräften erzielt werden kann.

[0042] Bei der Auslenkung aus der Ruhewinkelstellung begrenzt das Verhältnis des Durchmessers des Rands 6 des Schraubenelementes 1 zu dem Durchmesser der ersten Bohrung 15 in dem zweiten Kopfteil 10 die Auslenkbarkeit. Durch unterschiedliche Größenverhältnisse zwischen dem Durchmesser des Randes 6 und dem Innendurchmesser der Bohrung 15 kann somit die Auslenkbarkeit variiert werden. Z.B. können durch Wahl von Schrauben 1 mit unterschiedlich breiten Rändern 6, die in ein zweites Kopfteil mit vorgegebenen Innendurchmesser der Bohrung 15 einsetzbar sind, somit Verankerungselemente mit unterschiedlicher Auslenkbarkeit bereitgestellt werden.

[0043] Ein besonderer Vorteil dieser Ausbildung eines Knochenverankerungselements ist die Entkopplung der elastischen Auslenkung des Schraubenelements 1 von der Einstellmöglichkeit der Ruhewinkelstellung, was durch die Kombination von erstem Kopfteil 4, zweitem Kopfteil 10 und Aufnahmeteil 40 erreicht wird.

[0044] Eine erfindungsgemäße Stabilisierungseinrichtung umfasst wenigstens ein Knochenverankerungselement wie oben beschrieben in Kombination mit einem Stab und ein zweites Knochenverankerungselement, das bevorzugt ebenfalls wie oben beschrieben ausgebildet ist.

[0045] Bei einer Bewegung des Knochens bzw. Wirbels aus der zu stabilisierenden Ruhelage heraus wird über das elastische erste Druckelement 20 eine rücktreibende Kraft auf den Knochen bzw. Wirbel ausgeübt, die ihn wieder in die Ruhelage bringt und somit die Bewegung limitiert. Dadurch wird ein über die Bewegung des Knochens oder des Wirbels auf den Schraubenschaft wirkendes Biegemoment abgefangen und es kommt nicht zu einer Lockerung der Knochenverankerung.

Zweite Ausführungsform

[0046] Bei einem Knochenverankerungselement der zweiten Ausführungsform, die in Fig. 4 dargestellt ist, ist das Knochenverankerungselement derart ausgebildet, dass nicht das Befestigen eines Stabes, sondern einer Platte vorgesehen ist. Bei dieser Ausführungsform entspricht der Aufbau von erstem Schraubenelement 1, erstem Druckelement 20, Befestigungskappe 30 und zweitem Kopfteil 10 dem Aufbau der ersten Ausführungsform, weshalb für diese Komponenten dieselben Bezugszeichen verwendet werden und eine erneute Beschreibung unterbleibt.

[0047] Der wesentliche Unterschied der zweiten Ausführungsform gegenüber der ersten Ausführungsform besteht darin, dass das Aufnahmeteil durch die zu befestigende Platte 200 gebildet wird.

[0048] Die Platte 200 weist eine erste Bohrung 248 auf, die von einer ersten Seite der Platte in die Platte hineinreicht und deren Durchmesser größer ist, als der Außendurchmesser des zweiten Kopfteils 10. Die erste Bohrung 248 weist in dem der ersten Seite der Platte zugewandten Bereich desweiteren ein Innengewinde 246 auf. Angrenzend an die andere Seite 249 der Platte ist koaxial zur ersten Bohrung 248 und verbunden mit dieser eine zweite Bohrung 247 vorgesehen, deren Durchmesser sich vom Durchmesser der ersten Bohrung 248 gegen die zweite Seite 249 hin sphärisch verjüngt. Dadurch ist das zweite Kopfteil 10 in der Platte 200 gehalten und um einen vorbestimmten Winkelbereich schwenkbar, wie bei der ersten Ausführungsform.

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[0049] Auf der der zweiten Bohrung 247 abgewandten Seite befindet sich in der ersten Bohrung 248 ein auf das zweite Kopfteil 10 einwirkendes zweites Druckelement 250. Das zweite Druckelement 250 ist im Wesentlichen zylindersymmetrisch mit einem Außendurchmesser, der kleiner ist, als der Innendurchmesser der ersten Bohrung 248, sodass das Druckelement in die erste Bohrung 248 einsetzbar ist. Die dem zweiten Kopfteil 10 zugewandte Stirnseite 251 des zweiten Druckelements 250 ist konkav sphärisch ausgebildet, wobei der Radius dem Radius der sphärischen Außenfläche 11 des zweiten Kopfteils 10 und der daran befestigten Befestigungskappe 30 entspricht. Das zweite Druckelement 250 weist ferner eine koaxiale Bohrung zum Hindurchgreifen mit einem Schraubwerkzeug auf.

[0050] In Richtung der Bohrung in der Platte ist die Höhe des zweiten Druckelements 250 gerade so gewählt, dass durch Anziehen einer Sicherungsschraube 260, die in das Innengewinde 246 der Bohrung 248 einschraubbar ist, derart Druck auf das zweite Druckelement 250 ausgeübt werden kann, dass das zweite Kopfteil 10 in der Platte in einer zu dem Zeitpunkt des Anziehens der Sicherungsschraube 260 eingestellten Winkelstellung fixierbar ist, die nachfolgend als Ruhewinkelstellung bezeichnet ist, und die Platte dabei gleichzeitig mit dem Schraubenelement 1 verbunden wird.

[0051] Mit dieser Anordnung wird erreicht, dass das zweite Kopfteil 10 relativ zu der Platte 200 ausgerichtet und anschließend in dieser Ausrichtung vorfixiert werden kann.

[0052] Die Sicherungsschraube 260 weist eine koaxiale Bohrung 262 zum Eingreifen mit einem Schraubwerkzeug auf. In Fig. 4 ist eine sechskantförmige Bohrung 262 für einen Inbusschlüssel dargestellt. Es ist jedoch auch eine andere Formgebung zum Eingreifen mit einem Einschraubwerkzeug möglich.

[0053] Die koaxiale Bohrung 262 weist einen solchen Querschnitt auf, dass ein Hindurchgreifen mit dem Schraubwerkzeug, für das die Ausnehmung 8 des ersten Kopfteils vorgesehen ist, ermöglicht ist.

[0054] Diese Ausführungsform weist den besonderen Vorteil auf, dass der gesamte Aufbau vormontiert werden kann. Im Betrieb ist zuerst nur die Sicherungsschraube 260 nicht angezogen. Das Schraubenelement kann in dem vormontierten Zustand in den Knochen oder Wirbel eingeschraubt werden, indem mit dem Schraubwerkzeug durch die konzentrischen Bohrungen in dem ersten Druckelement 20, der Befestigungskappe 30, des zweiten Druckelements 250 und der Sicherungsschraube 260 in die Ausnehmung 8 des Schraubenelements 1 eingegriffen wird. Anschließend kann die Winkelstellung der Platte 200 zum Schaft 2 eingestellt werden und durch Anziehen der Sicherungsschraube 260 Druck auf das zweite Druckelement 250 und damit auf das zweite Kopfteil 10 ausgeübt werden, um ein Fixieren der Ruhewinkelstellung zu erzielen.

[0055] Dritte Ausführungsform

[0056] Bei einem Knochenverankerungselement der dritten Ausführungsform, das in Fig. 5 dargestellt ist, unterscheidet sich das Knochenverankerungselement nur dadurch von der zweiten Ausführungsform, dass das zweite Druckelement und die Sicherungsschraube einstückig in Form einer Sicherungsschraube 280 ausgebildet sind.

[0057] Bei dieser Ausführungsform entspricht der Aufbau von erstem Schraubenelement 1, erstem Druckelement 20, Befestigungskappe 30, zweitem Kopfteil 10 und Platte 200 dem Aufbau der zweiten Ausführungsform, weshalb für diese Komponenten dieselben Bezugszeichen verwendet werden und eine erneute Beschreibung unterbleibt.

[0058] Die Sicherungsschraube 280 weist einen ersten Abschnitt 281 auf, der mit einem Außengewinde 281 zum Einschrauben in das Innengewinde 246 der Bohrung 248 versehen ist. Angrenzend an den ersten Abschnitt 281 weist die Sicherungsschraube 280 auf der Seite, die der zweiten Bohrung 247 zugewandt ist, einen zweiten Abschnitt 282 auf. Der zweite Abschnitt 282 ist im Wesentlichen zylindersymmetrisch mit einem Außendurchmesser, der kleiner ist, als der Innendurchmesser der ersten Bohrung 248, sodass die Sicherungsschraube 280 in die erste Bohrung 248 einschraubbar ist.

[0059] Die dem zweiten Kopfteil 10 zugewandte Stirnseite 283 der Sicherungsschraube 280 ist konkav sphärisch ausgebildet, wobei der Radius dem Radius der sphärischen Außenfläche 11 des zweiten Kopfteils 10 und der daran befestigten Befestigungskappe 30 entspricht.

[0060] In Richtung der Bohrung in der Platte ist die Höhe der Sicherungsschraube 280 gerade so gewählt, dass durch Anziehen die Stirnfläche 283 derart Druck auf das zweite Kopfteil 10 ausübt, dass es in der Platte in einer zu dem Zeitpunkt des Anziehens der Sicherungsschraube 280 eingestellten Winkelstellung fixierbar ist, die nachfolgend als Ruhewinkelstellung bezeichnet ist. Die Platte 200 wird dabei gleichzeitig mit dem Schraubenelement 1 verbunden.

[0061] Mit dieser Anordnung wird erreicht, dass das zweite Kopfteil 10 relativ zu der Platte 200 ausgerichtet und anschließend in dieser Ausrichtung fixiert werden kann.

[0062] Die Sicherungsschraube 280 weist eine koaxiale Bohrung 285 auf, die ein Eingreifen mit einem Schraubwerkzeug ermöglicht. In Fig. 5 ist eine sechskantförmige Bohrung 285 für einen Inbusschlüssel dargestellt. Es ist jedoch auch eine andere Formgebung zum Eingreifen mit einem Einschraubwerkzeug möglich.

[0063] Die koaxiale Bohrung 285 weist einen solchen Querschnitt auf, dass ein Hindurchgreifen mit dem Schraubwerkzeug, für das die Ausnehmung 8 des ersten Kopfteils vorgesehen ist, ermöglicht ist.

[0064] Diese Ausführungsform weist den besonderen Vorteil auf, dass der gesamte Aufbau vormontiert werden kann. Im Betrieb ist zuerst nur die Sicherungsschraube 280 nicht angezogen. Das Schraubenelement kann in dem vormontierten Zustand in den Knochen oder Wirbel

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eingeschraubt werden, indem mit dem Schraubwerkzeug durch die konzentrischen Bohrungen in dem ersten Druckelement 20, der Befestigungskappe 30 und der Sicherungsschraube 280 in die Ausnehmung 8 des Schraubenelements 1 eingegriffen wird. Anschließend kann die Winkelstellung der Platte 200 zum Schaft 2 eingestellt und mit der Sicherungsschraube 280 fixiert werden.

Vierte Ausführungsform

[0065] Die in Fig. 6 dargestellte vierte Ausführungsform der vorliegenden Erfindung unterscheidet sich von der ersten bevorzugten Ausführung im Wesentlichen nur in der Ausbildung des ersten Kopfteiles und des elastischen ersten Druckelementes und gleiche oder ähnliche Elemente werden mit denselben Bezugszeichen bezeichnet.

[0066] Bei der vierten Ausführungsform schließt sich im Gegensatz zu der ersten Ausführungsform an den verbreiterten Rand 6 auf der dem Schaft 2 abgewandten Seite ein in dieser Ausführungsform mit dem ersten Kopfteil 4' einstückig verbundener zylinderförmiger Abschnitt 9 an, der als elastisches erstes Druckelement dient. Der zylinderförmige Abschnitt 9 erstreckt sich im Wesentlichen in Form eines Hohlzylinders koaxial zu der Achse des Schaftes 2 in Richtung des zweiten Druckelementes 50. In Richtung des zweiten Druckelements 50 weist der zylinderförmige Abschnitt 9 einen Bereich 9b mit einem verbreiterten Außendurchmesser auf, der in der ersten Bohrung 15 des zweiten Kopfteils 10 gehalten ist. Die dem zweiten Druckelement 50 zugewandte Stirnfläche des zylinderförmigen Abschnitts 9 ist derart sphärisch ausgebildet, dass sie im zusammengebauten Zustand des Knochenverankerungselementes eine Fortführung des der sphärischen Außenfläche 11 des zweiten Kopfteiles 10 bildet. Der Zylindermantel des zylinderförmigen Abschnittes 9 weist umlaufende Ausnehmungen 9a derart auf, dass der zylinderförmige Abschnitt 9 eine parallel zu der Schaftachse verlaufende Spiralfeder bildet.

[0067] Im Betrieb wird prinzipiell wie bei der ersten Ausführungsform verfahren und das zweite Kopfteil 10 durch den von dem zweiten Druckelement 50 ausgeübten Druck in dem Aufnahmeteil 40 in einer gewünschten Ruhewinkelstellung fixiert. In diesem Zustand ist wiederum, wie bei der ersten Ausführungsform eine Auslenkung des Schaftes 2 relativ zu dem zweiten Kopfteil 10 aus der Ruhewinkelstellung möglich. Bei der Auslenkung aus der Ruhewinkelstellung wird die Spiralfeder des zylinderförmigen Abschnitts 9 elastisch deformiert und es wirkt folglich auf das erste Kopfteil 4' eine in die Ruhewinkelstellung rücktreibende Kraft, wobei bei dieser Ausbildung in Form einer einstückig mit dem ersten Kopfteil 4 ausgebildeten Schraubenfeder eine Druck- und eine Zugseite zu der Rückstellung beitragen, da bei einer Auslenkung eine Seite komprimiert und die gegenüberliegende Seite gedehnt wird.

[0068] Durch die Spiralfeder des zylinderförmigen Abschnitts 9 können durch eine geeignete Wahl der Federkraft und der Vorspannung verschieden starke Rücktreibekräfte realisiert werden, was zu einer großen Variabilität des Knochenverankerungselementes führt.

[0069] Weiterhin ist auch eine Kombination der Merkmale der vierten Ausführungsführungsform mit denen der anderen Ausführungsformen möglich, insbesondere kann der beschriebene Aufbau auch in einer Platte wie bei der zweiten und dritten Ausführungsform Verwendung finden.

Weitere Ausführungsformen und Abwandlungen

[0070] Das erste Kopfteil 4 und die zweite Bohrung 16 in dem zweiten Kopfteil 10 müssen nicht kugelsegmentförmig bzw. hohlkugelsegmentförmig ausgebildet sein, sondern können eine andere Form aufweisen, solange die gewährleistet ist, daß das erste Kopfteil 4 in dem zweiten Kopfteil schwenkbar gehalten ist.

[0071] Ebenfalls müssen das zweite Kopfteil 10 und der das zweite Kopfteil haltende Bereich des Aufnahmeteils nicht kugelsegmentförmig bzw. hohlkugelsegmentförmig sein, sondern müssen ebenfalls eine Schwenkbarkeit des zweiten Kopfteils 10 in dem Aufnahmeteil und bei Fixierung in der gewünschten Ruhewinkelstellung eine ausreichende Haltekraft ermöglichen.

[0072] Das Halten der Befestigungskappe 30 in dem zweiten Kopfteil 10 kann auch durch ein auf dem Abschnitt 32 vorgesehenes Außengewinde realisiert sein, das mit einem Innengewinde der Bohrung 15 in einem an das erste Ende 12 angrenzenden Bereich zusammenwirkt.

[0073] Das erste Druckelement 20 muss nicht unbedingt aus einem Elastomer bestehen, sondern kann beispielsweise auch durch entsprechend angeordnete Federn realisiert werden, die die Rückstellkraft ausüben.

[0074] Es ist ebenfalls denkbar, zum Fixieren des Stabes 100 und zum Fixieren der Ruheposition nur eine Innenschraube zu verwenden, die über den Stab 100 Druck auf das zweite Druckelement 50 und damit auch auf das zweite Kopfteil 10 ausübt.

[0075] Der Schaft 2 und das erste Kopfteil 4 sind einstückig ausgebildet gezeigt, jedoch ist auch eine mehrstückige Ausbildung möglich, bei der zum Beispiel Schaft 2 und erstes Kopfteil 4 mittels einer Schraubverbindung, Passsitz oder ähnlichem verbunden sind.

[0076] Weitere Abwandlungen der vorher beschriebenen Ausführungsformen sind möglich. Insbesondere können Elemente einer Ausführungsform mit den Elementen einer anderen Ausführungsform kombiniert werden.

[0077] Es können zwei oder mehr erfindungsgemäße Knochenverankerungselemente in Kombination mit einem Stab oder mit einer Platte verwendet werden, ebenso können erfindungsgemäße Knochenverankerungselemente mit bekannten Knochenverankerungselementen, insbesondere mit Knochenschrauben oder Haken, kombiniert werden.

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[0078] Die Erfindung ist nicht auf die konkret beschriebenen Beispiele eines polyaxialen Knochenverankerungselements beschränkt. Es können auch andere Ausbildungen desselben, insbesondere der Aufnahmeteile und der Befestigungseinrichtungen möglich sein. Entscheidend ist, dass der Schaft elastisch aus einer Ruhewinkelstellung auslenkbar ist und dass die Einstellung der Ruhewinkelstellung von der elastischen Auslenkbarkeit entkoppelt ist.

[0079] Bei allen vorgenannten Ausführungsformen besteht ferner der Vorteil, daß die begrenzte Bewegungsmöglichkeit der Knochenteile bzw. Wirbel zu einer erhöhten zyklischen Teilbelastung führt, die das Knochenwachstum anregt. Gleichzeitig bleibt die Sicherheit der Verankerung im Knochen gewährleistet.

Patentansprüche

1. Knochenverankerungselement mit
einem Element (1) mit einem Schaft (2) zur Verankerung in einem Knochen oder einem Wirbel und mit einem mit dem Schaft (2) verbundenen ersten Kopfteil (4),
einem mit dem Element (1) verbindbaren zweiten Kopfteil (10), in dem das erste Kopfteil schwenkbar gehalten ist,
einem Aufnahmeteil (40, 200), in dem das zweite Kopfteil (10) aufgenommen ist, und
einer Fixiervorrichtung (60; 260; 280) zum Fixieren des zweiten Kopfteils (10) in dem Aufnahmeteil (40; 200)
dadurch gekennzeichnet, dass
das zweite Kopfteil (10) hülsenförmig zum Aufnehmen des ersten Kopfteils (4) ausgebildet und in dem Aufnahmeteil (40, 200) schwenkbar gehalten ist,
die Fixiervorrichtung das zweite Kopfteil (10) in dem Aufnahmeteil (40, 200) in einer Stellung fixiert, die eine Ruhewinkelstellung des Schaftes (2) relativ zu dem Aufnahmeteil bestimmt, und
das erste und das zweite Kopfteil derart miteinander elastisch verbunden sind, dass der Schaft (2) relativ zu dem zweiten Kopfteil (10) aus der Ruhewinkelstellung auslenkbar ist und dabei auf das erste Kopfteil (4) eine in die Ruhewinkelstellung rücktreibende Kraft wirkt.

2. Knochenverankerungselement nach Anspruch 1, **dadurch gekennzeichnet, dass** die Auslenkung des Schaftes (2) aus der Ruhewinkelstellung von dem Fixieren der Ruhewinkelstellung entkoppelt ist.

3. Knochenverankerungselement nach Anspruch 1 oder 2, die derart ausgebildet ist, dass ein elastisches Druckelement (20, 9) vorgesehen ist, das auf das erste Kopfteil (4) einwirkt.

