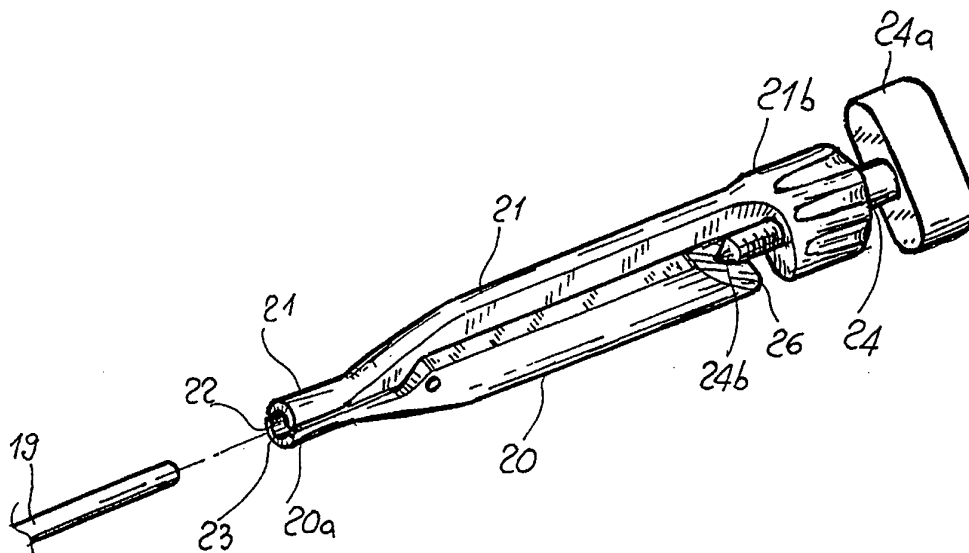




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<p>(54) Title: DEVICE FOR THE EXTRACTION OF SCREW-THREADED WIRES PARTICULARLY FOR ORTHOPAEDIC SURGICAL OPERATIONS</p>		



(57) Abstract

A device for the extraction of screw-threaded wires for osteosynthesis, characterized in that it comprises: at least two lever pieces (20, 21) hinged together and having at one longitudinal end (20a, 21a) seats (22, 23) for grasping the end of a wire (19) which it is required to extract, and clamp means acting on the other end of said lever pieces (20, 21) to promote their opening in such a way as to generate a couple of gripping forces on the end of the wire (19). Said clamp means are of screw type and preferably consist of a threaded pin (24) fitted with a knob (24a) and screwed into a tapped piece (25) integral with the end (21b) of one of said lever pieces (21). The end (24b) of the threaded pin nearest the pivot is of a generally frustoconical shape to interact with an inclined plane surface (26) formed in the end (20b) of the other lever piece (20) in such a way as to force it outwards when said pin (24) is screwed in. The thread on said pin (24) and on the tapped piece (25) is opposite to that of the thread of the wires (19).

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DEVICE FOR THE EXTRACTION OF SCREWTHREADED WIRES
PARTICULARLY FOR ORTHOPAEDIC SURGICAL OPERATIONS.

DESCRIPTION

5 The present invention relates to a device for the
extraction of screwthreaded wires for osteosynthesis at
the end of treatment.

As is known from German Patent Application No. P
4309707, screwthreaded wires are an improvement on the
Kirschner's wires used in orthopaedic surgery for
10 compacting bone fragments onto the main bone or in the
reconstruction of small fractured bones. Unlike
Kirschner's wires, screwthreaded wires are not
completely smooth: instead, the end that is to be
inserted into the bone is threaded, and the diameter of
15 the thread is less than that of the remaining
cylindrical shank of the wire. There is thus a shoulder
at the point where the screwthreaded part ends and the
smooth part begins. This shoulder serves to exert a
compressive action on the bone fragment towards the part
20 of the bone from which said fragment has become
detached, when the screwthreaded wire is screwed in.

Depending on the characteristics and dimensions of the
bone fragment and of the bone from which said fragment
has become detached, screwthreaded wires of different
25 diameters and with different thread diameters are used,
as for example 1.5-mm, 2.0-mm, or 3.0-mm diameter wires
with thread diameters of 1.2 mm, 1.6 mm or 2.2 mm
respectively, and with different lengths of the threaded
part.

30 When the treatment is finished, that is to say when the
bone fragment has become firmly fixed to the bone from
which it was detached, the screwthreaded wire or wires
must be removed.

CONFIRMATION COPY

A known method for the extraction of screwthreaded wires for osteosynthesis involves using ordinary forceps consisting of two levers giving mechanical advantage which are held by their longer arms and enable a gripping couple to be produced in the two jaws provided on the shorter arms.

During the operation of extracting a wire with forceps the following problem can arise.

Since the operator (the orthopaedic surgeon) is wearing elastic gloves his grip may relax as a result of slight slippages between his hand and the tool. This produces a relaxing of the effort applied to the levers and consequently a reduction in the gripping forces, as a result of which the jaws may slip on the end of the wire to be extracted.

Also known is a wire-extracting device consisting of a spanner in which the opposite end from that on which the grip is formed contains a cylindrical seat in which the cylindrical end of the wire to be extracted is accommodated. In the side wall of said cylindrical cavity is a set screw whose axis is perpendicular to the axis of said cylindrical cavity. This screw can be driven from the outside by a hexagon socket wrench in order to clamp the end of the wire to be extracted.

The problem with the known extractor device is that it cannot be used for removing a wire whose end is completely below the skin of the patient from whom the wire is to be extracted, because in order to clamp the cylindrical end of the wire to be extracted in this instrument, it is necessary to turn said set screw, and

since the latter must grip the lateral surface of said end, it would be necessary to work underneath the external surface of the skin, a position which is virtually inaccessible.

5 During the operations of removing the wire, the known extractor devices must be turned together with the wire itself, and in cases in which the end of the wire is deep below the external surface of the skin there could be accidental impact of the instrument on the soft
10 tissues surrounding the end of the wire in question.

It is the chief object of the present invention to provide orthopaedic surgeons with a device for the extraction of screwthreaded wires for osteosynthesis which can be held firmly and which, if the operator's
15 grip should relax, does not relax its grip on the end of the wire.

The present invention also aims to provide a device for the extraction of a wire that would also be able to extract wires whose ends are well below the external
20 surface of the skin, requiring only a small incision into the skin to get at the end of the wire and also avoiding, or reducing to a minimum, the impact between the device and the soft parts of the surrounding tissues.

