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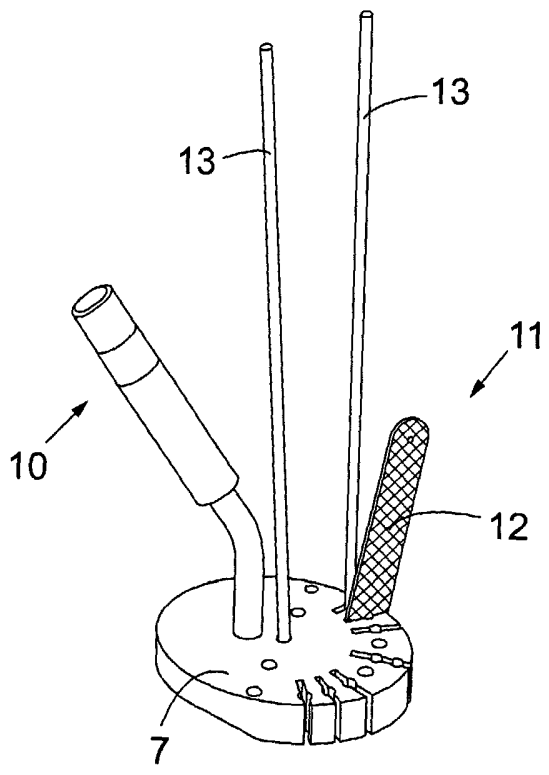
(54) **Title:** A MITRE INSTRUMENT, AS AN EXAMPLE FOR HALLUX SURGERY



(57) **Abstract:** The invention concerns a mitre instrument for use during surgery when cutting bone in connection with shortening or extension and/or correcting of the angle of the bone, comprising a body (9), in which there is at least one hole for a guide pin (13) for fixation of the instrument and at least two slots or scores (3) for a cutting tool (11). The slots (3) are provided in an oblique form relative each other and in predetermined, fixed angles, which converge in a common origin of coordinates (0), at the same time as the cutting tool (11) is extendable from the lower side of the body (9) at an outlet for a guide pin (13) in origin (0) without the pieces of cake (2) in the body (9) therebetween falling off.

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A MITRE INSTRUMENT, AS AN EXAMPLE FOR HALLUX SURGERY

The present invention regards a mitre instrument, as an example for hallux surgery and which is intended for use during surgery when cutting bone in connection with shortening or extension and/or correction of the angle of the bone and which instrument comprises a disc shaped body, in which there is at least one hole intended for a guide pin for securing of the instrument and at least two slots or scores for a cutting tool.

Today there is a large number of different methods described on how to operate for example hallux valgus and rigidus. Nearly every method has an own name after the surgeon/-orthopaedist that describes the operation procedure, for example McBride, Keller, Lapidus, Scarf, Reverdin, Akin, Waterman, Youngswick, Mitchell, Turan, Wilson and Austin to name the most common. These names house within itselfs those effects that can be reached at an operation of the present case. The operation methods may be divided into six main groups, namely the first only concerning soft part surgery, according to McBride, the second concerning proximal arthrodesis, i.e. arthrodesis with an angle alteration according to Lapidus, the third concerning proximal osteotomies, i.e. wedge-osteotomy, the fourth concerning mid-shaft osteotomies, for example scarf, the fifth concerns distal osteotomies, for example according to the names Reverdin, Mitchell, Wilson, Turan, Waterman, Youngswick and Austin and the sixth method concerning joint-cutting surgery, either a girdlestone according to Keller or arthrodesis. The methods most common, in superior, are within the fifth group and there the instrument according to the invention has its greatest benefit. The arthrodesis mentioned in method six may be apparently simplified by means of the instrument according to the present invention. The method described by Austin is based on so called chevron-osteotomy.