4. Knochenverankerungselement nach Anspruch 3, **dadurch gekennzeichnet, dass** das elastische Druckelement (20) aus einem Elastomer ausgebildet ist.

5. Knochenverankerungselement nach Anspruch 3, **dadurch gekennzeichnet, dass** das elastische Druckelement (9) einstückig mit dem ersten Kopfteil (4) ausgebildet ist.

6. Knochenverankerungselement nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** das zweite Kopfteil (10) eine im Wesentlichen kugelsegmentförmige Außenfläche aufweist.

7. Knochenverankerungselement nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** das erste Kopfteil (4) eine im Wesentlichen kugelsegmentförmige Form aufweist.

8. Knochenverankerungselement nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** der Innendurchmesser des hülsenförmigen zweiten Kopfteils (10) in einem ersten Bereich (15) größer ist als der Durchmesser des ersten Kopfteils (4) und in einem zweiten Bereich (16) kleiner ist, so dass das erste Kopfteil (4) darin einführbar und schwenkbar gehalten ist.

9. Knochenverankerungselement nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** das erste Kopfteil (4) an seiner dem Schaft (2) abgewandten Seite einen verbreiterten Rand (6) aufweist.

10. Knochenverankerungselement nach Anspruch 9, **dadurch gekennzeichnet, dass** der verbreiterte Rand (6) die Auslenkbarkeit des ersten Kopfteils (4) aus der Ruhewinkelstellung beschränkt.

11. Knochenverankerungselement nach einem der Ansprüche 3 bis 10, **dadurch gekennzeichnet, dass** das elastische Druckelement (20, 9) unter Vorspannung zwischen dem ersten Kopfteil (4) und einer das zweite Kopfteil (10) bedeckenden Kappe (30) befestigt ist.

12. Knochenverankerungselement nach einem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** ein zweites Druckelement (50; 250; 280) vorgesehen ist, das zum Fixieren der Ruhewinkelstellung auf das zweite Kopfteil einwirkt.

13. Knochenverankerungselement nach einem der Ansprüche 1 bis 12, **dadurch gekennzeichnet, dass** das Aufnahmeteil (40) im wesentlichen hohlzylinderförmig ausgebildet ist und an einem Ende einen Bereich (47) mit einem verjüngten Innendurchmesser zum Halten des zweiten Kopfteils (10) aufweist.

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14. Knochenverankerungselement nach einem der Ansprüche 1 bis 12, **dadurch gekennzeichnet, dass** das Aufnahmeteil als eine Platte (200) mit einer im wesentlichen hohlzylinderförmigen Bohrung (248; 247) ausgebildet ist und an einem Ende der Bohrung einen Bereich (247) mit einem verjüngten Innendurchmesser zum Halten des zweiten Kopfteils (10) aufweist.

15. Stabilisierungseinrichtung mit einem ersten Knochenverankerungselement und einem zweiten Knochenverankerungselement und einem diese verbindenden Stab (100) oder einer Platte (200), **dadurch gekennzeichnet, dass** wenigstens eines der Knochenverankerungselemente nach einem der Ansprüche 1 bis 14 ausgebildet ist.

Claims

1. Bone anchoring element with
an element (1) having a shaft (2) for anchoring in a bone or vertebra, and having a first head part (4) connected to the shaft (2),
a second head part (10) connectable to the element (1), in which the first head part is pivotably held,
a receiving part (40; 200) in which the second head part (10) is received, and
a fixation device (60; 260; 280) for fixing the second head part (10) in the receiving part (40; 200),
characterized in that
the second head part (10) is formed as sleeve-shaped for receiving the first head part (4) and is pivotably held in the receiving part (40, 200),
the fixing device fixes the second head part (10) in the receiving part (40, 200) in a position which determines a resting angular position of the shaft (2) relative to the receiving part, and
the first and second head parts are elastically connected to each other such that the shaft (2) is deflectable from the resting angular position relative to the second head part (10) and, in doing so, a force restoring to the resting angular position acts on the first head part (4).

2. Bone anchoring element according to Claim 1, **characterized in that** the deflection of the shaft (2) from the resting angular position is decoupled from the fixation of the resting angular position.

3. Bone anchoring element according to Claim 1 or 2, being formed such that an elastic pressure element (20, 9) acting on the first head part (4) is provided.

4. Bone anchoring element according to Claim 3, **characterized in that** the elastic pressure element (20) is made from an elastomer.

5. Bone anchoring element according to Claim 3, **characterized in that** the elastic pressure element (9) is formed in one piece with the first head part (4).

6. Bone anchoring element according to any one of Claims 1 to 5, **characterized in that** the second head part (10) comprises an outer surface essentially shaped as a segment of a sphere.

7. Bone anchoring element according to any one of Claims 1 to 6, **characterized in that** the first head part (4) essentially has a shape as a segment of a sphere.

8. Bone anchoring element according to any one of Claims 1 to 7, **characterized in that**, in a first region (15), the inner diameter of the sleeve-shaped second head part (10) is larger than the diameter of the first head part (4) and, in a second region (16), is smaller, such that the first head part (4) is insertable therein and pivotably held.

9. Bone anchoring element according to any one of Claims 1 to 8, **characterized in that** the first head part (4) comprises a widened edge (6) at its side facing away from the shaft (2).

10. Bone anchoring element according to Claim 9, **characterized in that** the widened edge (6) limits the capability of deflection of the first head part (4) from the resting angular position.

11. Bone anchoring element according to any one of Claims 3 to 10, **characterized in that** the elastic pressure element (20, 9) is attached under pre-load between the first head part (4) and a cap (30) covering the second head part (10).

12. Bone anchoring element according to any one of Claims 1 to 11, **characterized in that** a second pressure element (50; 250; 280) is provided which, for fixing the resting angular position, acts on the second head part.

13. Bone anchoring element according to any one of Claims 1 to 12, **characterized in that** the receiving part (40) is provided to be essentially hollow cylindrical in shape and, at one end, comprises a region (47) with a tapered inner diameter for holding the second head part (10).

14. Bone anchoring element according to any one of Claims 1 to 12, **characterized in that** the receiving part is provided as a plate (200) with an essentially hollow cylindrical bore (248; 247) and, at one end of the bore, comprises a region (247) with a tapered inner diameter for holding the second head part (10).

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15. Stabilization device with a first bone anchoring element and a second bone anchoring element and a rod (100) or a plate (200) connecting these, **characterized in that** at least one of the bone anchoring elements is provided according to any one of Claims 1 to 14.

Revendications

1. Élément d'ancrage osseux, comprenant :

   un élément (1) avec une tige (2), pour ancrage dans un os ou une vertèbre, et avec une première partie de tête (4) reliée à la tige (2),
   une deuxième partie de tête (10), susceptible d'être reliée à l'élément (1) et dans laquelle la première partie de tête est maintenue de façon à pouvoir pivoter,
   une partie de logement (40, 200) dans laquelle la deuxième partie de tête (10) est logée, et
   un dispositif de fixation (60; 260; 280) pour fixation de la deuxième partie de tête (10) dans la partie de logement (40 ; 200),

   caractérisé en ce que
   la deuxième partie de tête (10) est réalisée en forme de douille pour recevoir la première partie de tête (4) et est maintenue à pivotement dans la partie de logement (40 ; 200),
   le dispositif de fixation fixe la deuxième partie de tête (10) dans la partie de logement (40 ; 200), en une position déterminant une position angulaire de repos de la tige (2) par rapport à la partie de logement, et la première et la deuxième partie de tête étant reliées ensemble de façon élastique, de manière que la tige (2) puisse être déviée par rapport à la deuxième partie de tête (10) en partant d'une position angulaire de repos, et qu'une force, ramenant la première partie de tête (4) à la position angulaire de repos, agisse.

2. Élément d'ancrage osseux selon la revendication 1, **caractérisé en ce que** le débattement de la tige (2) depuis la position de repos, est désaccouplé de la fixation de la position angulaire de repos.

3. Élément d'ancrage osseux selon la revendication 1 ou 2, réalisé de manière qu'un élément de pressage (20, 9) élastique soit prévu, agissant sur la première partie de tête (4).

4. Élément d'ancrage osseux selon la revendication 3, **caractérisé en ce que** l'élément de pressage (20) élastique est réalisé en un élastomère.

5. Élément d'ancrage osseux selon la revendication 3, **caractérisé en ce que** l'élément de pressage (9) élastique est réalisé d'une seule pièce avec la première partie de tête (4).

6. Élément d'ancrage osseux selon l'une des revendications 1 à 5, **caractérisé en ce que** la deuxième partie de tête (10) présente une surface extérieure sensiblement en forme de segment de sphère.

7. Élément d'ancrage osseux selon l'une des revendications 1 à 6, **caractérisé en ce que** la première partie de tête (4) présente une forme sensiblement en forme de segment de sphère.

8. Élément d'ancrage osseux selon l'une des revendications 1 à 7, **caractérisé en ce que** le diamètre intérieur de la deuxième partie de tête (10) en forme de douille, dans une première zone (15), est plus grand que le diamètre de la première partie de tête (4) et, dans une deuxième zone (16), est plus petit, de manière que la première partie de tête (4) puisse y être introduite et y être maintenue à pivotement.

9. Élément d'ancrage osseux selon l'une des revendications 1 à 8, **caractérisé en ce que** la première partie de tête (4) présente sur sa face opposée à la tige (2) un bord (6) élargi.

10. Élément d'ancrage osseux selon la revendication 9, **caractérisé en ce que** le bord (6) élargi limite la possibilité de débattement de la première partie de tête (4) depuis la position angulaire de repos.

11. Élément d'ancrage osseux selon l'une des revendications 3 à 10, **caractérisé en ce que** l'élément de pressage (20, 9) élastique est fixé sous précontrainte entre la première partie de tête (4) et un capuchon (30) couvrant la deuxième partie de tête (10).

12. Élément d'ancrage osseux selon l'une des revendications 1 à 11, **caractérisé en ce qu'**un deuxième élément de pressage (50 ; 250 ; 280) est prévu, agissant pour fixer la position angulaire de repos sur la deuxième partie de tête.

13. Élément d'ancrage osseux selon l'une des revendications 1 à 12, **caractérisé en ce que** la partie de logement (40) est réalisée sensiblement avec une forme de cylindre creux, et présente à une extrémité une zone (47) ayant un diamètre intérieur effilé pour maintenir la deuxième partie de tête (10).

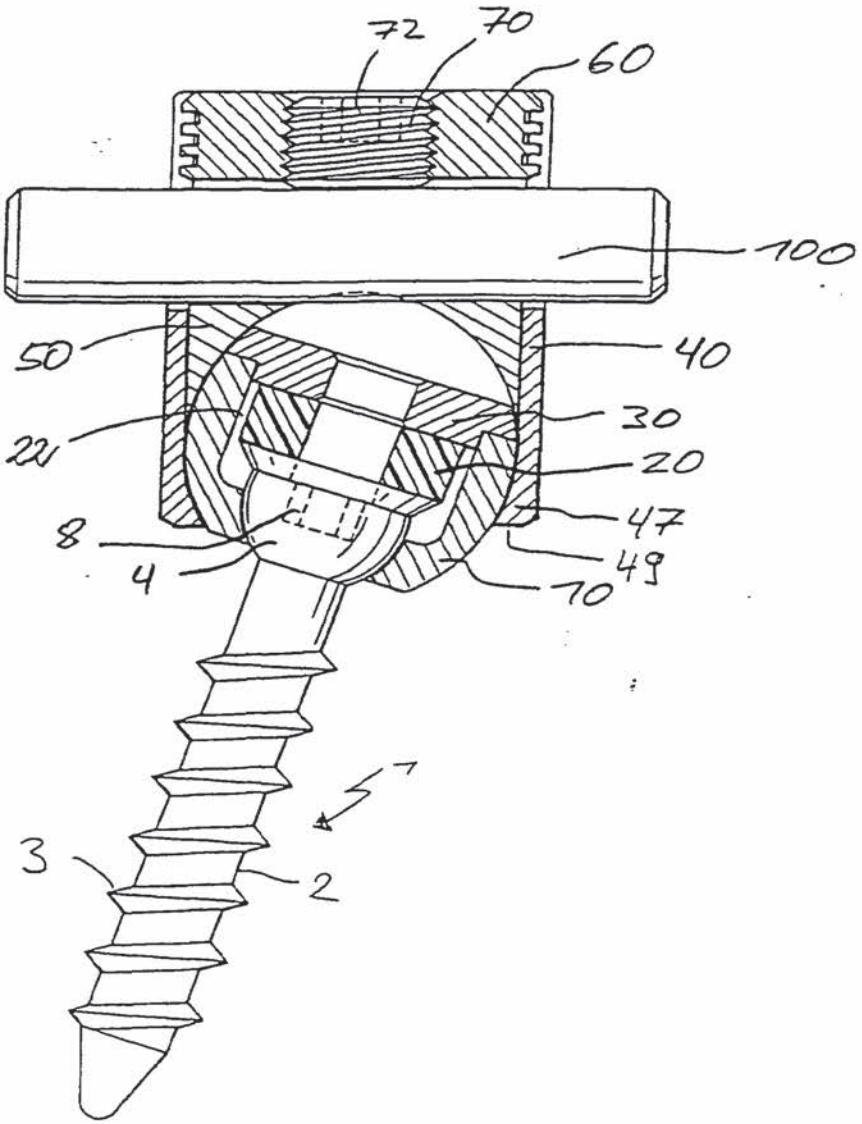
14. Élément d'ancrage osseux selon l'une des revendications 1 à 12, **caractérisé en ce que** la partie de logement est réalisée sous la forme d'une plaque (200) ayant un perçage (248 247) sensiblement en forme de cylindre creux, et présente sur une extrémité du perçage une zone (247) ayant un diamètre intérieur effilé, pour assure le maintien de la deuxième partie de tête (10).

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15. Dispositif de stabilisation comprenant un premier élément d'ancrage osseux et un deuxième élément d'ancrage osseux, et une barre (100) ou une plaque (200) reliant ceux-ci, **caractérisé en ce qu'** au moins l'un des éléments d'ancrage osseux est réalisé selon l'une des revendications 1 à 14.

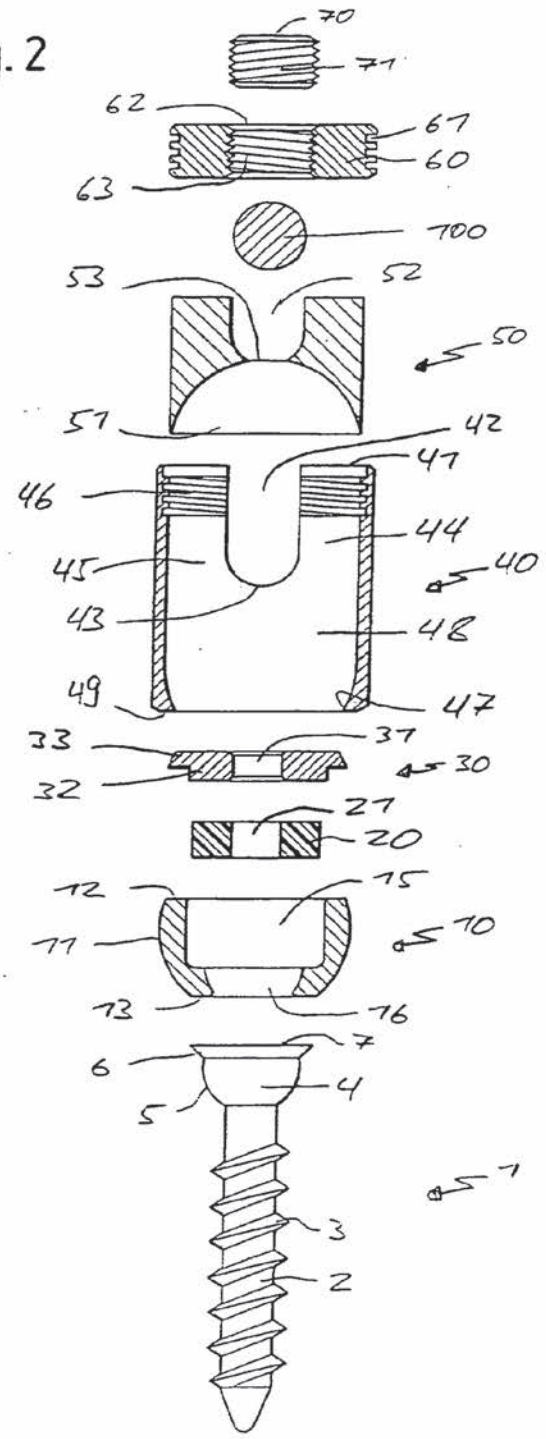
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Fig. 1