25 These objects are achieved with a device for the extraction of screwthreaded wires for osteosynthesis, characterized in that it comprises:
at least two lever pieces hinged together and having at one longitudinal end seats for grasping the end of a
30 wire which it is required to extract, and

clamp means acting on the other ends of said lever pieces to promote their opening or closing in such a way as to generate at least one gripping couple on the end of the wire.

5 Said clamp means are preferably of a screw type consisting of a screwthreaded pin fitted with a knob and screwed onto a tapped piece integral with the end of one of said lever pieces. The end of the screwthreaded pin nearest the pivot is of a generally frustoconical shape
10 to interact with an inclined plane surface formed at the end of the other lever piece in such a way as to force it outwards when said pin is screwed in. The hand of the thread on said pin and on the tapped piece is opposite to that of the thread on the wires.

15 A first advantage offered by most of the proposed solutions consists in the fact that the device has a mechanism for locking the end of the wire which it is required to extract, so that the operator can briefly relax his grip on said device without having the
20 extraction device relax its own grip on the end of the wire as a result. Furthermore, the jaws of this device increase their clamping force as the device turns with and unscrews the screwthreaded wire by virtue of the fact that the hand of the thread of the clamping
25 mechanism is opposite to that of the wire to be extracted.

A second advantage lies in the fact that the proposed device makes it possible also to remove screwthreaded wires whose ends are buried in the soft tissues and thus
30 not projecting above the skin. This is due to the fact, that because of the special shape of the end of the

device containing the clamping jaws, which may take the form in certain particular embodiments of a first, externally generally cylindrical portion having a slightly greater diameter than that of the wire itself and of a second, generally frustoconical portion joining it to the remainder of the extractor device, the latter can easily grip the end of the wire buried in the soft tissues once a small incision has been made near the end of the wire.

Other advantages will become clear in the following detailed description which explains a number of possible examples of embodiments of the present invention - no limitation being implied, with reference to the accompanying drawings, in which:

Figure 1 is a front view of a device for the extraction of screwthreaded wires according to the present invention;

Figure 2 is an exploded view of the device of the previous figure;

Figure 3 is a view from below of a first lever piece of the device shown in Figure 1;

Figure 4 is a view from above of a second lever piece of the device shown in Figure 1;

Figure 5 is a perspective view of the device shown in Figure 1;

Figure 6 is a perspective view of a second embodiment of the device according to the present invention;

Figure 7 is a perspective view of a third embodiment of the device according to the present invention;

Figure 8 is a sectional view of a detail of the device shown in Figure 7;

Figure 9 is a perspective view of a fourth embodiment of the device according to the present invention;

Figure 10 is an exploded partial perspective view of the device shown in Figure 9;

Figure 11 is a perspective view of a fifth embodiment of a device according to the present invention;

5 Figure 12 is an exploded partial perspective view of the device shown in Figure 11;

Figure 13 is a partial sectional view of the device shown in Figure 11;

10 Figure 14 is a perspective view of a sixth embodiment of the device according to the present invention.

With reference to Figures 1 to 5, it will be seen that in a first embodiment the device according to the invention comprises:

15 two lever pieces 20 and 21 hinged together and having at respective longitudinal ends 20a and 21a seats 22 and 23 for grasping the end of a wire 19 which it is required to extract, and clamp means 24-25 acting on the other end 20b and 21b of said lever pieces 20 and 21 to promote their opening or closing in such a way as to
20 generate at least one gripping couple on the end of the wire 19.

As illustrated in Figure 1, the clamp means 24-25 are of a screw type and consist of a screwthreaded pin 24
25 screwed into a tapped piece 25 integral with the end 21b of the lever piece 21. The axis of forward movement of said clamp means 24-25 is generally parallel with the second lever piece 21. The end 24b of the screwthreaded pin 24 nearest the pivot of said two lever pieces 20 and 21 is of a generally frustoconical shape to interact
30 with an inclined plane surface 26 formed at the end 20b of the first lever piece 20, in such a way as to force it outwards when said pin is screwed in.

The hand of the threads on the pin 24 and on the tapped piece 25 is opposite to that of the thread on the wires. In this way, as the operator continues to screw the pin 24 into the tapped piece 25, once the ends 20a and 21a of said lever pieces have closed on the end of the wire to be extracted, the rotation of the device is such as to unscrew the wire and thus extract it.

The pin 24, illustrated in detail in Figure 2, is provided, at the end opposite to that 24b of generally frustoconical shape, with a knob having a generally polygonal cavity 40 whose longitudinal axis is coaxial with the axis of said pin, which cavity is suitable for the insertion of a polygonal socket wrench (key), not illustrated in the drawings, which facilitates the operations of screwing the pin 24 and thus unscrewing the screwthreaded wire which it is required to extract.

As can be seen in Figures 1 and 3, the tapped piece 25 consists of a collar with a grooved outer surface 27 suitable for use as a knob to provide a better purchase during the extraction, by unscrewing, of the wire.

As illustrated in Figures 3 and 4, the opposing surfaces of the ends of the two lever pieces are formed into seats 22 and 23 for grasping the end of a wire which it is required to extract. Said seats consist of semicylindrical cavities whose diameter is approximately equal to the diameter of the wire to be extracted and whose longitudinal axis is coaxial with the longitudinal axis of said device.

The longitudinal ends of the two lever pieces furthest

from that to which the screw-tape clamp means are fitted, and containing said seats 22 and 23, are each formed by a first, cylindrical end part whose diameter is slightly greater than the diameter of the wire to be extracted and by a second, generally frustoconical part joining said first part and the generally cylindrical central part of the pair of lever pieces. Said end of the extractor device has been designed thus designed or conceived in order that, when the device is used to extract a wire whose end is buried in soft tissues, turning the device causes the least possible damage to those tissues.

Illustrated in Figure 6 is a second embodiment of the device for the extraction of screwthreaded wires, according to the present invention, in which, in contrast to the previous embodiment, the axis of forward movement of the screw-type clamp means is generally perpendicular to the longitudinal axis of said device. In this embodiment the pin 124 comprises two threaded portions 128 and 129 engaged in corresponding threads in tapped pieces 125 formed in the ends 120b, 121b of said lever pieces 120 and 121. The threads of the threaded portions 128 and 129 (and accordingly the threads of the topped pieces 125) are of mutually opposite hand so that turning said pin in one sense causes said lever pieces to open and turning the pin in the opposite sense causes said lever pieces to close.