The description by Austin with chevron-methodology is automatically loadstable without internal fixation. It is

with this method as a base the present invention has been developed. The instruments, on the market at present time, however, imply that only relatively simple, to the bone perpendicular or close to perpendicular osteotomies are carried out. At the slightest more difficult osteotomy it is a requirement of the operating orthopaedist or surgeon to have a three dimensional eyesight and also an ability to correctly estimate angles. This is a quality missing in the main part of the population. Indeed extremely skilled carpenters may be able to estimate an angle but for ordinary people a mitre saw is required to be able to saw for example a door rail in an exact angle degree.

The aim of the present invention is to provide a new type of mitre instrument by means of which the drawback of the presently used instruments have been eliminated. The characterizing features of the invention are given in the following claims.

Thanks to the invention a mitre instrument is provided that in an emint way fulfils its aims at the same time as it is relatively simple and inexpensive to manufacture. By means of the instrument of the invention a displacement can take place at osteotomy towards any desired direction, towards or from the sole of the foot, shortening or extension, slanting towards any desired direction and also rotation. Just as in Austins description the use of the instrument of the invention mean that a load capacity is created directly after the operation and thus no internal fixation of the cut apart bones is needed. Thanks to the use of the instrument according to the invention a securing of the qualitative surgery results will be facilitated, which lead to less pain and shorter healingtime and additionally quicker return to work at the same time as risks are minimized for post operative complications due to the rapid mobilization.

The great advantages attained with the instrument according to the invention are, for example, obtaining a stable fixation at a simple hallux vulgus operation and this without

using an internal fixation with screw or nail of the cut apart bones. The ends of the bones will namely lie fixed like the securing of a parquet flooring. This stability means in turn that the patient not only can, but shall, load the foot to 100 % already about 1 ½ hour after the operation. The medium value for apparent post-operative pain is about 36 hours and this can be reduced by means of, in connection with the operation, giving long time effect anaesthesia, which has effect 8-10 hours directly after the operation. In such a way the apperent pain period may be decreased to about 24 hours. The variation of the pain varies apparently, probably mostly due to respective personality of the patient. The majority of the patients cope to return to work within three days to a week after the operation. The groups of patients that need a longer period of sick-leave are, for example, firemen, buildingworkers and postmen.

The instrument or collection of instruments according to the present invention is actually formed of three mitre instruments where two of the instruments are constituted, above a basic embodiment, of a plus and a minus instrument, where the angles increase and decrease, respectively, with half a degree for each 15^{th} degree. With the help of this collection of instruments it is possible to secure that each orthopaedist will be aided to saw in correct degrees. With the help of the collection of instruments it is thus possible to secure to attain an exact, predetermined angle at a new sawing in bone. The instruments are additionally fully balanced and the center of gravity is positioned in the middle of origin of coordinates. With a horizontally fixing pin in origin of coordinates the instrument will retain the position it is placed in. The plus and minus variants of the instrument make it possible to attain a stable and correct adaption of the cut bone ends. With the help of two of the three part instruments it is possible to practice long osteotomies, for example, even along nearly the whole metatarsal bone of the hallux. The large number of parallel holes in the instrument makes it possible to displace parallely the guide pins so they have the same direction.

The invention is described in more detail below by means of a preferred example of an embodiment together with references to the appended drawings, in which

Fig. 1 shows a schematic perspective view of a basic embodiment of the instrument according to the invention,

Fig. 2 shows a schematic plan view of the instrument seen from below, in which the slots for the cutting tool run into a common origin of coordinates, which is centrally positioned in a disc shaped body forming the instrument,

Fig. 3 shows a schematic perspective view obliquely from below of the instrument,

Fig. 4 shows a schematic plan view from above of the instrument and

Fig. 5 shows a schematic perspective view obliquely from below of the instrument.