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Fig. 2



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Fig. 3c

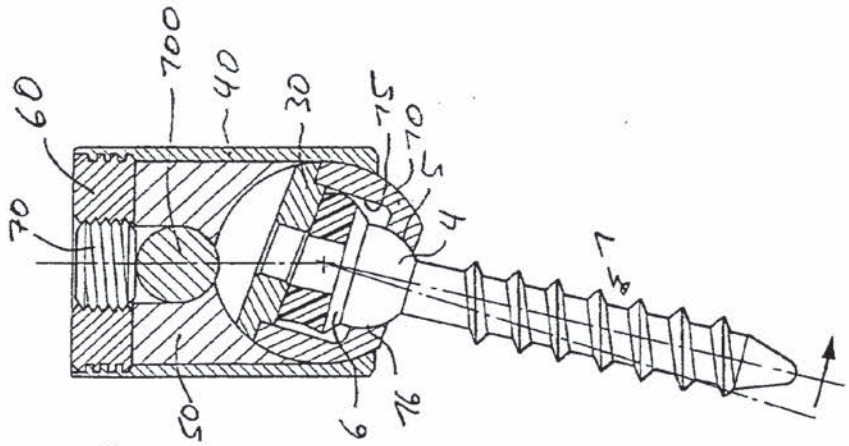


Fig. 3b

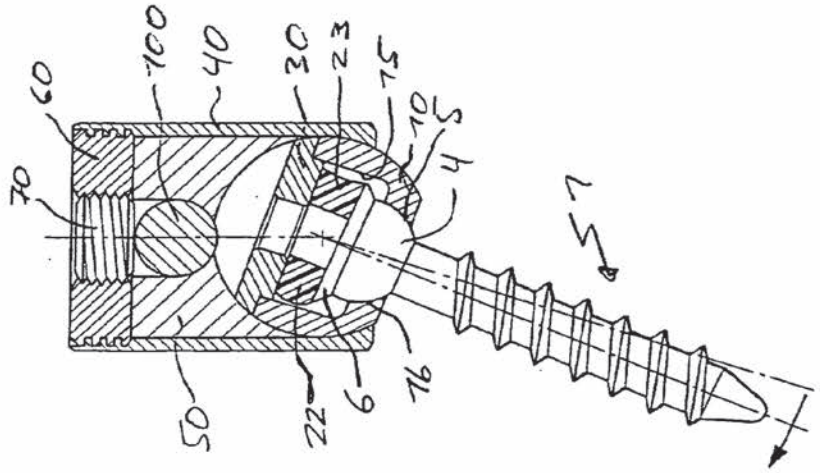
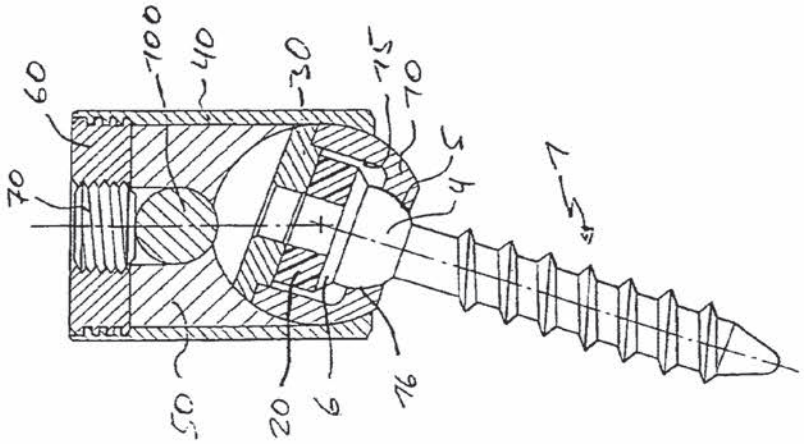
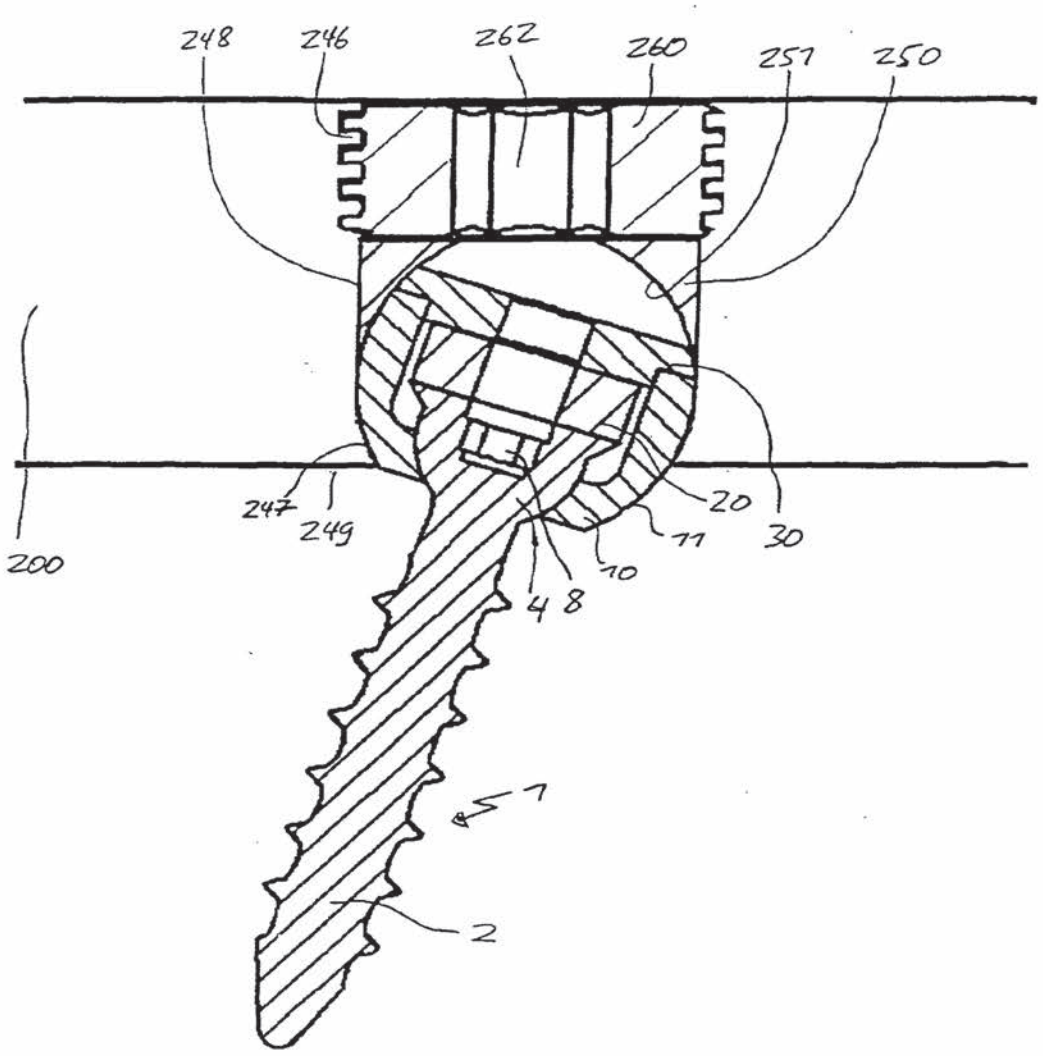


Fig. 3a



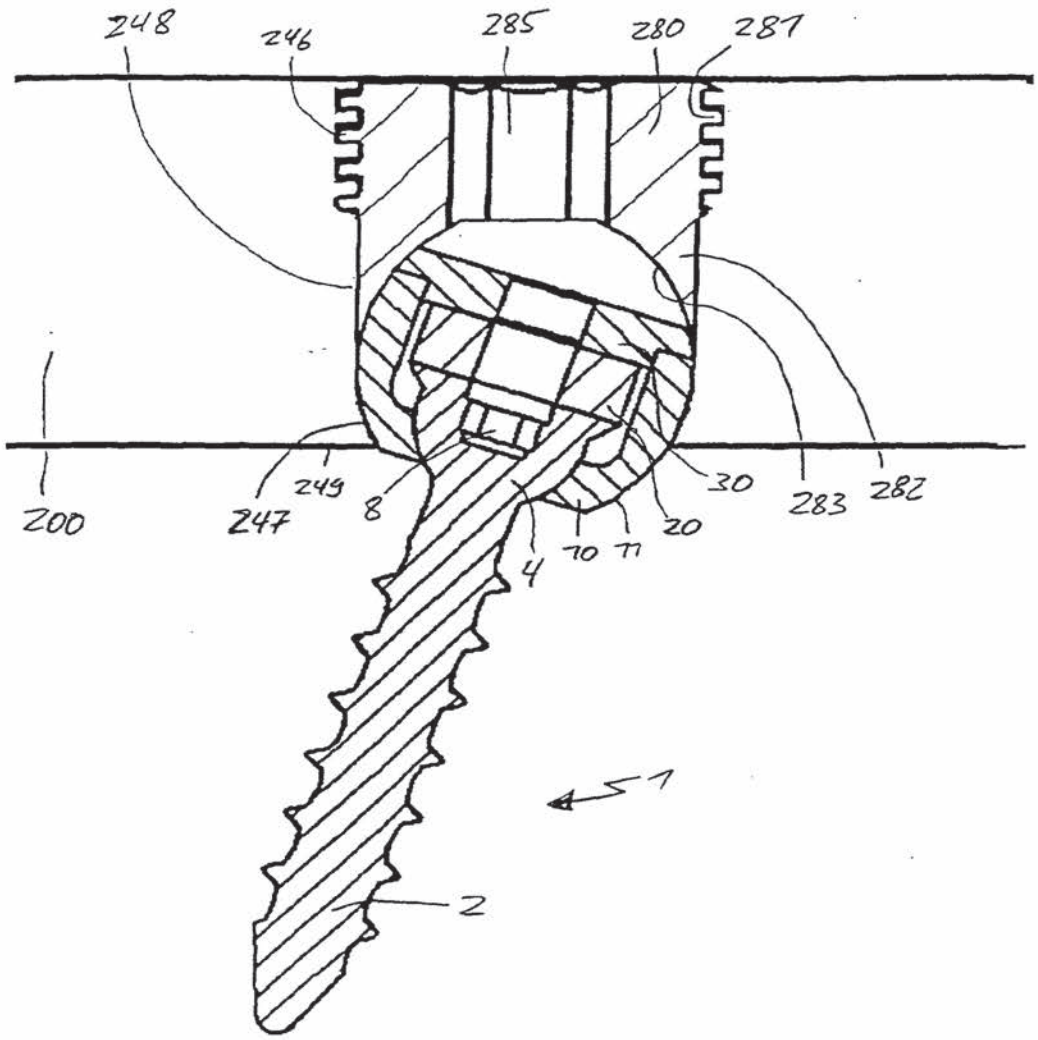
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Fig. 4



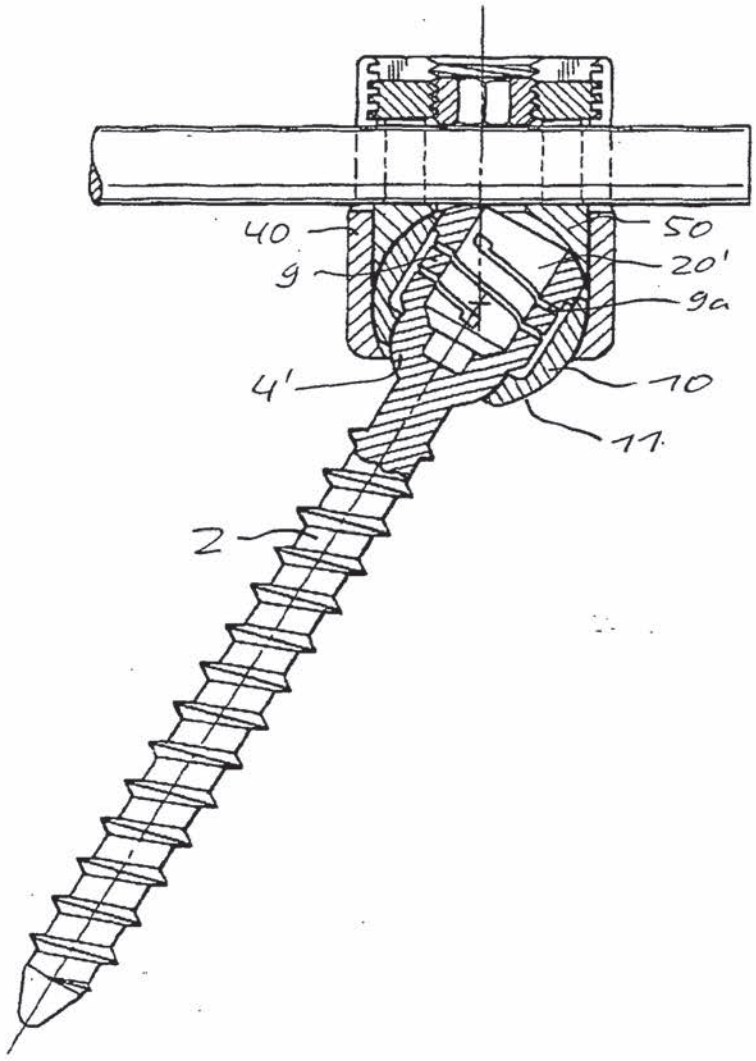
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Fig. 5



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Fig. 6



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F16B 31/02

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(58) Field of search
F2H

(54) Shear head screws or bolts, or shear head adaptor

(57) A shear head screw 10 (Fig. 3) comprises a first (screw) head 14A and a second head 14B coupled by a shear neck 16 so that the screw can be tightened by the first head 14A until the screw shears at the neck 16 leaving the second head 14B and a threaded stem 12 tightened to a predetermined torque determined by the shear force. The screw thus applied can subsequently be loosened by the second head 14B.

A shear head adaptor 108 (Fig. 19) comprises a socket 112 drivingly engageable with the screw head 106, and a drive head 114 coupled by a shear neck 116 to the socket 112.

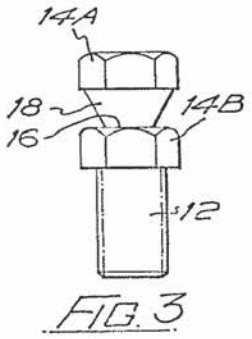


FIG. 3

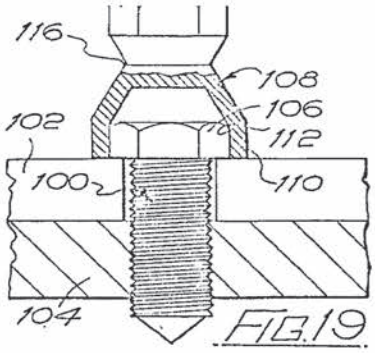


FIG. 19

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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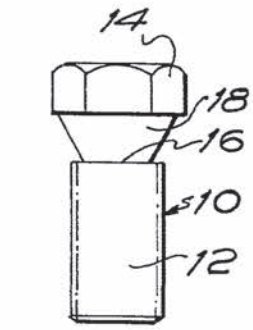


FIG. 1

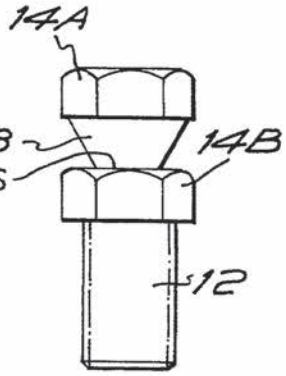


FIG. 3

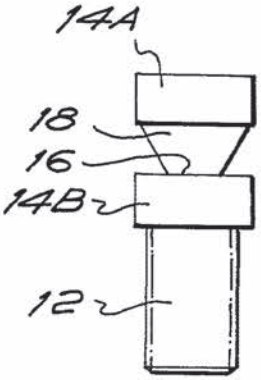


FIG. 5

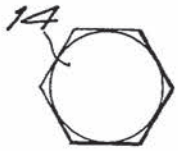


FIG. 2



FIG. 4

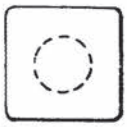


FIG. 6

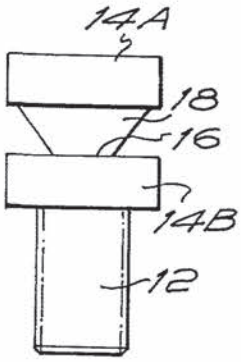


FIG. 7

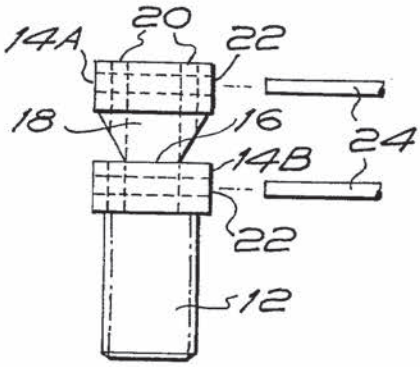


FIG. 9

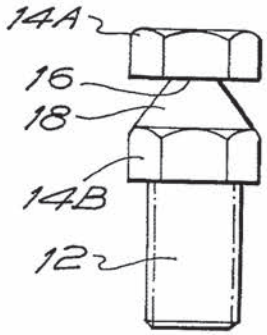


FIG. 11

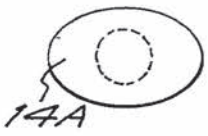


FIG. 8



FIG. 10

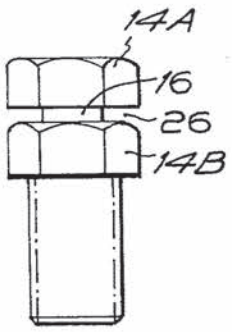


FIG.12

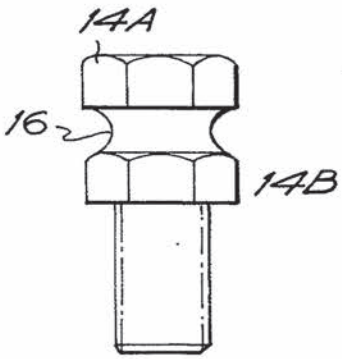


FIG.13

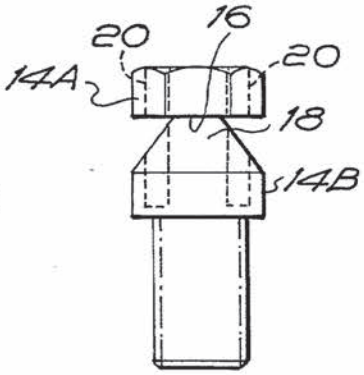


FIG.14

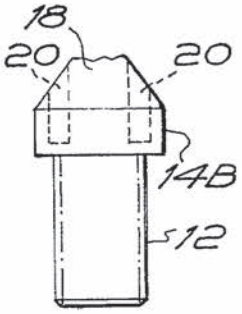


FIG.15

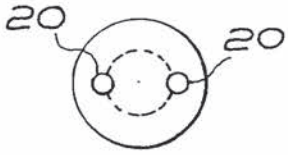


FIG.16

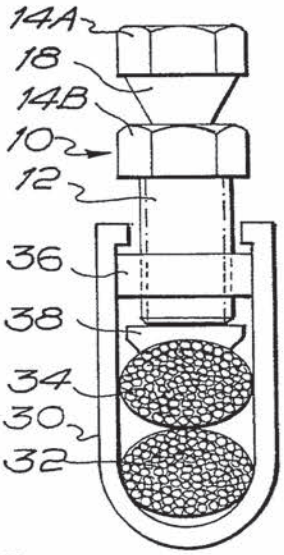


FIG.17

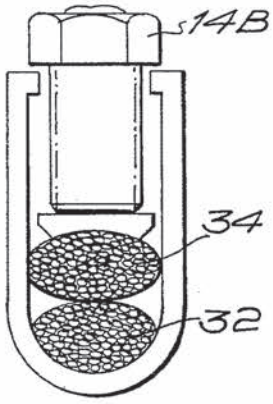


FIG.18

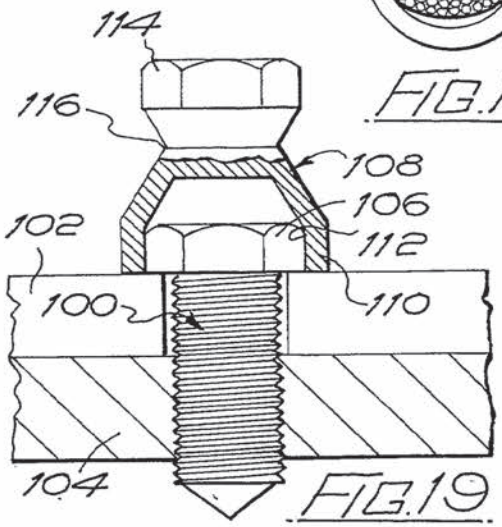


FIG.19

SPECIFICATION

Improvements relating to shear head screws or bolts

This invention relates to shear head screws or bolts, referred to hereinafter simply as shear head screws for convenience, or adaptors therefor, and concerns a novel form of shear head screw or adaptor to provide functionality not heretofore conceived in connection with shear head screws.

Essentially, shear head screws are utilised in circumstances where it is desired to turn a screw, in the tightening of same, to a torque of a predetermined value or lying within a predetermined range, the principle being that the screw is tightened until such times as the head thereof shears from the threaded portion of the screw in a predetermined region, the said region in relation to the screw thread pitch and diameter being designed so that shearing will take place at the predetermined torque.

These shear head screws have a wide application in electrical connectors for the connecting of electrical distribution cables, because in such connectors it is important that the torque applied to the screw which performs the clamping of the connector to another connector or to a connector body should be tightened to a predetermined torque reliably without the use of a torque meter. It is necessary in such application to have a predetermined torque which is neither too high nor too low, because if the torque is too high or too low then the electrical performance of the connector will be reduced unacceptably.

The disadvantage of a shear head screw is that when the head has been sheared from the threaded portion of the screw, it is difficult subsequently to remove the screw. This is not a problem in connection with many electrical connectors of the type referred to above, because such connectors are invariably included in shells or casing which are in any event filled with an encapsulating material such as a synthetic resin, and there is rarely if ever a requirement to disconnect an electrical connector once coupled.

However, the possibility of providing a shear head screw of a type which can be unscrewed represents a significant step forward in certain electrical connectors which are known as terminal connectors which couple supply cables to distribution boards, parts of which require replacement from time to time, but in any event a shear head screw which is capable of being unscrewed represents a considerable advantage in general engineering, because then the screw can be designed to shear at a particular torque, but the shearing of the head does not mean that the screw cannot subsequently be removed. A particularly suitable application for such screws is in internal combustion engines where such screws could be used with good effect for the connecting of the engine cylinder head to the cylinder block.