Rather than be formed directly in the ends 120b, 121b of said lever pieces 120 and 121, the tapped pieces 125 can be formed by inserting two cylindrical pieces 150, in which two tapped cavities of the same dimensions as the thread of said portions 128 and 129 are made, in corresponding cavities formed in said ends 120b, 121b of the lever pieces. This embodiment illustrated in Figure 6 makes it possible to give the two lever pieces 120 and

121 the right surface finishes appropriate to the type of use of the instrument separately from the threaded pieces.

Figure 7 illustrates a third embodiment of the device for the extraction of screwthreaded wires according to the present invention, in which the axis of forward movement of the screw-type clamp means is again generally perpendicular to the longitudinal axis of said device. However, as can be seen more clearly in Figure 8, said screw-type clamp means consist of a pair of pins 224 and 230, the first of which screws into the end 221b of the second lever piece of the extractor device, while the second is integral with the end 220b of the first lever piece and, in combination with the pin 224, provides a means of holding the device.

Figure 9 illustrates a fourth embodiment of the device for the extraction of screwthreaded wires according to the present invention, in which the axis of forward movement of the screw-type clamp means is generally parallel with one of the two lever pieces 320 and 321.

The lever pieces 320 and 321 are so formed that together they offer a generally frustoconical shape converging towards their first ends 320a, 321a, and are elastically hinged at their second ends 320b, 321b to form a body 331 to which is attached a rod 331' for screwing/unscrewing the wire to be extracted, when the jaws of the device have been clamped tightly on the end of the wire to be extracted. The gripping couple on the end of the wire to be extracted is provided by turning a ring nut 332, illustrated in detail in Figure 10, that is generally frustoconical and hollow, about a threaded

portion 334 of said two lever pieces which is located near the pivot of these pieces.

The ring nut 332 also includes a knob 333, knurled for easy purchase, for bending the two lever pieces so that
5 their ends 320a, 321a containing the seats 322 and 323 for gripping the end of a wire to be extracted, squeeze the end of this wire.

Figures 11 and 12 illustrate a fifth embodiment of the present invention that differs from that described
10 immediately above in that the two lever pieces 420 and 421 are formed in such a way that together they present a generally frustoconical shape converging towards their second ends 420b, 421b near the pivot.

Figure 13 is a longitudinal section through the device depicted in Figures 11 and 12 with the locking ringnut
15 432 fully screwed onto the threaded portion 434 of the body 431. In this position the device is ready to accommodate the end of the wire to be extracted in its seats 422 and 423 formed at the ends 420a and 421a of
20 the two lever pieces 420 and 421. The couple of forces required to grip said wire end is produced simply by partly unscrewing the ringnut 432 so that it moves towards the ends 420a and 421a of said two lever pieces.

It is clear in Figure 13 that the two lever pieces 420
25 and 421 can be made as a single part which is then fixed to said body 431 by means of a pin 435 or any other suitable means for fixing the two parts together.

The two lever pieces and the body can obviously equally well be made as a single part, as in the embodiment

illustrated in Figure 10. Likewise the embodiment
illustrated in Figure 10 can obviously be made with the
two lever pieces 320 and 321 in a single part which is
then fixed to the body 331 by means of a pin or any
5 other suitable means for fixing the two parts together.

This embodiment has the advantage that the locking
ringnut 432 is unable to unscrew itself on its own from
the pair of lever pieces 420 and 421.

This is because in order to remove the locking ringnut
10 432 completely from the pair of lever pieces 420 and 421
it is necessary to apply a force parallel to the
longitudinal axis of the extractor device. When the
ringnut 432 has been unscrewed from the threaded portion
434 and is slid in the longitudinal direction, its
15 internal surface comes into contact with the external
surface of the two lever pieces 420 and 421 which,
because they taper down towards their pivot, prevent the
ringnut from working itself loose. Only if the two lever
pieces are bent elastically and their ends 420a and 421a
20 brought together can the ringnut slide longitudinally
far enough to come completely off the device. This
prevents the ringnut from accidentally working itself
loose during the earlier operations of gripping the end
of the wire which it is required to extract.

25 Lastly, Figure 14 illustrates a sixth embodiment of the
invention, in which the two lever pieces 520 and 521 are
hinged together by a pin 539 to form forceps. A return
spring 544 is inserted close to said pin to enable the
extractor device to remain in the open position in the
absence of external action, that is to say with the ends
30 520a and 521a, containing the seats 522 and 523 for

gripping the end of a wire to be extracted, apart.

The clamp means consist of a lever device 541 comprising a camming rod 542 and a ring 543 for the pivoting of said rod 542. Said ring is also anchored, at the
5 opposite side from that secured to said rod 542, to one end 521b of one lever piece 521 of the extractor device.

The ring 543 could obviously equally well be anchored to the lever piece 520, in which case the rod 542 would act on the end 521b of the lever piece 521.

10 The lever device 541 is so located as to enable the operator who is holding the extractor device to act on the end 542a of said lever to force this end 542a towards the piece 520, thus increasing the gripping couple on the end of the wire which it is required to
15 extract, for by so doing the device 541 is made to exert a force on the lever piece 520 at the point of contact of the suitably shaped rod 542 with the end 520b of the lever piece 520, so tending to close or urging together the two ends 520b and 521b of the two lever pieces. The
20 closer the end 542a of the rod 542 comes to the piece 520, the more the two lever pieces 520 and 521 of the extractor device are forced to squeeze the jaws 520a and 521a of said device, and thus produce the couple of forces necessary to grip the end of the wire to be
25 extracted.

CLAIMS

1. Device for the extraction of screwthreaded wires for osteosynthesis, characterized in that it comprises: at least two lever pieces (20-21, 120-121, 220-221, 320-321, 420-421, 520-521) hinged together and having at one longitudinal end (20a-21a, 120a-121a, 220a-221a, 320a-321a, 420a-421a, 520a-521a) seats or jaws (22-23, 122-123, 222-223, 322-323, 422-423, 522-523) for grasping the end of a wire (19) which it is required to extract, and
- clamp means acting on the other ends (20b-21b, 120b-121b, 220b-221b, 320b-321b, 420b-421b, 520b-521b) of said lever pieces to promote their opening or closing in such a way as to generate at least one gripping couple on the end of the wire.
2. Device for the extraction of screwthreaded wires, according to Claim 1, in which the clamp means are of screw type.
3. Device for the extraction of screwthreaded wires, according to Claim 2, in which said screw-type clamp means consist of at least one screwthreaded pin (24, 124, 224) fitted with a knob and screwed into a tapped piece (25, 125, 225) integral with or otherwise carried by the end of one of said lever pieces.
4. Device for the extraction of screwthreaded wires, according to Claim 3, in which the axis of forward movement of said screw-type clamp means is generally parallel with one of said lever pieces (20-21, 320-321, 420-421).