There is furthermore the general application that if a screw is a shear head screw but is capable of subsequently being unscrewed, then in all engineering applications the screw can be designed so that the head will shear before the threads shear, and this will prevent the application of screws to more than a predetermined design torque. In many instances in engineering and industry, fitters overtighten screws, causing stripping of the thread, or shearing of the head, with the consequent difficulties of screw removal.

The shear head screw in accordance with the present invention comprises a threaded stem, and at one end of the stem, there are two tool engaging sections for the turning of the screw, the said two sections being an outer section and an inner section as regards their relationship with the threaded stem, such sections being separated by a shear throat designed so that when the screw is turned, the outer section will shear from the remainder of the screw including the second section and threaded stem in the throat area before failure of the screw threaded stem, leaving the screw to be unscrewed by means of a suitable tool which can engage the second section.

Preferably, the said throat will be a reduced diameter region between the first and second sections.

The form of tool to be used in connection with the turning of the screw by engagement of the first and second sections may be any suitable, such as a spanner or socket wrench, and the said sections may be designed so that different tools are required to turn the screw by engagement of the first and second sections.

To achieve any predetermined shear torque at which the first section will shear from the remainder of the screw, will depend upon a number of factors including the material from which the screw is produced, the pitch and diameter of the thread of the threaded portion, and the cross sectional area of the shear throat. Particular screws will of course be designed for particular applications.

The principle of the invention as applied to screws as mentioned above, can also be applied to adaptors, in that an adaptor is drivably coupleable to a screw head, and has another portion which is adapted to be engaged by a tool, and between these portions is a shear area, so that turning of the screw through the medium of the adaptor transmits the torque across the shear area of the adaptor, so that the adaptor will shear at such area when the predetermined torque has been applied to the screw. This means that adaptors can be used with conventional screws, and can tighten same to predetermined torques. In this arrangement, adaptors can be made of different material from the screw being tightened.

Various embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, wherein:-

Figures 1 and *2* are a side elevation and plan of a shear head screw which is used extensively in electrical connectors;

Figures 3 and *4* are views similar to Figures 1 and 2 showing a first embodiment of the invention;

Figures 5 and *6*, *Figures 7* and *8*, and *Figures 9* and *10* show respectively three further embodiments of a shear head screw according to the invention, in a manner similar to Figures 3 and 4;

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Figure 11 is a side elevation of a shear head screw according to another embodiment of the invention, showing an alternative formation;

Figures 12 and *13* respectively show, in two further embodiments of the invention, how the throat formation can be modified;

Figure 14 shows a side elevation of a screw according to yet another embodiment of the invention;

Figure 15 shows the screen of Figure 14 after shearing of same;

Figure 16 is a plan view of the shear head screw portion shown in Figure 15;

Figure 17 is a side elevation of an electrical connector showing how the screw according to Figures 3 and 4 is utilised;

Figure 18 shows the connector of Figure 17 after tightening of the screw and shearing of same; and

Figure 19 is a sectional elevation showing an adaptor according to the invention.

Referring to the drawings, where appropriate the same reference numerals, or the same reference numerals with suffix letters have been used throughout.

In Figure 1 there is shown a screw 10 which is of the shear head type in that it is provided with a threaded stem 12, a hexagonal head 14 and a reduced dimension throat 16 forming the shear area of the screw. The throat 16 connects the top of the threaded stem 12 to the head 14 by a frusto-conical section 18. The dimension of the throat 16 is smaller than at least the outer diameter of the thread of stem 12, and will usually be less than the inner diameter of the thread, to ensure that when the screw is tightened, the head 14 will shear from the stem 12 along the shear area 16, at a predetermined torque, which is related to the material of the screw, the diameter and pitch of the thread of stem 12, and the dimension of the throat 16, all of which can be calculated depending upon the application.

Figure 2 shows that the largest cross section of the screw is the head 14, and the screw can be produced from hexagonal bar of the dimension of the head 14.

Screws as shown in Figures 1 and 2 are widely used in electrical connectors as described herein.

The disadvantage of the screw shown in Figures 1 and 2 is that when the head has sheared from the threaded stem, the threaded stem cannot be unscrewed without considerable difficulty. The shear head screws of the present invention are such as to be capable of being unscrewed after the initial shearing has taken place.

In the embodiment of the invention shown in Figure 3, there are two sections 14A and 14B by which the screw can be turned, and the sections 14A and 14B are connected by frusto-conical portion 18 leading from the shear throat 16 located at one side of the section 14B. Figure 4 shows that the screw can be made from hexagonal bar stock. One use of the screw shown in Figures 3 and 4 will be described when referring to Figures 17 and 18.

Figures 5 and 6 show in a manner similar to Figures 3 and 4, a further embodiment of the invention, and illustrate that the sections 14A and 14B can be square instead of hexagonal, whilst Figures 7 and 8 show that the sections 14A and 14B may be oval, in which case a special tool may be required to turn the stem 12 by engaging either the section 14A or the section 14B. Figures 9 and 10 show that the sections 14A and 14B can in fact be circular, in which case the screw may be provided with axial holes 20 passing through both sections 14A and 14B, whereby turning of the screw to shear the section 14A would be by means of a special tool having two pins for engaging the holes 20. Figure 9 also shows that the sections 14A and 14B may be provided with radial holes 22 so that the screw can be turned by engaging either of the holes 22 with tommy bars 24.

In the arrangement of Figure 11, the only difference between this embodiment and the Figures 3 and 4 embodiment is that the section 18 is inverted, so that the shear throat 16 is adjacent to section 14A.

In the arrangement of Figure 12, the throat is defined by a radial slot 26, instead of a frusto-conical section 18, and in the arrangement of Figure 13, the shear section 16 is defined by waisting the section connecting sections 14A and 14B.

In each of the examples described, the shear head screw is applied initially by driving through the section 14A, until the section 14A shears from the remainder at the shear area 16, whereby the screw is tightened to a predetermined torque as indicated herein, and for the removal of the screw, a suitable tool is engaged with the section 14B, and the screw is unscrewed thereby.

As regards the arrangement shown in Figures 14 to 16, the screw illustrated has the first drive section 14A adapted for driving engagement by a tool of a first configuration, whilst the section 14B is such as to require a driving tool of a different configuration for the unscrewing of the screw, and indeed the section 14B is designed so that only a custom built tool will be capable of unscrewing the screw. This embodiment of the invention therefore is particularly effective for security applications where only possessors of the custom built tool can unscrew the screw. Specifically, the section 14A is hexagonal, whilst the section 14B is circular and the frusto-conical section 18 narrows from section 14B to section 14A defining the throat 16 adjacent section 14A. Axial holes 20 extend through the section 14A, the frusto-conical portion 18 and the section 14B as shown, and therefore when the section 14A has been sheared from the remainder as shown in Figure 15, only a tool with a frusto-conical cavity with appropriate drive pins therein can be used for unscrewing of the screw.

Figures 17 and 18 illustrate a typical application of the screw shown in Figures 3 and 4. In Figures 17 and 18, reference 30 indicates a rigid U-shaped, metal yoke, containing two stranded electrical conductors 32 and 34 which are to be electrically connected. The conductor wires are bared and placed in contact as shown, and a screw 10 as shown in Figures 3 and 4 is threaded in a bridge piece 36 and the lower end of the threaded stem 12 engages a pressure pad 38 of the same material as the yoke. To complete the connection, the screw is driven by the section 14A and thereby compressing the stranded

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conductors as shown in Figure 18, until the section 14A and the frusto-conical section 18 shear from the remainder of the screw as shown in Figure 18, at the predetermined torque giving a pre-calculated compression between the conductors 32 and 34. To unscrew the screw, it is simply a matter of driving same by the remaining section 14B using the same tool.

When driving a screw of the invention by the outer section 14A, it may be necessary to locate a member around the section 14B, preventing driving engagement between the driving tool and section 14B, to ensure that the tightening torque will be applied through the shear throat area 16.

Shear head screws according to the present invention will have many applications.

Referring now to Figure 19, in this drawing a conventional screw 100 is shown as connecting two components 102 and 104, and mounted on the head 106 of the screw is an adaptor 108 having a socket portion 110 of which a hexagonal socket 112 drivingly engages the head 106 of the screw, and the socket furthermore has a hexagonal drive head 114, the said headed socket being connected by a reduced dimension throat region 116, which forms a shear area enabling the tightening of the screw 100 to a predetermined torque. As will be understood, the adaptor, which is a rigid metallic member, operates in that the screw 106 is tightened by the head 114, using a suitable tool, until such times as the adaptor shears at throat 116, the shearing torque being designed to give predetermined tightening of the screw 100. Other forms of adaptor can be devised, and the advantage of using an adaptor is that it can be made in a different or perhaps cheaper materials, and adaptors can for example be moulded in multiple cavity moulds, whereas screws such as screw 100, or screws 10 of previous embodiments, tend to require machining.

The screws and adaptors according to the invention will normally be fabricated in metal, but the invention is not to be considered limited to such material, as other materials, such as plastics materials can be used.

CLAIMS

1. A shear head screw comprising a threaded stem, and at one end of the stem, there are two tool engaging sections for the turning of the screw, the said two sections being an outer section and an inner section as regards their relationship with the threaded stem, such sections being separated by a shear throat designed so that when the screw is turned, the outer section will shear from the remainder of the screw including the second section and threaded stem in the throat area before failure of the screw threaded stem, leaving the screw to be unscrewed by means of a suitable tool which can engage the second section.

2. A screw according to Claim 1, wherein the throat is a reduced diameter region between the first and second sections.

3. A screw according to Claim 1 or 2, wherein the first and second sections are of hexagonal cross section and are adapted to be turned by suitable spanners.

4. A screw according to Claim 1, 2 or 3, wherein the throat is defined by the end of a tapered conical section between said inner and outer sections.

5. A screw according to Claim 4, wherein the conical section tapers towards the second section.

6. A shear head adaptor for tightening a screw comprising a first portion which is adapted to be engaged by a tool, and a coupling portion adapted to be coupled drivingly to a screw head, and between these portions is a shear area, so that turning of the screw through the medium of the adaptor transmits the torque across the shear area of the adaptor, so that the adaptor will shear at such area when the predetermined torque has been applied to the screw.

7. An adaptor according to Claim 6, wherein the section which is adapted to be coupled drivingly to a screw head comprises a hexagonal socket for receiving the screw head, and said portion adapted to be turned by a suitable tool comprises a hexagonal sectioned portion.

8. A shear head screw substantially as any of the embodiments described with reference to the accompanying drawings Figures 1 to 18.

9. An adaptor for tightening the screw substantially as hereinbefore described with reference to Figure 19 of the accompanying drawings.

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Electronic Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES
First Named Inventor/Applicant Name:	Roger P. Jackson
Filer:	Joshua Pranckun/Helen Miswell
Attorney Docket Number:	JAC023-667905
Filed as Large Entity	
Filing Fees for Utility under 35 USC 111(a)	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		1820

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First Named Inventor/Applicant Name:	Roger P. Jackson
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37 CFR 1.19 (Document supply fees)

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Warnings:					
Information:					
2	Application Data Sheet	ApplicationDataSheet.pdf	120414 15fbb090bfc1f907345ed4152366ba6ef7e41dba	no	8
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6		Specification.pdf	289407 7edb37f7d219af6b303823a4cb2ea7e53c54ec2b	yes	38

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	Specification	1	33
	Claims	34	37
	Abstract	38	38

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7	Drawings-only black and white line drawings	Figures.pdf	10329272 cc4b014f0153acde5d06ccbda19d8aec8aa2394a	no	19
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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code : PET.OP.AGE
Description : Petition to make special based on Age/Health

PTO/SB/130 (07-09)

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number

PETITION TO MAKE SPECIAL BASED ON AGE FOR ADVANCEMENT OF EXAMINATION UNDER 37 CFR 1.102(c)(1)

Application Information

Application Number	17123499	Confirmation Number		Filing Date	01-Jan-0001
Attorney Docket Number (optional)	JAC023-667905	Art Unit		Examiner	
First Named Inventor	Roger P. Jackson				
Title of Invention	MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES				

Attention: Office of Petitions

An application may be made special for advancement of examination upon filing of a petition showing that the applicant is 65 years of age, or more. No fee is required with such a petition. See 37 CFR 1.102(c)(1) and MPEP 708.02 (II).

APPLICANT HEREBY PETITIONS TO MAKE SPECIAL FOR ADVANCEMENT OF EXAMINATION IN THIS APPLICATION UNDER 37 CFR 1.102(c)(1) and MPEP 708.02 (II) ON THE BASIS OF THE APPLICANT'S AGE.

A grantable petition requires one of the following items:
(1) Statement by one named inventor in the application that he/she is 65 years of age, or more; or
(2) Certification by a registered attorney/agent having evidence such as a birth certificate, passport, driver's license, etc. showing one named inventor in the application is 65 years of age, or more.

Name of Inventor who is 65 years of age, or older

Given Name	Middle Name	Family Name	Suffix
Roger	P.	Jackson	

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the format of the signature.

Select (1) or (2) :

○ (1) I am an inventor in this application and I am 65 years of age, or more.

◉ (2) I am an attorney or agent registered to practice before the Patent and Trademark Office, and I certify that I am in possession of evidence, and will retain such in the application file record, showing that the inventor listed above is 65 years of age, or more.

Signature	/Joshua J. Pranckun/		
Name	Joshua J. Pranckun	Registration Number	70712

EFSWeb 1.0.18

PTO/SB/130 (07-09)
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Fr eedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about indivi duals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Application of
Roger P. Jackson

Application No. 17123499
Filed:

Attorney Docket No. JAC023-667905

:DECISION ON PETITION TO MAKE SPECIAL
:UNDER 37 CFR 1.102(c)(1)

This is a decision on the electronic petition under 37 CFR 1.102 (c)(1), filed 16-DEC-2020 to make the above-identified application special based on applicant's age as set forth in MPEP § 708.02, Section II.

The petition is **GRANTED**.

A grantable petition to make an application special under 37 CFR 1.102(c)(1), MPEP § 708.02, Section II : Applicant's Age must include a statement by applicant or a registered practitioner having evidence that applicant is at least 65 years of age. No fee is required.

Accordingly, the above-identified application has been accorded "special" status and will be taken up for action by the examiner upon the completion of all pre-examination processing.

Telephone inquiries concerning this electronic decision should be directed to the Electronic Business Center at 866-217-9197.

All other inquiries concerning either the examination or status of the application should be directed to the Technology Center.

Electronic Acknowledgement Receipt	
EFS ID:	41403136
Application Number:	17123499
International Application Number:	
Confirmation Number:	2823
Title of Invention:	MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES
First Named Inventor/Applicant Name:	Roger P. Jackson
Correspondence Address:	- - - - - - - - - -
Filer:	Joshua Pranckun/Helen Miswell
Filer Authorized By:	Joshua Pranckun
Attorney Docket Number:	JAC023-667905
Receipt Date:	16-DEC-2020
Filing Date:	
Time Stamp:	13:39:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition automatically granted by EFS	petition-request.pdf	38058 2ba78a2d13ce7eed507c74b2585af5fcfcea5f09	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	38058		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/123,499

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	17 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 480 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/123,499	12/16/2020	3773	1820	JAC023-667905	17	2

CONFIRMATION NO. 2823

FILING RECEIPT

24030
POLSINELLI PC
900 WEST 48TH PLACE
SUITE 900
KANSAS CITY, MO 64112-1895

Date Mailed: 01/27/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Roger P. Jackson, Prairie Village, KS;
James L. Surber, Kansas City, KS;

Applicant(s)

Roger P. Jackson, Prairie Village, KS;

Assignment For Published Patent Application

Roger P. Jackson, Prairie Village, KS

Power of Attorney: The patent practitioners associated with Customer Number 24030

Domestic Priority data as claimed by applicant

This application is a CON of 16/779,304 01/31/2020 PAT 10898233
which is a CON of 15/964,502 04/27/2018 PAT 10548641
which is a CON of 15/469,076 03/24/2017 PAT 9956004
which is a CON of 14/566,356 12/10/2014 PAT 9636146
which is a CON of 13/694,849 01/10/2013 PAT 8911479
which claims benefit of 61/634,361 02/28/2012
and claims benefit of 61/631,746 01/10/2012

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 01/26/2021

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/123,499**

Projected Publication Date: 05/06/2021

Non-Publication Request: No

Early Publication Request: No

Title

MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES

Preliminary Class

606

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor

community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
Page 233 of 337

PLUS Search Results for S/N 17123499, Searched Thu Feb 25 08:28:45 EST 2021

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

4595228 99
4776589 66
4938818 84
5002594 84
6200664 84
5528831 83
4553359 68
4050402 68
4332560 68
4391188 68
4399679 68
4485647 68
4574608 68
4826026 68
4846375 68
4882012 68
4911563 68
4938520 68
4941623 68
RE33265 68
4948001 68
4961601 68
4966277 68
4987768 68
5027834 68
5277372 68
5322349 68
5368469 68
5497883 68
5531341 68
5620243 68
5647188 68
5749765 68
5758368 68
5802809 68
6076259 68
6088999 68
6112694 68
6142299 68
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6382443 68
20010001919 68
20040186486 68
20140336701 68
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/123,499	12/16/2020	Roger P. Jackson	JAC023-667905	2823

24030 7590 03/09/2021

POLSINELLI PC
900 WEST 48TH PLACE
SUITE 900
KANSAS CITY, MO 64112-1895

EXAMINER	
COMSTOCK, DAVID C	

ART UNIT	PAPER NUMBER
3773	

NOTIFICATION DATE	DELIVERY MODE
03/09/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

uspt@polsinelli.com

Office Action Summary	Application No. 17/123,499	Applicant(s) Jackson et al.	
	Examiner DAVID C COMSTOCK	Art Unit 3773	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 16 December 2020.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-17 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-17 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 16 December 2020 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date 16 DEC 2020.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under pre-AIA 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of pre-AIA 35 U.S.C. 103(c) and potential pre-AIA 35 U.S.C. 102(e), (f) or (g) prior art under pre-AIA 35 U.S.C. 103(a).

Claims 1, 2, 4, 5 and 8-10 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Prevost, et al. ("Prevost"; 2011/0106179).

Regarding claim 1, Prevost discloses a medical implant assembly 2 (Fig. 1) comprising: a receiver 20 (refer to Fig. 2) having a first arm, e.g., 22, and a second arm, e.g., 23, spaced apart from each other by a channel 21, the first arm and the second arm each having a top surface, e.g., 24, 25, respectively, and an inner surface having discontinuously helically wound threads, e.g., 7, extending up to the top surface, the channel being formed by the first arm and the second arm opening onto the top surfaces and configured to receive a rod 3 (refer to Fig. 1); and a closure 1 being threaded and configured to close the channel (id.), the closure having an axis of rotation X and a continuously helically wound thread form 5, the continuously helically wound thread form having a start structure 72 (Fig. 8; paras. 0006 and 0031; discussing the thread start 72 having a truncation cut 74 "so the threading begins smoothly and consistently at the same location") and an upper loading surface (see Fig. A, below) extending between a root (id.) and a crest (id.) of the continuously helically wound thread form, the start structure 72 (Fig. 8) having a leading face (Fig. B, below; cf. Fig. 8) extending below the upper loading surface, the leading face including a partial concave surface (see Fig. B, below) adjacent the root (Fig. A). Prevost teaches that the thread is formed with a truncation cut 74 (Fig. 8) having a smooth transition at the thread

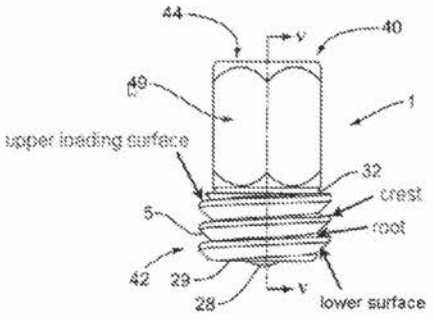


Fig. A

start 72 (Fig. 8 and cf. Fig. B) so the threading begins smoothly and consistently at the same location (para. 0031).