5. Device for the extraction of screwthreaded wires, according to Claim 3, in which the axis of forward movement of said screw-type clamp means is generally perpendicular to the longitudinal axis of the said device.

6. Device for the extraction of screwthreaded wires, according to Claim 4, in which the end (24b) of the screwthreaded pin (24) nearest the pivot is of a generally frustoconical shape to interact with an inclined plane surface (26) formed at the end (20b) of the other lever piece in such a way as to force it outwards when said pin is screwed in.

7. Device for the extraction of screwthreaded wires, according to Claim 6, in which the hand of the thread on said pin (24) and on the tapped piece (25) is opposite to that of the thread on the wires.

8. Device for the extraction of screwthreaded wires, according to Claim 7, in which said pin (24) is provided, at the end opposite to that (24b) of generally frustoconical shape, with a knob having a generally polygonal cavity (40) whose longitudinal axis is coaxial with the axis of said pin, which cavity is suitable for the insertion of a polygonal socket wrench.

9. Device for the extraction of screwthreaded wires, according to Claim 8, in which said tapped piece (25) consists of a collar with a grooved or similar outer surface (27) suitable for use as a knob to provide a purchase during the extraction, by unscrewing, of the wire.

10. Device for the extraction of screwthreaded wires,
according to Claim 2, in which said lever pieces (320-
5 321, 420-421) are elastically hinged at a first end
(320b-321b, 420b-421b), are of generally frustoconical
overall shape and include a threaded portion (334, 434)
close to said first ends, and in which said clamp means
consist of an internally threaded ring nut (332, 432)
10 that screws onto the threaded portion (334, 434) of said
lever pieces, in such a way as to close the second ends
(320a, 321a) of said pieces.

11. Device for the extraction of screwthreaded wires,
15 according to Claim 5, in which said pin (124) comprises
two threaded portions (128 and 129) having threads of
mutually opposite hand such that rotating said pin in one
sense causes said tapped pieces and the corresponding
ends of said lever pieces to move together and rotating
20 said pin in the other sense causes said tapped pieces and
the corresponding ends of the lever pieces to move apart.

12. Device for the extraction of screwthreaded wires,
according to Claim 11, in which said tapped pieces (125)
25 are formed in two cylindrical pieces (150) each inserted
in one of two corresponding cylindrical cavities whose
axes are generally perpendicular to those of the tapped
pieces (125) located near the ends (120b, 121b) of said
lever pieces (120 and 121).

13. Device for the extraction of screwthreaded wires,
according to Claim 5, in which the lever piece opposite
that on which said threaded pin (24) is mounted has a
second knob (231) mounted on a fixed pin (230) that is
35 generally coaxial with said pin (224).

14. Device for the extraction of screwthreaded wires, according to Claim 1, in which the clamped means are of lever type.

5 15. Device for the extraction of screwthreaded wires, according to Claim 14, in which the lever-type clamp means consist of a rod (542) and a ring (543) for the pivoting of said rod (542), said ring being anchored, at the opposite side from that secured to said rod (542), to one end (520b or 521b) of a lever piece (520 or 521)
10 of said device.

16. Device for the extraction of screwthreaded wires, according to Claim 1, in which the seats (22-23, 122-123, 222-223, 322-323, 422-423) for grasping the end of a wire which it is required to extract consist of
15 semicylindrical cavities whose diameter is approximately equal to the diameter of the wire to be extracted and whose longitudinal axis is coaxial with the longitudinal axis of said device.

17. Device for the extraction of screwthreaded wires,
20 according to Claim 1, in which the longitudinal end of said lever pieces containing said seats (22-23, 122-123, 222-223, 322-323, 422-423) is formed by a first, cylindrical end part whose diameter is slightly greater than the diameter of the wire to be extracted and by a
25 second, generally frustoconical part joining said first part and the generally cylindrical central part of the pair of lever pieces.

18. Device for the extraction of screwthreaded wires substantially as described herein with reference to and
30 as illustrated in the accompanying drawings.

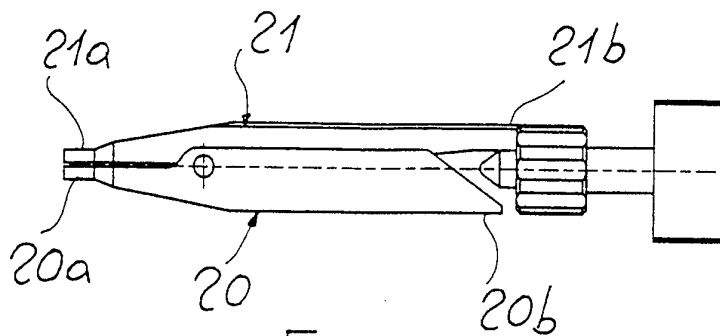


FIG. 1

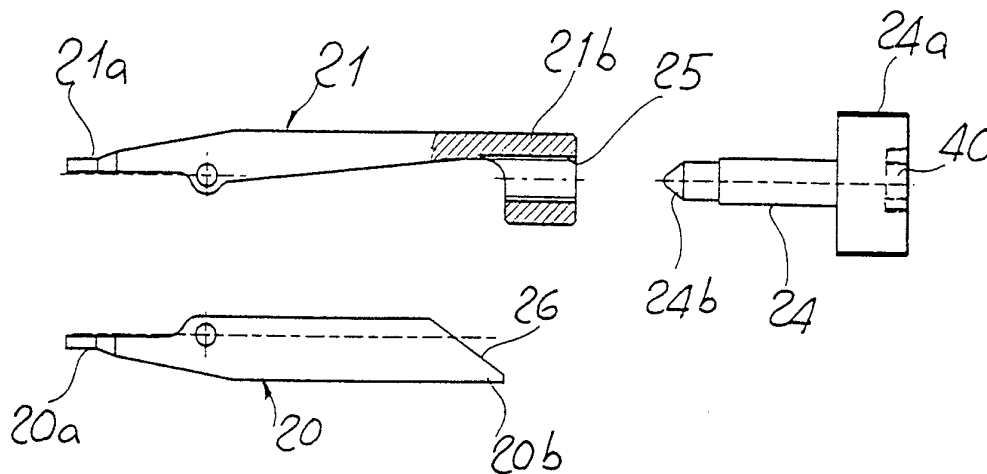


FIG. 2

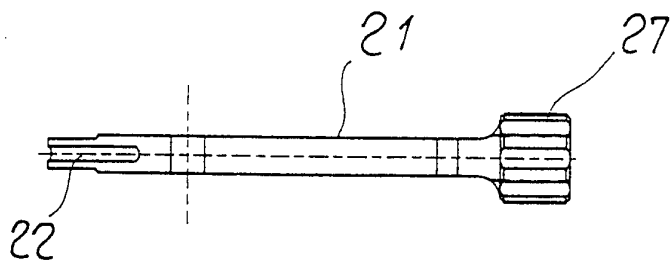


FIG. 3

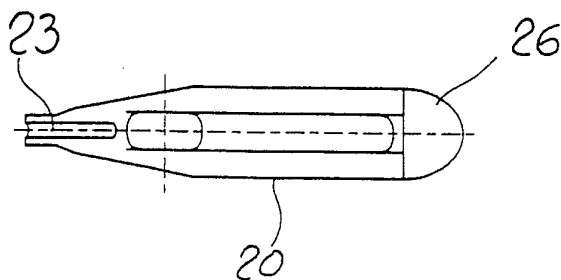