Prevost does not disclose the partially convex surface adjacent the crest (*added by Examiner to Fig. B for illustration and the following discussion; cf. Fig. 8*). However, as previously mentioned, Prevost is interested in providing a thread with a smooth transition "so the threading begins smoothly and consistently at the same location" (supra and para. 0031). In keeping with this guiding principle, it would have been obvious to a person having ordinary skill in the art before the effective filing date of the claimed invention to round off the sharp edge (i.e., include an exterior fillet, in basic engineering terms; similar to the disclosed partially concave surface, which is essentially an interior fillet) in order to provide an even smoother transition so the threading begins smoothly and consistently at the same location without catching any sharp edges. It would have been further obvious to define the radius of curvature of both the partial concave and partial convex surfaces to be substantially equal to each other, e.g., for simplicity of design and manufacturing and to facilitate a smooth transition.

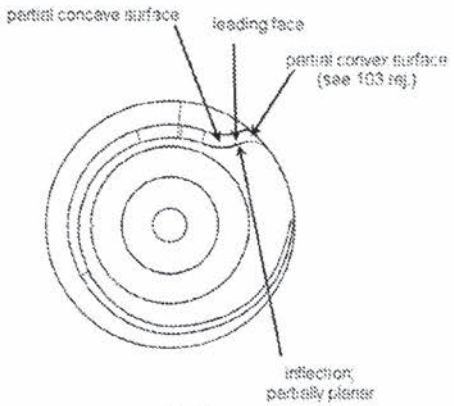


Fig. B

Regarding claim 2, the partial concave surface would tangentially blend with the partial convex surface where the two have the same radius of curvature (supra and Fig. B illustration).

Regarding claim 4, the continuously helically wound thread form of the closure includes a lower surface (Fig. A) disposed between the root and the crest, and wherein the leading face of the start structure extends between the upper loading surface and the lower surface (Fig. B).

Regarding claim 5, the leading face of the start structure would include an at least partial planar surface at the region of inflection between the concave and convex portions (Fig. B).

Regarding claim 8, the start structure includes a bottom beveled surface (annotated Fig. 3).

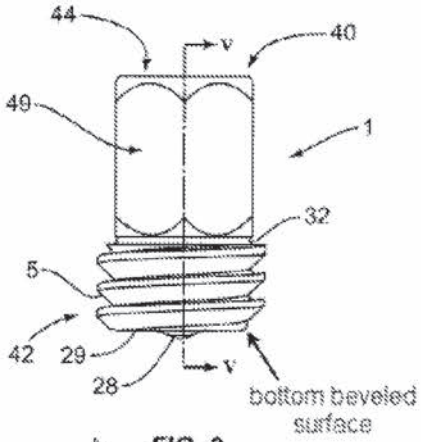


FIG. 3

Regarding claim 9, the upper loading surface of the continuously helically wound thread form of the threaded closure slopes rearward from the root to towards the crest (the upward angle of the thread, i.e., helix angle).

Regarding claim 10, Prevost discloses the claimed invention (supra) except for explicitly reciting that the slope of the upper loading surface is greater than five degrees measured from a horizontal line drawn tangent along the upper loading surface. It would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to select a slope greater than five degrees, e.g., to provide a desired rate of advancement and an efficient and effective closure mechanism. It is further noted that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Claim 3 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Prevost, et al. ("Prevost"; 2011/0106179), as applied to claim 1, in view of Boschert (2005/0277928).

Prevost discloses the claimed medical implant assembly (supra) except for a second start structure at a location diametrically opposed to the first start structure (e.g., 72, Fig. 8). Boschert also discloses a medical implant assembly 10 (Fig. 1) and teaches that the threads of a set screw, which would correspond to appropriate receiver threads, can be designed with a double lead (i.e., a second thread and second start) "to allow the set screw to start more easily than with a single lead" (para. 0057). It would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to configure the set screw and cooperating threads of Prevost with a second thread and second start, in view of Boschert, in order to allow the set screw to start more easily than with a single thread and start. It would have been further obvious to position the thread starts at diametrically opposed locations, e.g., to provide maximum clearance for ease of starting and to correspond to the locations of the threads on the opposing arms of the receiver.

Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Prevost, et al. ("Prevost"; 2011/0106179), as applied to claim 1, in view of Raynor et al. ("Raynor"; 2004/0162560).

Regarding claim 6, Prevost discloses the claimed implant assembly (supra) except for the arms including threaded breakoff extensions. Raynor also discloses a medical implant assembly 10 (see, e.g., Figs. 1 and 2) and teaches that arms of a receiver 12 can include a first and second breakoff extension 22, 24 (para. 0022) coupled to the top surface of each arm, respectively. The breakoff extensions include an inner surface having a discontinuously helically wound thread

form 28, 30, respectively (Fig. 1 and para. 0022). The discontinuously helically wound thread form of each breakoff extension is configured to cooperate with the discontinuously helically wound thread of each arm to rotatably transfer a closure (set screw) 14 there between prior to the first and second breakoff extensions being separated from the first and second arms, respectively (para. 0022). The breakoff arms facilitate easier access of the closure and easy breaking off and removal of the extensions when the closure is secured in place (id.).

Thus, it would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to provide the implant assembly of Prevost with arms including a breakoff extension coupled to the top surface of each arm, each breakoff extension including an inner surface having a discontinuously helically wound thread form configured to cooperate with the discontinuously helically wound thread of each arm, in view of Raynor, to rotatably transfer the closure there between prior to the first and second breakoff extensions being separated from the first and second arms, and facilitate easier access of the closure and easy breaking off and removal of the extensions when the closure is secured in place.

Regarding claim 7, Raynor further teaches that a radiused notch 32 (refer to Fig. 1) is located at a convergence of the first breakoff extension 22 and the first arm at the top surface thereof, and a second outer radiused notch 34 is located at a convergence of the second breakoff extension 24 and the second arm at the top surface thereof, each outer radiused notch being located opposite a first and second inner radiused recess (i.e., generally the thread root at that location), respectively. The radiused notch facilitates easy breaking off of the extensions (para. 0022).

Therefore, it would have been further obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to provide a radiused notch located at a convergence of each breakoff extension and each respective arm at the top surface thereof, each radiused notch being located opposite a respective inner radiused recess (i.e., generally the thread root at that location), in view of Raynor, to facilitate the easy breaking off of the extensions.

Claims 11-15 and 17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Prevost, et al. ("Prevost"; 2011/0106179) in view of Boschert (2005/0277928).

Regarding claim 11, Prevost discloses a medical implant assembly 2 (Fig. 1) comprising: a receiver 20 (refer to Fig. 2) having a first arm, e.g., 22, and a second arm, e.g., 23, spaced apart from each other by a channel 21, the first arm and the second arm each having a top surface, e.g., 24, 25, respectively, and an inner surface, e.g., 7, the first and second arms each having discontinuously helically wound threads, e.g., 7, extending up to the top surface, the channel being formed by the first arm and the second arm opening onto the top surfaces and configured to receive a rod 3 (refer to Fig. 1); and a closure 1 configured to close the channel (id.), the closure having an axis of rotation X and a continuously helically wound thread form 5, the continuously helically wound thread form having a start structure 72 (Fig. 8; paras. 0006 and 0031; discussing the thread start 72 having a truncation cut 74 "so the threading begins smoothly and consistently at the same location") and an upper loading surface (see Fig. A) extending

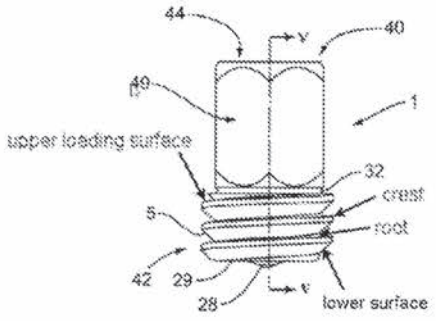


Fig. A

between a root (id.) and a crest (id.) of the continuously helically wound thread form, the start structure 72 (Fig. 8) having a leading face (Fig. B; cf. Fig. 8) extending below the upper loading surface, the leading face including a partial concave surface (see Fig. B) adjacent the root (Fig. A). Prevost teaches that the thread is formed with a truncation cut 74 (Fig. 8) having a smooth transition at the thread start 72 (Fig. 8 and cf. Fig. B) so the threading begins smoothly and consistently at the same location (para. 0031).

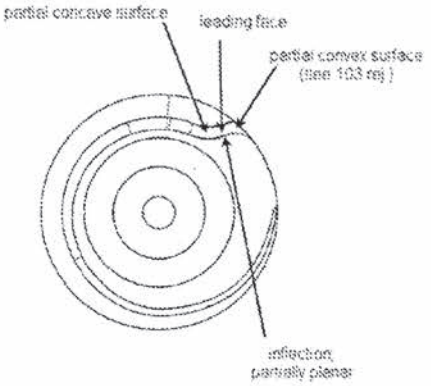


Fig. B

Prevost does not disclose the partially convex surface adjacent the crest (*added by Examiner to Fig. B for illustration and the following discussion; cf. Fig. 8*). However, as previously mentioned, Prevost is interested in providing a thread with a smooth transition "so the threading begins smoothly and consistently at the same location" (supra and para. 0031). In keeping with this guiding principle, it would have been obvious to a person having ordinary skill in the art before the effective filing date of the claimed invention to round off the sharp edge (i.e., include an exterior fillet, in basic engineering terms; similar to the disclosed partially concave surface, which is essentially an interior fillet) in order to provide an even smoother transition so the threading begins smoothly and consistently at the same location without catching any sharp edges. It would have been further obvious to define the radius of curvature of both the partial concave and partial convex surfaces to be substantially equal to each other, e.g., for simplicity of design and manufacturing and to facilitate a smooth transition.

Prevost also does not disclose a second thread and second start structure in addition to the first thread and start structure. Boschert discloses a medical implant assembly 10 (Fig. 1) and teaches that the threads of a set screw, which would correspond to appropriate receiver threads, can be designed with a double lead (i.e., a second thread and second start) "to allow the set screw to start more easily than with a single lead" (para. 0057). It would have been further obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to configure the set screw and cooperating threads of Prevost, as modified above, with a second thread and second start, in view of Boschert, in order to allow the set screw to start more easily than with a single lead.

Regarding claim 12, it would have been further obvious to position the thread starts at diametrically opposed locations on the closure, e.g., to provide maximum clearance for ease of starting and to correspond to the locations of the threads on the opposing arms of the receiver.

Regarding claim 13, each leading face would include an inflection point where the curvature transitions from concave to convex (see, e.g., Fig. B showing the first such inflection point; the second being comparable and provided by Boschert (supra)).

Regarding claim 14, each of the two threads (the second thread and start being taught by Boschert (supra)) comprises a lower surface (e.g., Fig. A) disposed between the root and the crest, and wherein the leading face of the start structure extends between the upper loading surface and the lower surface (cf. Fig. B).

Regarding claim 15, the leading face of each start structure would include an at least partial planar surface at the region of inflection between the concave and convex portions (cf. Fig. B).

Regarding claim 17, each start structure of the combination would include a bottom beveled surface portion (cf., e.g., annotated Fig. 3).

Claim 16 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Prevost, et al. ("Prevost"; 2011/0106179) in view of Boschert (2005/0277928), as applied to claim 11, and further in view of Raynor et al. ("Raynor"; 2004/0162560).

The combination of Prevost and Boschert, as set forth above, discloses the claimed implant assembly except for the top surfaces of the first and second arms including a breakoff extension with an inner surface having a discontinuously helically wound thread form, the first and second arm breakoff extension thread forms being continuous with the respective discontinuously helically wound thread form on the inner surface of the first and second arms.

Raynor also discloses a medical implant assembly 10 (see, e.g., Figs. 1 and 2) and teaches that arms of a receiver 12 can include a first and second breakoff extension 22, 24 (para. 0022) coupled to the top surface of each arm, respectively. The breakoff extensions include an inner surface having a discontinuously helically wound thread form 28, 30, respectively (Fig. 1 and para. 0022). The discontinuously helically wound thread form of each breakoff extension is configured to cooperate with the discontinuously helically wound thread of each arm to rotatably transfer a closure (set screw) 14 there between prior to the first and second breakoff extensions being separated from the first and second arms, respectively (para. 0022). The breakoff arms facilitate easier access of the closure and easy breaking off and removal of the extensions when the closure is secured in place (id.).

Thus, it would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to provide the implant assembly of the

combination of Prevost and Boschert, as set forth above, with top surfaces of the first and second arms each including a breakoff extension with an inner surface having a discontinuously helically wound thread form, the first and second arm breakoff extension thread forms being continuous with the respective discontinuously helically wound thread form on the inner surface of the first and second arms, in view of Raynor, in order to rotatably transfer the closure there between prior to the first and second breakoff extensions being separated from the first and second arms, and facilitate easier access of the closure and easy breaking off and removal of the extensions when the closure is secured in place.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

Claims 1-17 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-26 of U.S. Patent No. 10,548,641. Although the claims at issue are not identical, they are not patentably distinct from each other because the differences amount to minor changes in the arrangement and phraseology of the claim limitations. The claims of the issued patent and the present application are directed to the substantially same invention of an implant assembly characterized by a receiver having threaded arms and a threaded

closure, the closure having a thread start structure with a concave and convex surface and in some claims a dual-start configuration. The claims also are directed to threaded breakoff extensions and other details such as a beveled surface. Where differences exist, the claims of the issued patent recite more elements and are more specific (e.g., further details regarding the receiver and the discontinuously wound threads on the arms). Thus, the invention of the patent claims are in effect a "species" of the "generic" invention of the application claims. It has been held that the generic invention is "anticipated" by the "species". See *In re Goodman*, 29 USPQ2d 2010 (Fed. Cir. 1993). Since the application claims are anticipated by the patent claims, they are not patentably distinct from the patent claims.

The claims of the present application are generally mapped to the claims of the issued patent as follows:

Application 17/123,499	Patent 10,548,641
1	1, 9-12, 21
2	14
3	5
4	1
5	14
6	20
7	20
8	13
9	1
10	1
11	1, 9-12, 21
12	5
13	14
14	1
15	14
16	20
17	13

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure (see attached PTO-892). Included on the PTO-892 or cited by Applicant, the following references are particularly relevant to the thread start structure.

Wilcox (2010/0137918), on attached PTO-892, discloses a bone anchor having a set screw with a truncated thread that facilitates easier threading (end of para. 0050).

Prevost et al. (2011/0270321), cited by Applicant, shows a bone anchor having a set screw with a thread having a truncation cut in Figure 9.

Kirschman (2011/0152947), cited by Applicant, teaches a bone anchor with a cap (set screw) starting thread having a cut-out area to provide tactile feedback to the surgeon as the cap drops into the receiver (para. 0038).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Comstock whose telephone number is (571) 272-4710. The examiner can normally be reached Monday-Friday, 9 a.m. - 6 p.m.

If attempts to reach the examiner by telephone are unsuccessful, ***please contact* the examiner's supervisor, SPE, *at* (571) 272-4719**. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the

Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DAVID C COMSTOCK/
Examiner, Art Unit 3773

/EDUARDO C ROBERT/
Supervisory Patent Examiner, Art Unit 3773

Notice of References Cited	Application/Control No. 17/123,499	Applicant(s)/Patent Under Reexamination Jackson et al.	
	Examiner DAVID C COMSTOCK	Art Unit 3773	Page 1 of 1

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-5320467-A	06-1994	Erbes; John G.	F16B35/047	411/386
*	B	US-20040162560-A1	08-2004	Raynor, Donald E.	F16B33/02	606/278
*	C	US-20040172032-A1	09-2004	Jackson, Roger P.	A61B17/683	606/278
*	D	US-20050267477-A1	12-2005	Jackson, Roger P.	A61B17/7032	606/278
*	E	US-20050277928-A1	12-2005	Boschert, Paul F.	A61B17/7037	606/328
*	F	US-20100137918-A1	06-2010	WILCOX; Bryan S.	A61B17/7037	606/301
*	G	US-7927360-B2	04-2011	Pond, Jr.; John D.	A61B17/7037	606/265
*	H	US-20110106179-A1	05-2011	Prevost; Julien J.	A61B17/7032	606/308
*	I	US-20150119945-A1	04-2015	Sasing; Jude L.	A61B17/7032	606/308
*	J	US-10548641-B2	02-2020	Jackson; Roger P.	A61B17/8665	1/1
	K					
	L					
	M					

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/123,499	Jackson et al.
	Examiner	Art Unit
	DAVID C COMSTOCK	3773

CPC - Searched*		
Symbol	Date	Examiner
A61B17/7035, 7032, 863, 8665, 8685	02/26/2021	/DC/
A61B2090/037	02/26/2021	/DC/
A61B2017/8655	02/26/2021	/DC/

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
606	264, 265, 266, 267, 270, 273, 306	02/26/2021	/DC/
403	362	02/26/2021	/DC/
411	386, 393	02/26/2021	/DC/

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/DAVID C COMSTOCK/ Examiner, Art Unit 3773	

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	17/123,499	Jackson et al.
	Examiner	Art Unit
	DAVID C COMSTOCK	3773

Search Notes		
Search Notes	**Date**	**Examiner**
PLUS search	02/25/2021	/DC/
EAST text search--see EAST search history (CPC and US classification search text limited except where otherwise indicated)	02/26/2021	/DC/
Inventor name search--see EAST search history	02/26/2021	/DC/
Consulted Daniel Wiley in class 403 (joints and connections): recommended speaking with Fleming Saether in class 411	02/25/2021	/DC/
Consulted Fleming Saether in class 411 (threaded fasteners): search 411/386 and F16B25/0052, 0042	02/25/2021	/DC/
References cited in parent applications 16779304, 15964502, 15469076, 14566356 and 13694849 have been reviewed	02/26/2021	/DC/

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

/DAVID C COMSTOCK/ Examiner, Art Unit 3773	

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	Art Unit
	DAVID C COMSTOCK	3773

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/26/2021								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
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	12	✓								
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	14	✓								
	15	✓								
	16	✓								
	17	✓								

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PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(Use as many sheets as necessary)*	**APPLICATION NO.:** TBD	**FILING DATE:** Herewith
	INVENTOR(S): Roger P. Jackson	**ART UNIT:**
	EXAMINER NAME:	**ATTY. DOCKET NO.:** JAC023-667905

U.S. PATENT DOCUMENTS

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[1] Applicant's unique citation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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IPR2023-01433; Petitioners' EX1002
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OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
EXAMINER INITIALS*	Cite No.[1]	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T[6]
	D1.		
EXAMINER /DAVID C COMSTOCK/		DATE CONSIDERED 02/24/2021	
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Bibliographic Data

Application No: 17/123,499

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /DAVID C COMSTOCK/ (Examiner's Signature) | (Initials)

Title: MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/16/2020	606	3773	JAC023-667905
RULE			

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CONTINUING DATA

This application is a CON of 16779304 01/31/2020 PAT 10898233

16779304 is a CON of 15964502 04/27/2018 PAT 10548641

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13694849 has PRO of 61634361 02/28/2012