FIG. 4

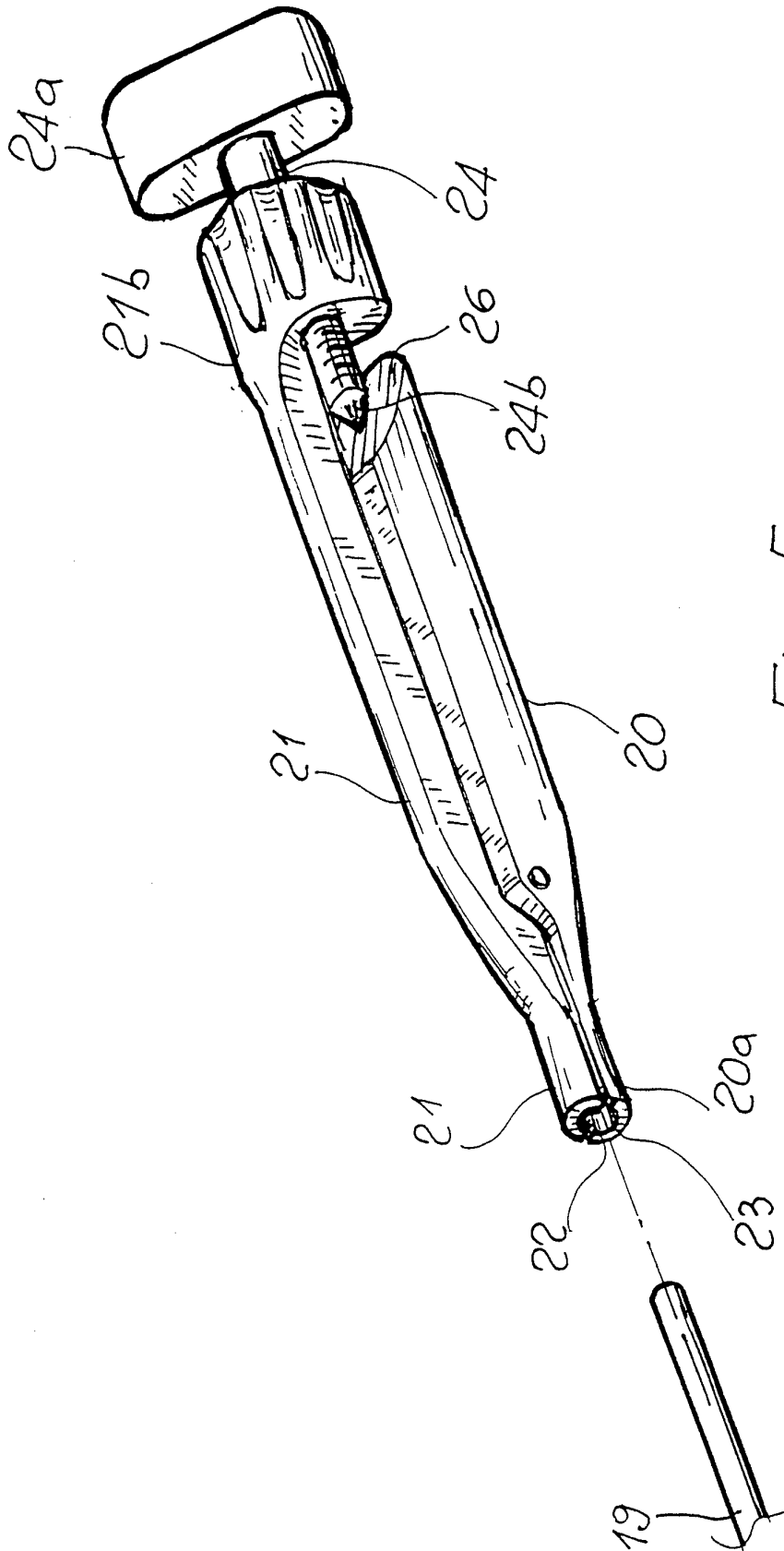


FIG. 5

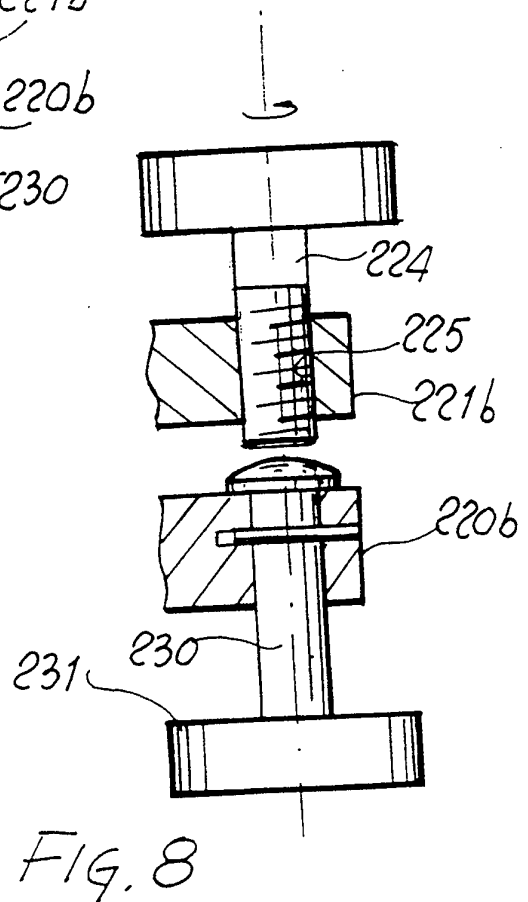
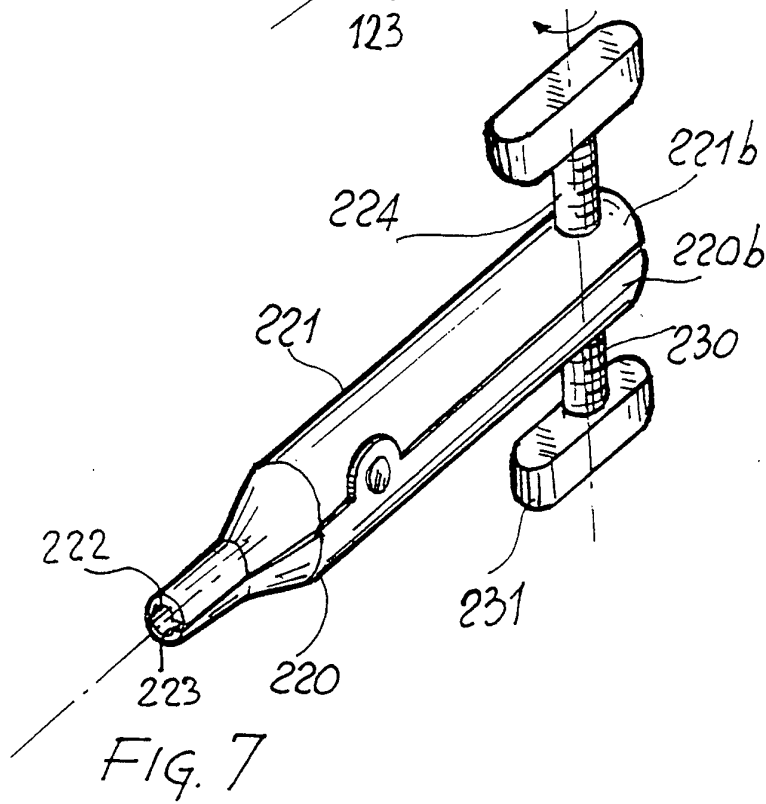
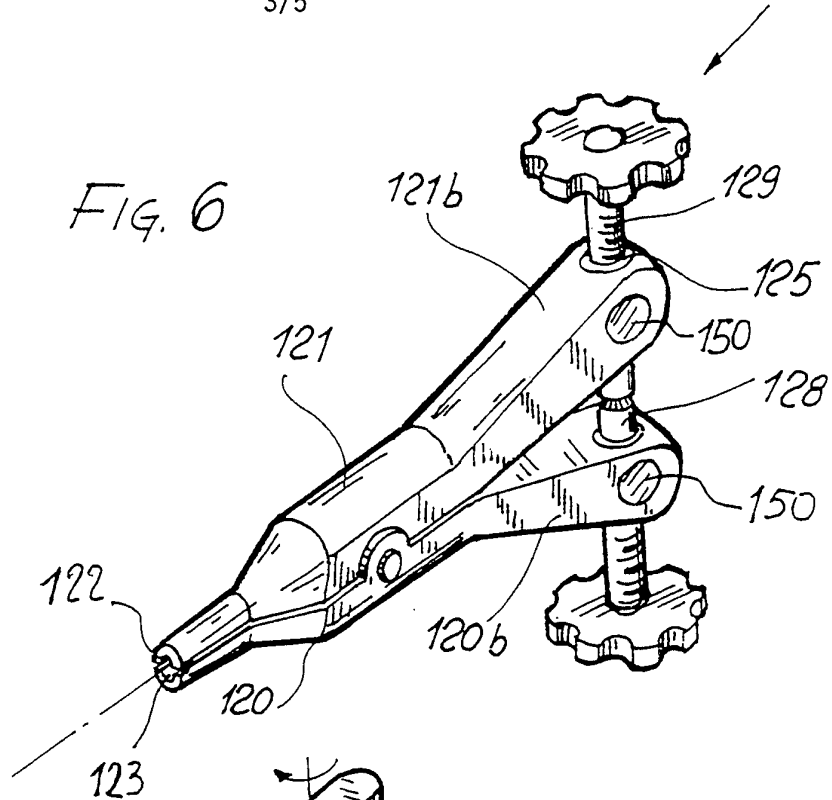