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FOREIGN APPLICATIONS

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	666	(setscrew or "set screw" or closure) same thread same (higby or higbee or truncated)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/27 01:10
L2	27	1 and (vertebr$2 or (fixation with rod) or surgery or surgical or medical)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/27 01:11
S1	1,038	((("JACKSON") near3 ("Roger")) OR (("SURBER") near3 ("James"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2021/02/24 19:03
S2	249	("0000002" | "0447775" | "1300275" | "20010047208" | "20020035366" | "20020120272" | "20020133154" | "20020143341" | "20020173791" | "20030014054" | "20030023243" | "20030088248" | "20030100896" | "20030100904" | "20030114852" | "20030125741" | "20030149431" | "20030153913" | "20030158552" | "20030187433" | "20030199873" | "20040039383" | "20040049196" | "20040138660" | "20040138662" | "20040143265" | "20040147929" | "20040153068" | "20040167524" | "20040167525" | "20040172032" | "20040176766" | "20040186474" | "20040260283" | "20050000348" | "20050131421" | "20050182410" | "20050216003" | "20050277928" | "20050283157" | "20060009773" | "20060036244" | "20060079893" | "20060083603" | "20060089643" | "20060155278" | "20070043357" | "20070093827" | "20070123862" | "20070123867" | "20070208344" | "20070219554" | "20070260246" |	US-PGPUB; USPAT	OR	ON	2021/02/24 19:05

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S4	3	(("20080045953") or ("20050277928") or ("20100125302")).PN.	US-PGPUB; USPAT	OR	OFF	2021/02/24 20:09
S5	797	(411/386).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/02/26 19:11
S6	1,871	F16B25/0052,0042.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:12
S7	341	S5 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 19:15
S8	211	S5 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:15
S9	552	S7 S8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:16
S10	133	S9 and ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or	US-PGPUB; USPAT; USOCR;	OR	ON	2021/02/26 19:18

		rounded or rounding or concave or convex or easy or quick))	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S11	515	(411/393).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/02/26 19:36
S12	119	S11 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 19:36
S13	56	S11 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:36
S14	175	S12 S13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:36
S15	10	S14 and ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or rounded or rounding or concave or convex or easy or quick))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:37
S16	165	S14 not S15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:38
S17	298	(vertebr$2 or surgical or surgery or medical) and ((setscrew or "set screw") same ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or rounded or rounding or concave or convex or easy or quick)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:43
S18	75	S17 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 19:43

S19	2	S17 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:43
S20	77	S18 S19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:44
S21	158	S6 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 19:47
S22	1,080	S6 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:47
S23	1,238	S21 S22	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:48
S24	1,568	(403/362).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/02/26 19:59
S25	386	S24 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 19:59
S26	161	S24 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:59
S27	547	S25 S26	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 19:59
S28	11	S27 and ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or	US-PGPUB; USPAT; USOCR;	OR	ON	2021/02/26 20:00

		rounded or rounding or concave or convex or easy or quick))	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S29	240	("2004/0162560").URPN.	USPAT	OR	ON	2021/02/26 20:05
S30	3	("9445847" | "D309664" | "D346150").PN.	US-PGPUB; USPAT	OR	ON	2021/02/26 20:06
S31	15	(vertebr$2 or surgical or surgery or medical) and ((setscrew or "set screw") same (thread or (advancement with structure) or (helical$2 with wound)) same truncat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:25
S32	36,811	A61B17/7035,7032,863,8665,8685.cpc. A61B2090/037.cpc. A61B2017/8655.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:32
S33	6,096	A61B17/863.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:35
S34	747	S33 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 20:36
S35	2,967	S33 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:36
S36	3,714	S34 S35	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:37
S37	250	S36 and ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or rounded or rounding or concave or convex or easy or quick or truncat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2021/02/26 20:38

			DERWENT; IBM_TDB			
S38	5,647	S32 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 20:42
S39	18,696	S32 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:42
S40	24,343	S38 S39	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:43
S41	151	S40 and ((arm or extension) with (break$4 or frangibl$1)) and (setscrew or "set screw" or (closure with thread$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:46
S42	22	S40 and (setscrew or "set screw" or (closure with thread$3)) same ((thread$3 or (helically with wound) or (guide with advancement)) with (truncat$3 or start))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:50
S43	3,549	(606/264,265,266,267,270,273,306).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/02/26 20:55
S44	1,836	S43 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 20:55
S45	1,165	S43 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 20:56
S46	3,001	S44 S45	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2021/02/26 20:56

			DERWENT; IBM_TDB			
S47	98	S46 and (setscrew or "set screw" or (closure with thread$3)) and (((extension or arm) with (break$4 or frangible)) or ((higby or truncated) with thread$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 21:01
S48	14	(US-20090092463-$ or US-20050267477-$ or US-20050187549-$ or US-20040162560-$ or US-20140081334-$ or US-20110270321-$ or US-20110152947-$ or US-20090138052-$ or US-20040172032-$ or US-20100137918-$ or US-20110106179-$).did. or (US-5320467-$ or US-7927360-$).did. or (US-20110106179-$).did.	US-PGPUB; USPAT; DERWENT	OR	ON	2021/02/26 21:03
S49	199	("0447775" | "2152681" | "2564029" | "3183531" | "4755092" | "4840526" | "4952110" | "4981406" | "5073073").PN. OR ("2005/0187549" | "2009/0138052" | "2010/0137918" | "2011/0152947" | "2011/0270321" | "2014/0081334" | "5320467").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 21:06
S50	72	S49 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 21:07
S51	0	S49 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/26 21:08
S52	50	(US-17123499-$ | US-20010001919-$ | US-20040186486-$ | US-20140336701-$ | US-20190161996-$ | US-4050402-$ | US-4273123-$ | US-4332560-$ | US-4391188-$ | US-4399679-$ | US-4485647-$ | US-4553359-$ | US-4574608-$ | US-4576299-$ | US-4595228-$ | US-4615441-$ | US-4631644-$ | US-4775064-$ | US-4776589-$ | US-4826026-$ | US-4846375-$ | US-4882012-$ | US-4911563-$ | US-4938520-$ | US-4938818-$ | US-4941623-$ | US-4948001-$ | US-4961601-$ | US-4966277-$ | US-4987768-$ | US-5002594-$ | US-5027834-$ | US-5277372-$ | US-5322349-$ | US-5368469-$ | US-5497883-$ | US-5528831-$ | US-5531341-$ | US-5620243-$ | US-5647188-$ | US-5749765-$ | US-5758368-$ | US-5802809-$ | US-6076259-$ | US-6088999-$ | US-6112694-$ | US-	US-PGPUB; USPAT; USOCR	OR	ON	2021/02/26 21:12

		6142299-$ | US-6195962-$ | US-6200664-$ | US-6382443-$ | US-RE33265-$).DID.				
S53	8	(US-20140081334-$ or US-20110270321-$ or US-20110152947-$ or US-20100137918-$ or US-20090138052-$ or US-20050187549-$).did. or (US-5320467-$).did. or (US-20110106179-$).did.	US-PGPUB; USPAT; DERWENT	OR	ON	2021/02/26 21:14
S54	1	("10898233").PN.	USPAT	OR	OFF	2021/02/26 21:25
S55	1	("10548641").PN.	USPAT	OR	OFF	2021/02/26 21:26
S56	1	("9956004").PN.	USPAT	OR	OFF	2021/02/26 21:28
S57	1	("9636146").PN.	USPAT	OR	OFF	2021/02/26 21:29
S58	1	("8911479").PN.	USPAT	OR	OFF	2021/02/26 21:30
S59	469	(606/270).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/02/26 21:38
S60	14	S48 S53	US-PGPUB; USPAT; DERWENT	OR	ON	2021/02/26 21:55
S61	249	("0000002" | "0447775" | "1300275" | "20010047208" | "20020035366" | "20020120272" | "20020133154" | "20020143341" | "20020173791" | "20030014054" | "20030023243" | "20030088248" | "20030100896" | "20030100904" | "20030114852" | "20030125741" | "20030149431" | "20030153913" | "20030158552" | "20030187433" | "20030199873" | "20040039383" | "20040049196" | "20040138660" | "20040138662" | "20040143265" | "20040147929" | "20040153068" | "20040167524" | "20040167525" | "20040172032" | "20040176766" | "20040186474" | "20040260283" | "20050000348" | "20050131421" | "20050182410" | "20050216003" | "20050277928" | "20050283157" | "20060009773" | "20060036244" | "20060079893" | "20060083603" | "20060089643" |	US-PGPUB; USPAT	OR	ON	2021/02/26 22:00

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ATTACHMENT A
APPLN. NO. TBD
INFORMATION DISCLOSURE STATEMENT
FOR
STATEMENT UNDER MPEP § 2001.06(b)

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U.S. APPLICATION DOCUMENTS			
Examiner Initials	Application No.	Filing Date	Name of Patentee or Applicant of Cited Document
EXAMINER /DAVID C COMSTOCK/		DATE CONSIDERED 02/24/2021	
EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DC/

Zimvie_Zimmer Biomet v. Jackson
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UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/123,499	12/16/2020	Roger P. Jackson	JAC023-667905

CONFIRMATION NO. 2823

24030
POLSINELLI PC
900 WEST 48TH PLACE
SUITE 900
KANSAS CITY, MO 64112-1895

PUBLICATION NOTICE

OC000000125401332

Title:MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES

Publication No.US-2021-0128202-A1
Publication Date:05/06/2021

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/123,499	Filing Date 12/16/2020	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

AMENDMENT	06/09/2021	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/JAMES ELLIOTT/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s):	Roger P. Jackson et al.		
App. No.:	17/123,499	Con. No.:	2823
Filed:	December 16, 2020	Art Unit:	3773
Title:	MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES	Examiner:	David C. Comstock

AMENDMENT AND RESPONSE TO NON-FINAL OFFICE ACTION

Via EFS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Dear Commissioner:

In response to the Non-Final Office action dated March 9, 2021, please consider the following remarks and amend the above-identified application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims begin on page 3 of this paper.

Remarks begin on page 7 of this paper.

Amendments to the Specification

Please replace the Title on page 1 of the Specification with the following showing markings to show all changes relative to the previous version:

MEDICAL IMPLANT THREADED PLUG ~~CLOSURE~~ HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES

Please replace the Abstract on page 38 of the Specification with the following showing markings to show all changes relative to the previous version:

A medical implant assembly including a receiver and a plug ~~closure~~. The receiver ~~having~~ can be configured with first and second arms [[each]] having a ~~discontinuously~~ helically wound thread extending up to a top surface thereof. The plug ~~closure~~ being at least partially threadably positioned within ~~threaded and configured to close~~ the channel. The plug ~~closure~~ having an axis of rotation and a continuously helically wound thread form. The continuously helically wound thread form having a start structure and an upper ~~loading~~ surface extending between a root and a crest of the continuously helically wound thread form. The start structure having a leading face extending below the upper ~~loading~~ surface. The leading face including a partial concave surface adjacent the root and a partial convex surface adjacent the crest. The partial concave and partial convex surfaces each defined by a radius of curvature that [[is]] can be substantially equal with respect to each other.

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior listings and versions of claims in this application.

1. (Currently Amended) A medical implant assembly comprising:

a receiver having ~~a first arm and a second arm spaced apart from each other by a channel, the first arm and the second arm each having a top surface and~~ an upper portion with an inner surface~~, the first and second arms each having a discontinuously~~ at least partially configured as a helically wound thread extending up to [[the]] a top surface of the receiver, and a [[the]] channel ~~being~~ formed in the upper portion of the receiver ~~by the first arm and the second arm opening onto the top surfaces~~ and configured to receive a rod; and

a ~~closure~~ plug being threaded and configured to be positioned within the upper portion ~~close the channel~~, the ~~closure~~ plug having an axis of rotation, [[and]] a continuously helically wound thread form, and a substantially flat bottom surface with an annular outer edge, the substantially flat bottom surface configured to engage the rod, the continuously helically wound thread form having a start structure [[and]] with an upper ~~loading~~ surface extending between a root and a crest of the continuously helically wound thread form, the start structure having a leading face extending below the upper ~~loading~~ surface to a lower surface of the start structure, the leading face including a partial concave surface adjacent the root and a partial convex surface adjacent the crest, the partial concave and partial convex surfaces each defined by a radius of curvature that is substantially equal with respect to each other, the lower surface of the start structure being spaced apart and above the annular outer edge of the substantially flat bottom surface so as to not be connected with the annular outer edge thereof.

2. (Original) The medical implant assembly of claim 1, wherein the partial concave surface tangentially blends with the partial convex surface.

3. (Currently Amended) The medical implant assembly of claim 1, wherein the start structure is a first start structure disposed at a diametrically opposite location on the ~~closure~~ plug from a second start structure.

4. (Canceled)

5. (Original) The medical implant assembly of claim 1, wherein the leading face of the start structure includes at least a partial planar surface.

6. (Currently Amended) The medical implant assembly of claim [[1]] 19, wherein the first arm includes a first breakoff extension coupled to the top surface of the first arm, and the second arm includes a second breakoff extension coupled to the top surface of the second arm, each of the first and second breakoff extensions including an inner surface having a discontinuously helically wound thread form, the discontinuously helically wound thread form of the first breakoff extension configured to cooperate with the discontinuously helically wound thread of the first arm, and the discontinuously helically wound thread form of the second breakoff extension configured to cooperate with the discontinuously helically wound thread of the second arm to rotatably transfer the plug therebetween ~~closure there between~~ prior to the first and second breakoff extensions being separated from the first and second arms, respectively.

7. (Original) The medical implant assembly of claim 6, wherein a first outer radiused notch is located at a convergence of the first breakoff extension and the first arm at the top surface thereof, and a second outer radiused notch is located at a convergence of the second breakoff extension and the second arm at the top surface thereof, the first outer radiused notch being located opposite a first inner radiused recess, and the second outer radiused notch being located opposite a second inner radiused recess.

8. (Currently Amended) The medical implant assembly of claim 1, wherein the lower surface of the start structure includes a bottom beveled surface.

9. (Currently Amended) The medical implant assembly of claim 1, wherein the upper ~~loading~~ surface of the continuously helically wound thread form of the threaded ~~closure~~ plug slopes rearward from the root [[to]] towards the crest.

10. (Currently Amended) The medical implant assembly of claim 9, wherein [[the]] a slope of the upper ~~loading~~ surface is at an angle greater than five degrees measured between a ~~from a horizontal~~ line drawn perpendicular to the axis of rotation of the plug and a tangent line drawn ~~tangent~~ along the upper ~~loading~~ surface.

11. (Currently Amended) A medical implant assembly comprising:

a receiver having an upper portion with an inner surface, a top surface, and ~~a first arm and a second arm spaced apart from each other by~~ a channel, the ~~first arm and the second arm each having a top surface and an inner surface, the first and second arms~~ inner surface having ~~a discontinuously~~ helically wound ~~threads~~ thread extending up to the top surface, the channel ~~being formed by the first arm and the second arm opening onto the top surfaces and~~ configured to receive a rod; and

a ~~closure~~ plug configured for positioning within the upper portion of the receiver ~~to close the channel~~, the ~~closure~~ plug having an axis of rotation, [[and]] a continuously helically wound thread form comprising a first thread and a second thread, a substantially flat bottom surface with an annular outer edge, and an outward facing surface encircling the substantially flat bottom surface, the first thread comprising a first start structure and a first upper ~~loading~~ surface extending between a first root and a first crest of the first thread, the first start structure including a first leading face extending below the first upper ~~loading~~ surface to a first lower surface, the second thread comprising a second start structure and a second upper ~~loading~~ surface extending between a second root and a second crest of the second thread, the second start structure including a second leading face extending below the second upper ~~loading~~ surface to a second lower surface, the first and second leading faces each including a partial concave surface adjacent the first and second root, respectively, and a partial convex surface adjacent the first and second crest, respectively, the partial concave and partial convex surfaces of the first and second leading faces each defined by a radius of curvature, ~~that is substantially equal with respect to each other~~ the first lower surface of the first thread and from the second lower surface of the second thread are spaced above and apart from the annular outer edge of the substantially flat bottom surface of the plug.

12. (Currently Amended) The medical implant assembly of claim 11, wherein the first start structure and the second start structure are disposed at diametrically opposite locations from each other on the ~~closure~~ plug.

13. (Original) The medical implant assembly of claim 11, wherein the first leading face includes a first inflection point between the partial concave surface and the partial convex surface of the first leading face, and the second leading face includes a second inflection point between the partial concave surface and the partial convex surface of the second leading face.

14. (Canceled)

15. (Original) The medical implant assembly of claim 11, wherein the first and second leading faces each includes at least a partial planar surface.

16. (Currently Amended) The medical implant assembly of claim [[11]] 21, wherein the top surfaces of the first and second arms each include a breakoff extension with an inner surface having a discontinuously helically wound thread form, the first and second arm breakoff extension thread forms being continuous with the respective discontinuous ~~discontinuously~~ helically wound thread form on the inner surface of the first and second arms.

17. (Currently Amended) The medical implant assembly of claim 11, wherein the first ~~start structure~~ lower surface includes a first bottom beveled surface and the second lower surface ~~start structure~~ includes a second bottom beveled surface.

18. (New) The medical implant assembly of claim 1, wherein the plug is a breakoff plug.

19. (New) The medical implant assembly of claim 1, wherein the upper portion of the receiver includes a first arm and a second arm spaced apart from each other by the channel, the helically wound thread being discontinuous and formed on the first and second arms, the top surface of the receiver being formed on the first arm and the second arm.

20. (New) The medical implant assembly of claim 11, wherein the plug is a breakoff plug.

21. (New) The medical implant assembly of claim 11, wherein the upper portion of the receiver includes a first arm and a second arm spaced apart from each other by the channel, the helically wound thread being discontinuous and formed on the first and second arms, the top surface of the receiver being formed on the first arm and the second arm.

22. (New) The medical implant assembly of claim 11, wherein the radius of curvature for the partial concave and partial convex surfaces of the first and second leading faces are substantially equal with respect to each other.

REMARKS

This paper is submitted in response to the Office action dated March 9, 2021.

I. Status of the Claims

Claims 1-17 were originally presented in the as-filed application. In the present amendment and response claims 1, 3, 6, 8-12, and 16-17 have been amended and claims 4 and 14 are canceled, without prejudice or disclaimer of the subject matter contained therein. New claims 18-22 have been added herein. Accordingly, claims 1-3, 5-13, and 15-22 are now pending in the application. New claims 18-22 are fully supported in the original application and do not include new matter.

II. Rejections under 35 USC §103

Claims 1, 2, 4, 5, and 8-10 stand rejected under pre-AIA 35 U.S.C. § 103(a) as being anticipated by U.S. Patent Publication No. 2011/0106179 to Prevost (hereinafter "Prevost").

Claim 3 stands rejected under pre-AIA 35 U.S.C. § 103(a) as being obvious by Prevost in view of U.S. Patent Publication No. 2005/0277928 to Boschert (hereinafter "Boschert").

Claims 6 and 7 stand rejected under pre-AIA 35 U.S.C. § 103(a) as being obvious by Prevost in view of U.S. Patent Publication No. 2004/0162560 to Raynor (hereinafter "Raynor").

Claims 11-15 and 17 stand rejected under pre-AIA 35 U.S.C. § 103(a) as being obvious by Prevost in view of Boschert.

Claim 16 stands rejected under pre-AIA 35 U.S.C. § 103(a) as being obvious by Prevost in view of Boschert and further in view of Raynor.

Applicant respectfully traverses the rejections for at least the following reasons.

a. Independent claim 1 is patentable because Prevost does not disclose a lower surface of the start structure being spaced apart and above an annular outer edge of a substantially flat bottom surface of the plug – instead, Prevost discloses a lower surface of a start structure that is contiguous with the bottom surface of the plug.

Independent claim 1 is amended to recite "the lower surface of the start structure being spaced apart and above the annular outer edge of the substantially flat bottom surface so as to not be connected with the annular outer edge thereof." Independent claim 1 is rejected in view

of Prevost. Prevost, however, does not describe the limitations of amended claim 1 for at least the following reasons.

To reject a claim as obvious, the Office must articulate "a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference[.]" *MPEP 2143(I)(A)*.