Fig. 9

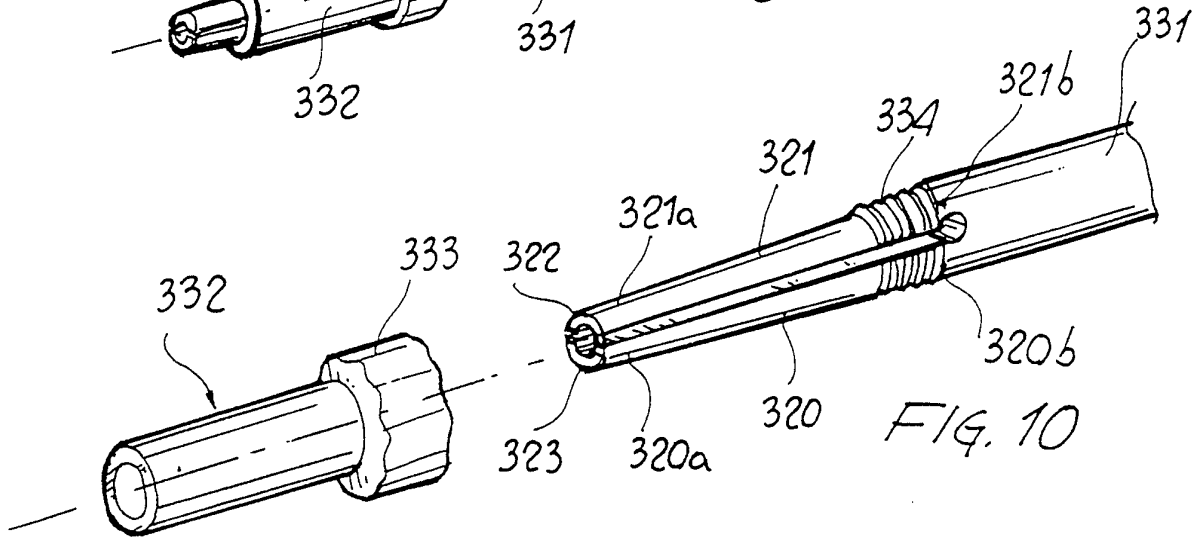
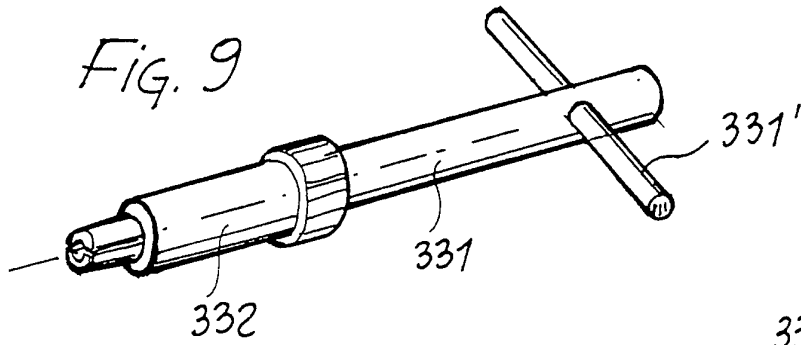


FIG. 10

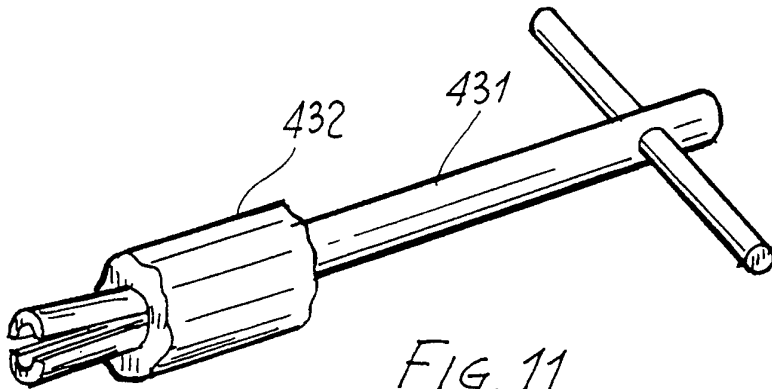


FIG. 11

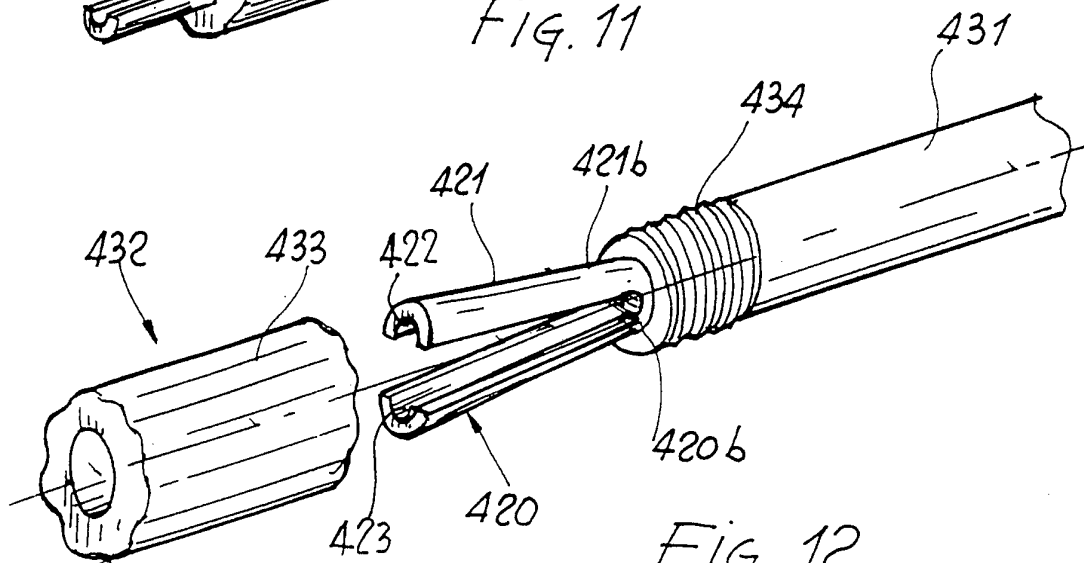
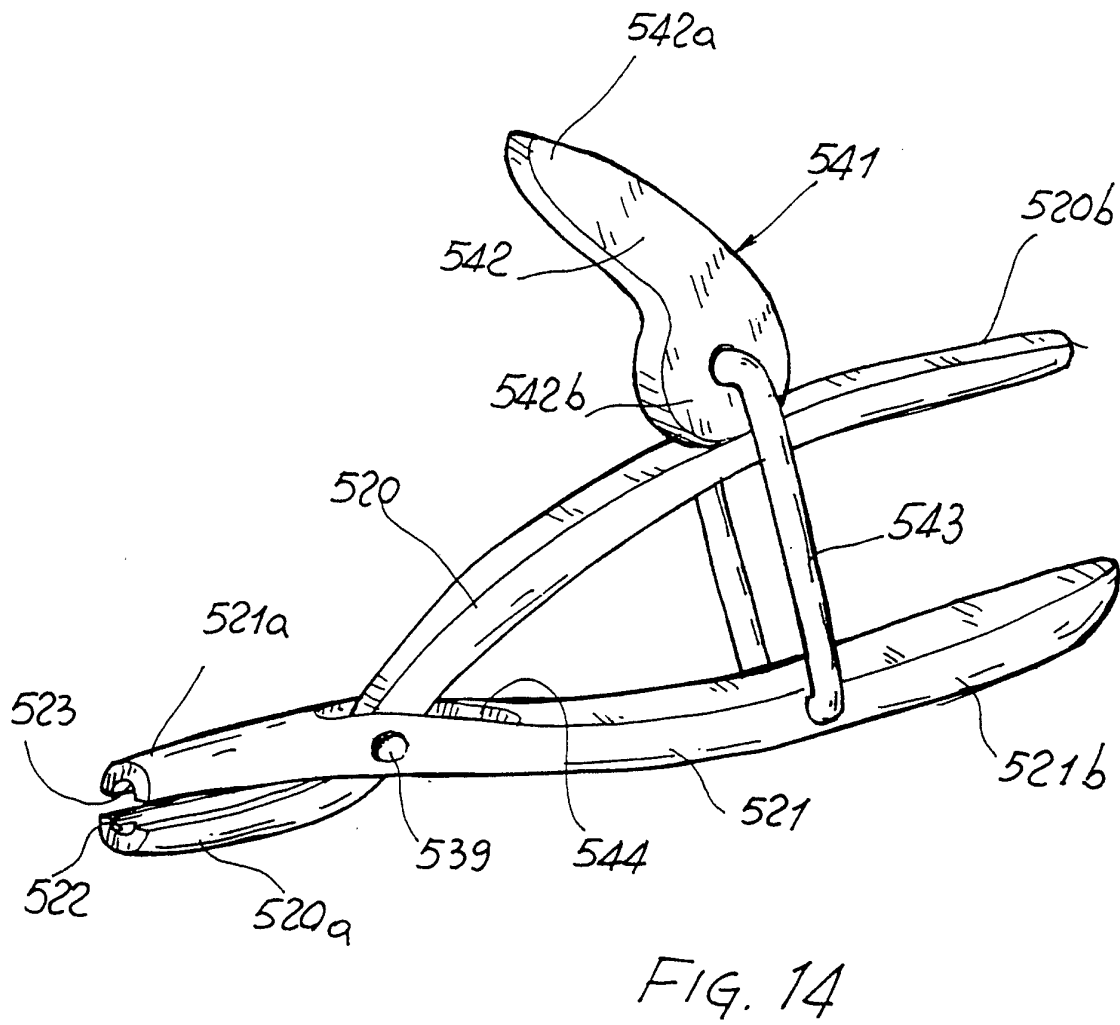
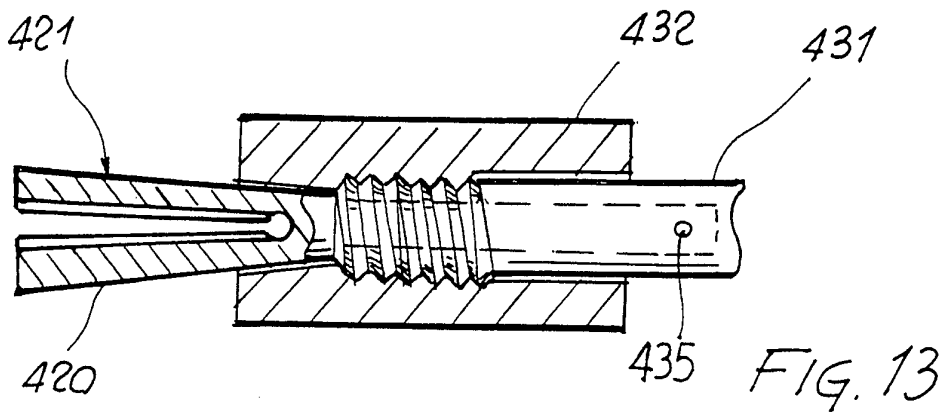