Prevost discloses a set screw 1 with external threads 5 on the lower end 42. The Examiner alleges a surface of the external threads 5 discloses the claimed lower surface. *Office action, p. 3; Fig. A, below.*

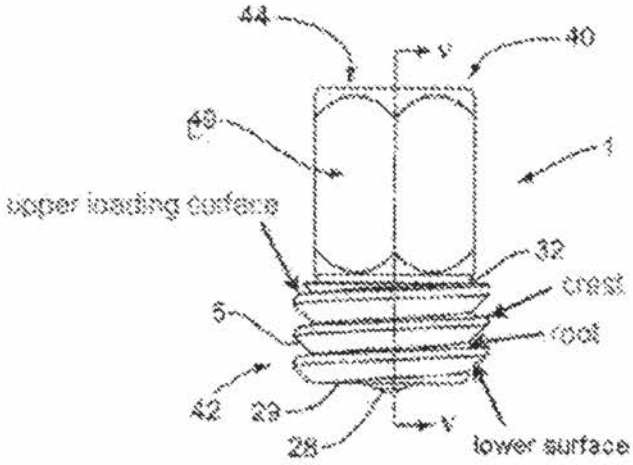


Fig. A

The surface identified by the Examiner is contiguous with the bottom end 29 of the set screw 1. That is, the surface of the external thread 5 and the bottom end 29 adjoin each other. This is seen clearly in Figure 5, below.

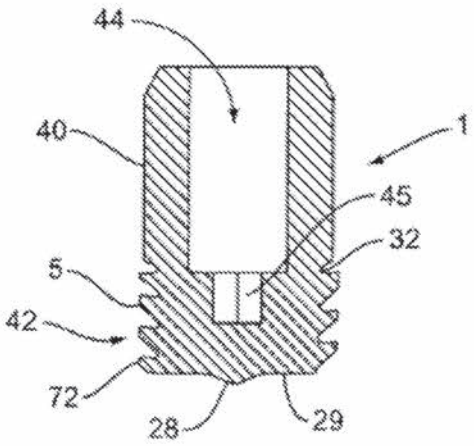


FIG. 5

Claim 1 requires "the lower surface of the start structure being spaced apart and above the annular outer edge of the substantially flat bottom surface so as to not be connected with the annular outer edge thereof." As seen in Figure 5, the lower surface, as identified by the Examiner, is connected to the outer edge of the bottom end 29. For at least these reasons, Prevost does not disclose all the elements of independent claim 1. And therefore claim 1 is therefore allowable.

Claims 2, 4, 5, and 8-10 are similarly rejected as obvious in view of Prevost. Claim 4 is canceled so the rejection of that claim is moot. Claims 2, 5, and 8-10 depend from independent claim 1, and therefore incorporate the allowable limitations from claim 1. Thus, the dependent claims are allowable for at least this reason. This statement is made without addressing the individual allowable limitations of the dependent claims and such an argument is reserved by Applicant.

Claim 3 stands rejected as obvious by Prevost in view of Boschert. Claims 6 and 7 stand rejected as obvious by Prevost in view Raynor. Claims 3 and 6-7 all depend from claim 1 and therefore incorporate the limitations of claim 1. Neither Boschert nor Raynor remedy the deficiencies of Prevost. As such, claims 3 and 6-7 are allowable for at least the reason of their dependency on claim 1. This statement is made without addressing the individual allowable limitations of the dependent claims and such an argument is reserved by Applicant.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejections of claims 1-3, 5-10.

b. Independent claim 11 is patentable because neither Prevost nor Boschert discloses a substantially flat bottom surface with an annular outer edge and an outward facing surface encircling the substantially flat bottom surface.

Independent claim 11 is amended to recite "a substantially flat bottom surface with an annular outer edge, and an outward facing surface encircling the substantially flat bottom surface, [...]the first lower surface of the first thread and from the second lower surface of the second thread are spaced above and apart from the annular outer edge of the substantially flat bottom surface of the plug." Independent claim 11 is rejected in view of a combination of Prevost and Boschert. Prevost and Boschert, however, does not describe the limitations of amended claim 11 either individually or in combination.

To reject a claim as obvious, the Office must articulate "a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference[.]" *MPEP 2143(I)(A)*.

Prevost discloses a set screw 1 with external threads 5 on the lower end 42. The Examiner alleges a surface of the external threads 5 discloses the claimed lower surface. *Office action, p. 8; Fig. A, below.*

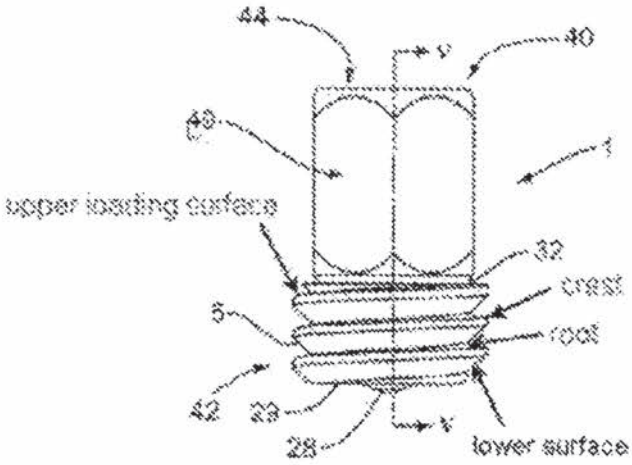


Fig. A

The surface identified by the Examiner is contiguous with the bottom end 29 of the set screw 1. That is, the surface of the external thread 5 and the bottom end 29 adjoin each other. This is seen clearly in Figure 5, below.

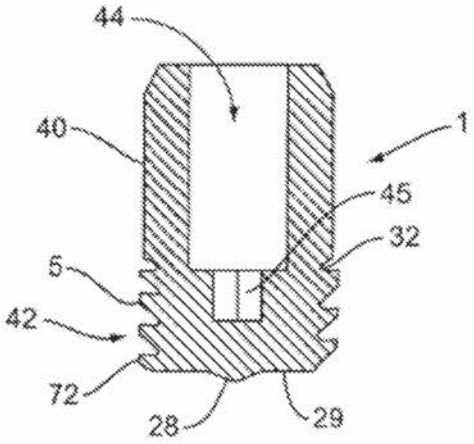


FIG. 5

Claim 11 requires "a substantially flat bottom surface with an annular outer edge, and an outward facing surface encircling the substantially flat bottom surface, [...]the first lower surface of the first thread and from the second lower surface of the second thread are spaced above and apart from the annular outer edge of the substantially flat bottom surface of the plug." As seen in Figure 5, the lower surface, as identified by the Examiner, is connected to the outer edge of the bottom end 29. Stated differently, there is no a substantially flat bottom surface and an outward facing surface encircling the substantially flat bottom surface. For at least these reasons, Prevost does not disclose all the elements of independent claim 11. Boschert does not remedy the deficiencies of Prevost. And therefore claim 11 is therefore allowable.

Claims 12-15 and 17 are similarly rejected as obvious in view of a combination of Prevost and Boschert. Claim 14 is canceled so the rejection of that claim is moot. Claims 12-13, 15, and 17 depend from independent claim 11, and therefore incorporate the allowable limitations from claim 1. Thus, the dependent claims are allowable for at least this reason. This statement is made without addressing the individual allowable limitations of the dependent claims and such an argument is reserved by Applicant.

Claim 16 stands rejected as obvious by Prevost in view of Boschert, and in further view of Raynor. Claims 16 depends from claim 11 and therefore incorporates the limitations of claim

11. Neither Boschert nor Raynor remedy the deficiencies of Prevost. As such, claim 16 is allowable for at least the reason of its dependency on claim 11. This statement is made without addressing the individual allowable limitations of the dependent claims and such an argument is reserved by Applicant.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejections of claims 11-13 and 15-17.

III. Double Patenting Rejection

Applicant acknowledges that claims 1-17 stand provisionally rejected under the judicially created, i.e. nonstatutory obviousness-type double patenting doctrine as being unpatentable over claims 1-26 of U.S. Patent No. 10,548,641. Applicant respectfully submits, however, that the Examiner has not yet indicated that the pending claims 1-17 of the present application would be allowable but for the nonstatutory double patenting rejection, and that no further amendments to the claims are required or permitted. Consequently, it is the understanding of the Applicant that the scope of the pending claims cannot be readily ascertained until after such indication is provided, and that the filing of a terminal disclaimer prior to such indication would be premature. Applicant therefore wishes to defer action on the double-patenting grounds until after the claims have been provided with an indication of allowability with regards to any rejections based upon the prior art or upon grounds other than nonstatutory double patenting. Moreover, if the nonstatutory double patenting rejection is resolved in Applicant's favor, such as through the amendments to the claims entered above, Applicant respectfully requests that the nonstatutory double patenting rejection be withdrawn.

IV. New Claims

New claims 18-22 are added with this paper. No new matter is added with the new claims. Rather, all elements of the new claims are fully supported by the original application. All new claims depend from either independent claim 1 or independent claim 11. Therefore, the claims are allowable for at least the reason of their dependency on an allowable independent claim. This statement is made without addressing the individual allowable limitations of the dependent claims and such arguments are reserved by Applicant. As such, Applicant respectfully requests acceptance and allowance of the new claims.

CONCLUSION

In summary, Applicant submits that the present claims are in condition for allowance. The Examiner is requested contact the undersigned counsel if allowance of the claims can be facilitated by examiner's amendment or telephone interview.

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Order Account No. 50-1662.

Dated: June 9, 2021

Respectfully submitted,

/Joshua J. Pranckun/
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	: TBD	Confirmation No.	:	
First Applicant	: Roger P. Jackson	Art Unit	:	
Filed	: Herewith	Examiner	:	
Title	MEDICAL IMPLANT RECEIVERS HAVING BREAK-OFF EXTENSIONS WITH DUAL LEAD IN CLOSURE MATING THREAD FORMS			
Docket No.	: JAC023-667905			
Customer No.	: 24030	Entity Status	:	Undiscounted

INFORMATION DISCLOSURE STATEMENT
PURSUANT TO 37 C.F.R. §§ 1.56, 1.97, AND 1.98

Commissioner:

The Examiner is respectfully requested to consider the patents, patent applications, publications, or other information cataloged on the enclosed Form PTO/SB/08A during examination of the above-identified patent application. The order of presentation of the references should not be construed as an indication of importance. These references are submitted for the Examiner's consideration and are submitted pursuant to an Applicant's duty of disclosure under 37 C.F.R. § 1.56.

Copies of all of the cited documents

☐ are enclosed unless otherwise indicated on the enclosed Form PTO/SB/08a.

☐ have been previously furnished to the Office in prior application No. _____, filed _____, which the present application relies upon for an earlier effective filing date under 35 U.S.C. § 120. Therefore, no copies of the cited documents are included herewith pursuant to 37 C.F.R. § 1.98(d); MPEP § 609(III)(A)(2).

☒ are enclosed unless they are U.S. patents or U.S. patent application publications pursuant to 37 C.F.R. § 1.98(a).

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I
BASIS

This information disclosure statement is filed pursuant to

☐ 37 C.F.R. § 1.97(b).
This information disclosure statement is filed either (1) within three months of the filing date of a national application other than a continued prosecution application under 37 C.F.R. § 1.53(d); (2) within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application; (3) before the mailing date of a first Office action on the merits; or (4) before the mailing of a first Office action after the filing of a request for continued examination under 37 C.F.R. § 1.114, whichever event occurs last.

Accordingly, this information disclosure statement requires no fee and no certification.

☒ 37 C.F.R. § 1.97(c).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(b), but before the mailing date of any of (1) a final action under 37 C.F.R. § 1.113; (2) a notice of allowance under 37 C.F.R. § 1.311; or (3) an action that otherwise closes prosecution in the application.

Accordingly, this information disclosure statement requires either the fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c), or a statement under 37 C.F.R. § 1.97(e).

☐ 37 C.F.R. § 1.97(d).
This information disclosure statement is filed after the period specified in 37 C.F.R. § 1.97(c) since a

☐ final action under 37 C.F.R. § 1.113

☐ notice of allowance under 37 C.F.R. § 1.311

was mailed to the Applicant(s) on _____. The issue fee has not been paid herein.

Accordingly, this information disclosure statement requires the fee set forth in 37 C.F.R. § 1.17(p) to consider an information disclosure statement under 37 C.F.R. § 1.97(d), and a statement under 37 C.F.R. § 1.97(e).

If this statement crosses in the mail with an Office action, or is otherwise not in the indicated category of 37 C.F.R. § 1.97, it is respectfully requested that this statement be treated in the next appropriate category and made of record. To the extent required, please treat this paper as a conditional petition for acceptance of the information disclosure statement.

II
FEES

Any required fee is being paid as indicated below by an enclosed check or our deposit account.

☐ No fee is due.

☒ The fee specified in 37 C.F.R. § 1.17(p) for submission of an information disclosure statement under 37 C.F.R. § 1.97(c) or (d) is due.

☐ A check is enclosed for the required fee.

☐ Payment by credit card is submitted simultaneously herewith for the required fee.

☒ Please charge the required fee to our deposit account no. 50-1662.

☒ The Commissioner is hereby authorized to charge any additional required fees or credit any overpayments associated with this information disclosure statement to our deposit account no. 50-1662.

III
CERTIFICATION

Pursuant to 37 C.F.R. § 1.97(e), I state as follows:

☒ No statement is necessary.

☐ Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(1).

☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to my knowledge after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this information disclosure statement. 37 C.F.R. § 1.97(e)(2).

Pursuant to 37 C.F.R. § 1.704(d), I state as follows:

☐ Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart application, and this communication was not received by any individual designated in 37 C.F.R. § 1.56(c) more than thirty days prior to the filing of this information disclosure statement.

IV
FOREIGN LANGUAGE REFERENCES

Pursuant to 37 C.F.R. § 1.98(a)(3)(i), any information disclosure statement filed under 37 C.F.R. § 1.97 shall include a concise explanation of the relevance, as it is presently understood by the individual designated in § 1.56(c) most knowledgeable about the content of the information, of each patent, publication, or other information listed that is not in the English language. The concise explanation may be either separate from the specification or incorporated therein. In compliance with the rules, the Applicant states as follows:

☒ No concise explanation is required since all cited references are in English.

☐ A concise explanation of the relevance of one or more foreign language references is attached.

☐ No English language version was available for one or more foreign language references.

☐ According to the procedural policy adopted by the PTO with regard to disclosure requirements, the Applicant is satisfying the disclosure requirement pursuant to MPEP § 609.04(a)(III) by submitting herewith the following:

- ☐ An English language version of one or more non-English language documents.
- ☐ An English language equivalent application or patent of one or more non-English language applications or patents.
- ☐ An English language version of one or more search reports or other actions by one or more foreign patent offices in one or more counterpart foreign applications, which indicate the degree of relevance found by the foreign office(s).
- ☐ An English language abstract of one or more non-English language references.

The Applicant has not analyzed these documents and, therefore, declines to comment on their relevance at this time.

V
REMARKS

☐ Pursuant to the doctrines established by the Court of Appeals for the Federal Circuit in *McKesson Information Solutions, Inc. v. Bridge Medical, Inc.*, 487 F.3d 897 (Fed. Cir. 2007) and *Dayco Products, Inc. v. Total Containment, Inc.*, 329 F.3d 1358 (Fed. Cir. 2003), Applicant(s) submit documents herewith reflecting the prosecution history of applications that Applicant(s) believe may be considered related to the present application.

☐ In satisfaction of the duty of disclosure under 37 C.F.R. § 1.56, and as required by M.P.E.P. § 2001.06(b), the Examiner is requested to consider the pending U.S. patent applications listed in "Attachment A," which are owned by the Assignee of the present

application. The pending patent applications may include subject matter similar to that of the present application.

It is respectfully requested that

(1) the Examiner sign the enclosed Form PTO/SB/08a to evidence that the cited information has been fully considered by the Patent and Trademark Office during the examination of this application; and

(2) the citations for the cited information be printed on any patent that issues from this application.

The submission of this information disclosure statement by the Applicant(s) shall not be construed as a representation that a search has been performed or that no other material information under 37 C.F.R. § 1.56 exists. See 37 C.F.R. § 1.97(g).

The submission of this information disclosure statement by the Applicant(s) shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, material to the patentability of one or more of the pending claims in this application pursuant to 37 C.F.R. § 1.56(b), unless specifically designated by the Applicant(s) as such. See 37 C.F.R. § 1.97(h).

The submission of this information disclosure statement by the Applicant(s) shall not be construed as an admission that any information cited or referred to herein is, or is considered to be, or even qualifies as "prior art" under 35 U.S.C. § 102 with respect to this invention, unless specifically designated by the Applicant(s) as such.

Notwithstanding any statements by the Applicant(s), the Examiner is urged to form his or her own conclusion regarding the relevance of the cited information.

VI
CONCLUSION

The Examiner is encouraged to contact the undersigned attorney to discuss any questions concerning this information disclosure statement or any of the information cited or referred to herein.

Respectfully submitted June 9, 2021

/Joshua J. Pranckun/

Joshua J. Pranckun, Registration No. 70712
Attorney for Assignee
USPTO Customer No.

Polsinelli PC
1401 Lawrence Street
Suite 2300
Denver, CO 80202
Phone: (303) 583-8469
Fax: (303) 942-3621

PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*	APPLICATION NO.: 17/123,499	FILING DATE: December 16, 2020
	INVENTOR(S): Roger P. Jackson et al.	ART UNIT: 3773
	EXAMINER NAME: David C. Comstock	ATTY. DOCKET NO.: JAC023-667905

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,562,663	10-1996	Wisnewski et al.	

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PUBLICATION NUMBER Number – Kind Code[2] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	DOCUMENT NUMBER Country Code[3] – Number[4] – Kind Code[5] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T[6]

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
Page 299 of 337

Electronic Patent Application Fee Transmittal	
Application Number:	17123499
Filing Date:	16-Dec-2020
Title of Invention:	MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES
First Named Inventor/Applicant Name:	Roger P. Jackson
Filer:	Joshua Pranckun/Helen Miswell
Attorney Docket Number:	JAC023-667905
Filed as Large Entity	
Filing Fees for Utility under 35 USC 111(a)	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
		Total in USD ($)		**260**

Electronic Acknowledgement Receipt	
EFS ID:	42942657
Application Number:	17123499
International Application Number:	
Confirmation Number:	2823
Title of Invention:	MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES
First Named Inventor/Applicant Name:	Roger P. Jackson
Customer Number:	24030
Filer:	Joshua Pranckun/Helen Miswell
Filer Authorized By:	Joshua Pranckun
Attorney Docket Number:	JAC023-667905
Receipt Date:	09-JUN-2021
Filing Date:	16-DEC-2020
Time Stamp:	15:33:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$260
RAM confirmation Number	E202169F33492820
Deposit Account	501662
Authorized User	Helen Miswell
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		17-123499_ResponsetoNonFinalOA.pdf	714111 468e6645395ee43efdc812750fab8e6859ad732c	yes	13

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	2
	Claims	3	6
	Applicant Arguments/Remarks Made in an Amendment	7	13

Warnings:

Information:

2		17-123499_InformationDisclosureStatement.pdf	379764 63f262d17f3c934d8e6de26606dc91f3b068fcb5	yes	6

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	5
	Information Disclosure Statement (IDS) Form (SB08)	6	6

Warnings:

Information:

3	Fee Worksheet (SB06)	fee-info.pdf	30984 c5c65187071af551dfce247352cadd9f95cb1ca6	no	2

Warnings:

Information:

Total Files Size (in bytes):	1124859

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

24030 7590 06/24/2021

POLSINELLI PC
900 WEST 48TH PLACE
SUITE 900
KANSAS CITY, MO 64112-1895

EXAMINER	
COMSTOCK, DAVID C	
ART UNIT	PAPER NUMBER
3773	

DATE MAILED: 06/24/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/123,499	12/16/2020	Roger P. Jackson	JAC023-667905	2823

TITLE OF INVENTION: MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	09/24/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

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Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24030 7590 06/24/2021

POLSINELLI PC
900 WEST 48TH PLACE
SUITE 900
KANSAS CITY, MO 64112-1895

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/123,499	12/16/2020	Roger P. Jackson	JAC023-667905	2823

TITLE OF INVENTION: MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	09/24/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
COMSTOCK, DAVID C	3773	606-306000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
Page 306 of 337

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/123,499	12/16/2020	Roger P. Jackson	JAC023-667905	2823

24030 7590 06/24/2021

POLSINELLI PC
900 WEST 48TH PLACE
SUITE 900
KANSAS CITY, MO 64112-1895

EXAMINER	
COMSTOCK, DAVID C	

ART UNIT	PAPER NUMBER
3773	

DATE MAILED: 06/24/2021

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 02/11)

Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
Page 307 of 337

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/123,499	Applicant(s) Jackson et al.	
	Examiner DAVID C COMSTOCK	Art Unit 3773	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to amendment and arguments filed 09 June 2021.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-3,5-13 and 15-22 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 09 June 2021.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☑ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/DAVID C COMSTOCK/ Examiner, Art Unit 3773	/EDUARDO C ROBERT/ Supervisory Patent Examiner, Art Unit 3773

Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
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EXAMINER'S COMMENT

The double patenting rejection set forth in the Office action mailed 09 March 2021 has been withdrawn because the amended claims now recite elements that are not found in the claims of the issued patent (10,548,641). Specifically, the issued patent does not recite the limitations directed to the configuration of the start structure and the lower surface of the thread spaced from an annular outer edge of a substantially flat bottom of a plug of a receiver, as set forth in independent claims 1 and 11.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Comstock whose telephone number is (571) 272-4710. The examiner can normally be reached Monday-Friday, 9 a.m. - 6 p.m.