FIG. 12



INTERNATIONAL SEARCH REPORT

International Application No.
PCT/IB 96/00155

A. CLASSIFICATION OF SUBJECT MATTER

A 61 B 17/88, A 61 B 17/28

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A 61 B

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU, B, 75 239/87 (D. WHITMAN VICKERS) 07 January 1988 (07.01.88), the whole document, especially fig. 6-8; page 11, line 9 - page 12, line 3.	1, 14, 15
Y A	--	16 2, 10
X	FR, A, 1 322 212 (E. ALBERT et al.) 18 February 1963 (18.02.63), the whole document.	1, 2
Y A	--	10, 16 3, 4
Y	US, A, 4 438 769 (C.R. PRATT et al.) 27 March 1984 (27.03.84),	10, 16

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
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- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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- *&* document member of the same patent family

Date of the actual completion of the international search
24 June 1996

Date of mailing of the international search report

05. 07. 96

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LUDWIG e.h.

INTERNATIONAL SEARCH REPORT

 Internatic Application No
 PCT/IB 96/00155

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	<p>the whole document, especially claims 1,2,5-9, 16.</p> <p style="text-align: center;">--</p>	
A	<p>DE, A, 3 001 087 (ORTOPEDIA) 16 July 1981 (16.07.81), fig. 1-3; page 5, last line - page 7, last paragraph.</p> <p style="text-align: center;">--</p>	1-3,5
A	<p>US, A, 2 654 632 (L.C. HERBERT) 06 October 1953 (06.10.53), the whole document, especially fig. 1,5-8; column 3, line 5 - column 5, line 69.</p> <p style="text-align: center;">--</p>	1-4,6
A	<p>DE, C, 735 333 (H.W. SEIDEL) 08 April 1943 (08.04.43), page 1, lines 1-11.</p> <p style="text-align: center;">----</p>	1-4,6

ANHANG

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

ANNEX

to the International Search Report to the International Patent Application No.

ANNEXE

au rapport de recherche international relatif à la demande de brevet international n°

PCT/IB 96/00155 SAE 127728

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentedokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The Office is in no way liable for these particulars which are given merely for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche international visée ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office.

In Recherchenbericht angeführtes Patentedokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
AU A 75239		AU A1 75239/87 AU B2 589532 DE U1 8709220 US A 4911154	07-01-88 12-10-88 05-11-87 27-03-90
FR A 1322212		keine - none - rien	
US A 4438769	27-03-84	CA A1 1180246 DE A1 3310833 DE C2 3310833 FR A1 2473301 FR B1 2473301 GB AO 8307840 GB A1 118474 GB B2 118474 JP A2 81038441 JP B4 81038693	01-01-85 27-10-83 19-06-83 27-01-84 17-03-84 27-04-84 02-11-83 30-10-83 02-11-83 30-08-86
DE A1 3001087	16-07-81	FR A1 2473301	17-07-81
US A 2654632		keine - none - rien	
DE 735333		keine - none - rien	