If attempts to reach the examiner by telephone are unsuccessful, ***please contact* the examiner's supervisor, SPE, *at* (571) 272-4719**. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DAVID C COMSTOCK/
Examiner, Art Unit 3773

/EDUARDO C ROBERT/
Supervisory Patent Examiner, Art Unit 3773

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/123,499	Jackson et al.
	Examiner	Art Unit
	DAVID C COMSTOCK	3773

CPC							
Symbol						Type	Version
A61B	/	17	/	7035		F	2013-01-01
A61B	/	17	/	7032		I	2013-01-01
A61B	/	17	/	8665		I	2013-01-01
A61B	/	17	/	863		I	2013-01-01
A61B	/	17	/	8685		I	2013-01-01
A61B	/	2090	/	037		A	2016-02-01
A61B	/	2017	/	8655		A	2013-01-01

CPC Combination Sets								
Symbol						Type	Set	Ranking	Version
	/		/						

/DAVID C COMSTOCK/ Examiner, Art Unit 3773	17 June 2021	Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/EDUARDO C ROBERT/ Supervisory Patent Examiner, Art Unit 3773	17 June 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

U.S. Patent and Trademark Office

Part of Paper No.: 20210617

Zimvie_Zimmer Biomet v. Jackson
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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/123,499	Jackson et al.
	Examiner	Art Unit
	DAVID C COMSTOCK	3773

INTERNATIONAL CLASSIFICATION				
CLAIMED				
A61B	/	17	/	70

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
606	270

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

/DAVID C COMSTOCK/ Examiner, Art Unit 3773	17 June 2021	Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/EDUARDO C ROBERT/ Supervisory Patent Examiner, Art Unit 3773	17 June 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

U.S. Patent and Trademark Office

Part of Paper No.: 20210617

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/123,499	Jackson et al.
	Examiner	Art Unit
	DAVID C COMSTOCK	3773

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	7	10	9	19										
2	2	12	11	17	20										
3	3	13	12	18	21										
	4	14	13	20	22										
4	5		14												
10	6	15	15												
11	7	19	16												
5	8	16	17												
6	9	8	18												

/DAVID C COMSTOCK/ Examiner, Art Unit 3773	17 June 2021	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/EDUARDO C ROBERT/ Supervisory Patent Examiner, Art Unit 3773	17 June 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

U.S. Patent and Trademark Office

Part of Paper No.: 20210617

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/123,499	Jackson et al.
	Examiner	Art Unit
	DAVID C COMSTOCK	3773

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/26/2021	06/17/2021							
1	1	✓	=							
2	2	✓	=							
3	3	✓	=							
	4	✓	-							
4	5	✓	=							
10	6	✓	=							
11	7	✓	=							
5	8	✓	=							
6	9	✓	=							
7	10	✓	=							
12	11	✓	=							
13	12	✓	=							
14	13	✓	=							
	14	✓	-							
15	15	✓	=							
19	16	✓	=							
16	17	✓	=							
8	18		=							
9	19		=							
17	20		=							
18	21		=							
20	22		=							

Zimvie_Zimmer Biomet v. Jackson
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/123,499	Jackson et al.
	Examiner	Art Unit
	DAVID C COMSTOCK	3773

CPC - Searched*		
Symbol	**Date**	**Examiner**
A61B17/7035, 7032, 863, 8665, 8685	02/26/2021	/DC/
A61B2090/037	02/26/2021	/DC/
A61B2017/8655	02/26/2021	/DC/
Search updated	06/17/2021	/DC/

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
606	264, 265, 266, 267, 270, 273, 306	02/26/2021	/DC/
403	362	02/26/2021	/DC/
411	386, 393	02/26/2021	/DC/
Search updated		06/17/2021	/DC/

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/DAVID C COMSTOCK/ Examiner, Art Unit 3773	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/123,499	Jackson et al.
	Examiner	Art Unit
	DAVID C COMSTOCK	3773

Search Notes		
Search Notes	**Date**	**Examiner**
PLUS search	02/25/2021	/DC/
EAST text search--see EAST search history (CPC and US classification search text limited except where otherwise indicated)	02/26/2021	/DC/
Inventor name search--see EAST search history	02/26/2021	/DC/
Consulted Daniel Wiley in class 403 (joints and connections): recommended speaking with Fleming Saether in class 411	02/25/2021	/DC/
Consulted Fleming Saether in class 411 (threaded fasteners): search 411/386 and F16B25/0052, 0042	02/25/2021	/DC/
References cited in parent applications 16779304, 15964502, 15469076, 14566356 and 13694849 have been reviewed	02/26/2021	/DC/
EAST text search updated--see EAST search history	06/17/2021	/DC/

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
See EAST interference search	N/A	06/17/2021	/DC/

/DAVID C COMSTOCK/ Examiner, Art Unit 3773	

Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L7	673	(setscrew or "set screw" or closure) same thread same (higby or higbee or truncated)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:33
L9	29	L7 and (vertebr$2 or (fixation with rod) or surgery or surgical or medical)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:33
L10	797	(411/386).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/06/17 00:34
L11	341	L10 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/06/17 00:34
L12	211	L10 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:34
L13	552	L11 L12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:34
L14	133	L13 and ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or rounded or rounding or concave or convex or easy or quick))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:34

L15	515	(411/393).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/06/17 00:35
L16	119	L15 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/06/17 00:35
L17	56	L15 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:35
L18	175	L16 L17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:35
L19	10	L18 and ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or rounded or rounding or concave or convex or easy or quick))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:35
L20	10	L18 and ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or rounded or rounding or concave or convex or easy or quick))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:35
L21	165	L18 not L20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:35
L22	301	(vertebr$2 or surgical or surgery or medical) and ((setscrew or "set screw") same ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or rounded or rounding or concave or convex or easy or quick)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:36

L23	75	L22 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/06/17 00:36
L24	2	L22 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:36
L25	77	L23 L24	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:36
L26	1,914	F16B25/0052,0042.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:36
L27	158	L26 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/06/17 00:36
L28	1,080	L26 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:36
L29	1,238	L27 L28	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:36
L30	1,568	(403/362).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/06/17 00:37
L31	386	L30 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/06/17 00:37
L32	161	L30 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:37

L33	547	L31 L32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:37
L34	11	L33 and ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or rounded or rounding or concave or convex or easy or quick))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:37
L35	16	(vertebr$2 or surgical or surgery or medical) and ((setscrew or "set screw") same (thread or (advancement with structure) or (helical$2 with wound)) same truncat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:37
L36	6,189	A61B17/863.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:38
L37	747	L36 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/06/17 00:38
L38	2,970	L36 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:38
L39	3,717	L37 L38	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:38
L40	250	L39 and ((thread or (advancement with structure) or (helical$2 with wound)) with (start or bevel or chamfer or fillet or rounded or rounding or concave or convex or easy or quick or truncat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:38

L41	37,456	A61B17/7035,7032,863,8665,8685.cpc. A61B2090/037.cpc. A61B2017/8655.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:38
L42	5,651	L41 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/06/17 00:38
L43	18,738	L41 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:38
L44	24,389	L42 L43	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:38
L45	151	L44 and ((arm or extension) with (break$4 or frangibl$1)) and (setscrew or "set screw" or (closure with thread$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:38
L46	22	L44 and (setscrew or "set screw" or (closure with thread$3)) same ((thread$3 or (helically with wound) or (guide with advancement)) with (truncat$3 or start))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:39
L47	3,547	(606/264,265,266,267,270,273,306).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/06/17 00:39
L48	1,836	L47 and @ad<"20120110"	US-PGPUB; USPAT; USOCR	OR	ON	2021/06/17 00:39
L49	1,166	L47 and @prad<"20120110"	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:39

L50	3,002	L48 L49	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:39
L51	98	L50 and (setscrew or "set screw" or (closure with thread$3)) and (((extension or arm) with (break$4 or frangible)) or ((higby or truncated) with thread$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:39
L52	469	(606/270).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/06/17 00:40
L53	7	(7 9 13 14 18 19 21 25 29 33 34 35 40 45 46 51 52) and @pd>"20210227"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/06/17 00:43

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L54	0	(implant and assembly and receiver and upper and portion and inner and surface and helically and wound and thread and extending and top and channel and rod and plug and positioned and axis and rotation and continuously and flat and bottom and annular and outer and edge and engage and form and start and structure and root and crest and leading and face and partial and concave and convex and radius and curvature and equal and spaced and apart and above and connected).clm.	US-PGPUB; USPAT	OR	ON	2021/06/17 00:47
L56	0	(implant and assembly and receiver and upper and portion and inner and surface and helically and wound and thread and extending and top and channel and rod and plug and positioning and axis and rotation and continuously and flat and bottom and annular and outer and edge	US-PGPUB; USPAT	OR	ON	2021/06/17 00:56

		and outward and facing and encircling and start and structure and root and crest and leading and face and partial and concave and convex and radius and curvature and spaced and above).clm.				

6/17/2021 12:57:52 AM
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PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*	APPLICATION NO.: 17/123,499	FILING DATE: December 16, 2020
	INVENTOR(S): Roger P. Jackson et al.	ART UNIT: 3773
	EXAMINER NAME: David C. Comstock	ATTY. DOCKET NO.: JAC023-667905

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,562,663	10-1996	Wisnewski et al.	

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PUBLICATION NUMBER Number – Kind Code[2] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	DOCUMENT NUMBER Country Code[3] – Number[4] – Kind Code[5] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T[6]

EXAMINER /DAVID C COMSTOCK/	DATE CONSIDERED 06/17/2021

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

78399094.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DC/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/123,499	12/16/2020	3773	1820	JAC023-667905	17	2

CONFIRMATION NO. 2823

CORRECTED FILING RECEIPT

24030
POLSINELLI PC
900 WEST 48TH PLACE
SUITE 900
KANSAS CITY, MO 64112-1895

Date Mailed: 07/01/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Roger P. Jackson, Prairie Village, KS;
James L. Surber, Kansas City, KS;

Applicant(s)

Roger P. Jackson, Prairie Village, KS;

Assignment For Published Patent Application

Roger P. Jackson, Prairie Village, KS

Power of Attorney: The patent practitioners associated with Customer Number 24030

Domestic Priority data as claimed by applicant

This application is a CON of 16/779,304 01/31/2020 PAT 10898233
which is a CON of 15/964,502 04/27/2018 PAT 10548641
which is a CON of 15/469,076 03/24/2017 PAT 9956004
which is a CON of 14/566,356 12/10/2014 PAT 9636146
which is a CON of 13/694,849 01/10/2013 PAT 8911479
which claims benefit of 61/634,361 02/28/2012
and claims benefit of 61/631,746 01/10/2012

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 01/26/2021

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/123,499**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

MEDICAL IMPLANT THREADED PLUG HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES

Preliminary Class

606

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor

community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
Page 329 of 337

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24030 7590 06/24/2021

POLSINELLI PC
900 WEST 48TH PLACE
SUITE 900
KANSAS CITY, MO 64112-1895

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

Helen Miswell Maiden	(Typed or printed name)
/Helen Miswell Maiden/	(Signature)
August 26, 2021	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/123,499	12/16/2020	Roger P. Jackson	JAC023-667905	2823

TITLE OF INVENTION: MEDICAL IMPLANT THREADED CLOSURE HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	09/24/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
COMSTOCK, DAVID C	3773	606-306000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Polsinelli PC
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Roger P. Jackson

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Prairie Village, KS

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☒ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ☒ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-1662

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Joshua J. Pranckun/ Date August 26, 2021

Typed or printed name Joshua J. Pranckun Registration No. 70712

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
Page 330 of 337

Electronic Patent Application Fee Transmittal	
Application Number:	17123499
Filing Date:	16-Dec-2020
Title of Invention:	MEDICAL IMPLANT THREADED PLUG HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES
First Named Inventor/Applicant Name:	Roger P. Jackson
Filer:	Joshua Pranckun/Helen Miswell
Attorney Docket Number:	JAC023-667905
Filed as Large Entity	

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1200**

Electronic Acknowledgement Receipt	
EFS ID:	43615889
Application Number:	17123499
International Application Number:	
Confirmation Number:	2823
Title of Invention:	MEDICAL IMPLANT THREADED PLUG HAVING A START STRUCTURE WITH SYMMETRICALLY SHAPED CONCAVE AND CONVEX LEADING SURFACES
First Named Inventor/Applicant Name:	Roger P. Jackson
Customer Number:	24030
Filer:	Joshua Pranckun/Helen Miswell
Filer Authorized By:	Joshua Pranckun
Attorney Docket Number:	JAC023-667905
Receipt Date:	26-AUG-2021
Filing Date:	16-DEC-2020
Time Stamp:	17:41:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1200
RAM confirmation Number	E20218PH42250217
Deposit Account	501662
Authorized User	Helen Miswell
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	17123499_IssueFeeTransmittal.pdf	1090308 34a9ec826fba7902744f93a10c87e148ec779a67	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	38145 d47784dd4c656f10b541b15960288641a43fdbf6	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1128453		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

ATTACHMENT A
APPLN. NO. TBD
INFORMATION DISCLOSURE STATEMENT
FOR
STATEMENT UNDER MPEP § 2001.06(b)

U.S. PATENT DOCUMENTS			
Examiner Initials	**Patent No.**	**Issue Date**	**Name of Patentee or Applicant of Cited Document**
	8,377,100	02/19/2013	Jackson
	9,636,146	5/02/2017	Jackson et al.
Change(s) applied	9,717,533	8/01/2017	Jackson et al.
to document,	9,743,957	~~8/29/2014~~ 08/2017	Jackson
/T.W./	9,861,394	1/09/2018	Jackson
6/30/2021	10,004,541	6/26/2018	Jackson
	10,206,716	02/19/2019	Jackson et al.

U.S. PUBLICATION DOCUMENTS			
Examiner Initials	**Publication No.**	**Publication Date**	**Name of Patentee or Applicant of Cited Document**
	2014/0214097	7/31/2014	Jackson et al.
	2015/0119942	4/30/2015	Jackson et al.
	2015/0148846	5/28/2015	Jackson
	2015/0164558	6/18/2015	Jackson et al.
	2016/0038188	2/11/2016	Jackson et al.
	2016/0242818	8/25/2016	Jackson
	2017/0189073	7/06/2017	Jackson et al.
	2017/0333083	11/23/2017	Jackson et al.
	2017/0354443	12/14/2017	Jackson
	2017/0354441	12/14/2017	Jackson et al.
	2018/0243013	08/30/2018	Jackson et al.
	2018/0296249	10/18/2018	Jackson
	2019/0231400	08/01/2019	Jackson et al.
	2019/0175225	06/13/2019	Jackson et al.
	2019/0274734	09/12/2019	Jackson et al.
	2019/0298415	10/03/2019	Jackson et al.
	2020/0163702	05/28/2020	Jackson et al.
	2020/0179014	06/11/2020	Jackson

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DC/

Zimvie_Zimmer Biomet v. Jackson
IPR2023-01433; Petitioners' EX1002
Page 335 of 337

U.S. PATENT DOCUMENTS					
EXAMINER INITIALS*	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A77.	4,538,947	09/195	Burkholder	
	A78.	4,764,068	08-1988	Crispell	
	A79.	5,005,562	04-1991	Cotrel	
	A80.	5,073,074	12-1991	Corrigan et al.	
	A81.	5,667,508	09-1997	Errico et al.	
	A82.	5,697,929	12-1997	Mellinger	
	A83.	5,885,286	03-1999	Sherman et al.	
	A84.	6,004,349	12-1999	Jackson	
	A85.	6,056,753	05-2000	Jackson	
	A86.	6,224,596	05-2001	Jackson	
	A87.	6,261,288	07-2001	Jackson	
	A88.	6,565,565	05-2003	Yuan et al.	
	A89.	6,786,903	09-2004	Lin	
	A90.	6,843,791	01-2005	Serhan	
	A91.	7,141,051	11-2006	Janowski	
	A92.	7,641,674	01-2010	Young	
	A93.	7,566,163	07-2009	Inoue	
	A94.	7,490,394	02-2009	Zakrzewski	
	A95.	7,334,307	02-2008	Helenowski	
	A96.	7,320,570	01-2008	Czarnek	
	A97.	7,311,563	12-2007	Siebens	
	A98.	7,247,020	07-2007	Takahashi	
	A99.	7,232,104	06-2007	Krapels	
	A100.	7,515,220	~~12-2006~~ 04/2009	~~Rubin de la Borbolla~~ Ko,	et al.
	A101.	7,096,071	08-2006	Ollivier	
	A102.	6,851,337	02-2005	Stokes	
	A103.	6,817,910	11-2004	Borgstrom	
	A104.	6,788,756	09-2004	Erbes	
	A105.	6,764,354	07-2004	Kaine	
	A106.	6,699,248	03-2004	Jackson	
	A107.	6,688,921	02-2004	Borgstrom	
	A108.	6,634,842	10-2003	Ueno	
	A109.	6,634,246	10-2003	Ohya	
	A110.	6,550,959	04-2003	Huber	
	A111.	6,478,795	11-2002	Gournay	
	A112.	6,454,772	09-2002	Jackson	
	A113.	6,454,768	09-2002	Jackson	
	A114.	6,361,535	03-2002	Jackson	
	A115.	6,302,888	10-2001	Mellinger	
	A116.	6,224,598	05-2001	Jackson	
	A117.	6,209,575	04-2001	Graziano	
	A118.	6,193,719	02-2001	Gournay	

Change(s) applied to document,
/N.W.S/
7/2/2021

75819001.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DC/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/123,499	09/28/2021	11129646	JAC023-667905	2823

24030 7590 09/08/2021

POLSINELLI PC
PO Box 140310
KANSAS CITY, MO 64114-0310

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Roger P. Jackson, Prairie Village, KS;

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