As emerges from the drawings the present invention comprises a mitre instrument 1 in its basic embodiment and to which there is a plus and a minus instrument, where the angles increases and decreases, respectively, with half a degree for each 15^{th} degree. The basis for the instrument 1 according to the invention is constituted briefly of the fact that it comprises fixed angles, which converge in a central, in the instrument positioned, common origin of coordinates 0 and that without so called "pieces of cake" 2 positioned therebetween falling off. The instrument further comprises slots or scores 3, which extend obliquely downwards in the instrument in such a way that a cutting tool 11, such as a saw blade 12, which is for cutting the bone in question may reach out at an outlet of a guide pin 13 in origin of the coordinates 0 on the lower side 4 of the instrument 1 and

this is the fact that makes the possibility for these slots 3 to be present without the pieces of cake 2, falling off. A further basis for the invention is that the instrument also is formed, above its base embodiment, with a plus and a minus variant, which means that the small differences in angle between the neutral instrument and the plus or minus instrument lead to that a stability in the bone to be cut is attained. The mitre instrument comprises fixed distances from the centre, i.e. origin 0, for holes 5 in the same, which are provided for the fixation of the instrument. The instrument has also prepared holes 6 for adaption of specially construed Hohman hooks.

The lower side 4 of the instrument 1 which in the shown example is grooved, shows a bevelling or bevelled edge 8, which extends across about half of the lower side 4. The inclination of the so called "facet" is about 20-22°, which design facilitate the estimation of angle at the most common, i.e. shortening, effect of osteotomy. The collection of instruments according to the invention may also be used for hand surgery and then in a reduced size and for correction osteotomies on lower legbones and thighbones.

The mitre instrument according to the invention comprises, as evident from the drawing and especially Fig. 1, an elliptic, disc shaped body 9, which may have a thickness of about 7 mm with ellipse diameters of 22x28 mm. The instrument comprises thus as mentioned above in its entirety of three to each other complementing parts and besides a so called neutral variant there are a plus and a minus variant with some what differing degrees between the slots 3 made in the disc shaped bodies 9.

On the instrument, i.e. all variants, there is a gripfriendly handle formation 10 with ergonomically optimal angle and length. The handle formation 10 is additionally an assistance when balancing the three instrument variants. In the elliptic disc shaped body 9, which forms the instrument according to the invention, there is as is evident from the drawings a

number of holes 5, 6 for guide or fixation pins 13 and slots or scores 3 for a cutting tool 11. The holes 5 are positioned in the angles +15°, -15°, +30°, -30°, +45°, -45°, +60°, -60°. In the same angles as above there is also slots 3 for the saw blade 12 of the cutting tool 11. The slots 3 have an inclination within the goods from the upper side 7 of the instrument 1 towards its lower side 4 of about 45° so that an oscillating saw easily can be handled. On the lower side 4 there is a "facet" 8, which has an inclination of about 20-22°. For correction of the centre of gravity of the instrument the "facet" 8 may be grooved.

The plus and minus variants of the instrument have the same design as the neutral variant with the difference that the angles have been displaced so that they increase (plus variant) and decrease (minus variant), respectively with half a degree for each 15^{th} degree.

The technical advantages with the collection of instruments according to the invention is namely that the fixed angles, which are built into the instruments, bring about the full security that the angle chosen corresponds to the angle aiming at when cutting during an operation. At osteotomy with double chevrons, i.e. double angle cuts and removal of bone, one can be sure that the resection surfaces in the bone will exactly fit each other again after the cutting. This exactness in cutting lead to secure the results of the operations and shortening of the convalescence after the operation. The collection of instruments according to the invention lead to a security to operations performed by less experienced surgeons and the collection of instruments also lead to that pins for fixing of the mitre instruments can be displaced parallelly with great exactness. Finally the collection of instruments according to the invention are fully balanced and do not rotate out of its position due to gravity, like corresponding previously known instruments that have been used up till now in this type of operations.

CLAIMS

1. A mitre instrument for use during surgery when cutting bone in connection with shortening or extension and/or correcting of the angle of the bone, comprising a body (9), in which there is at least one hole for a guide pin (13) for fixation of the instrument and at least two slots or scores (3) for a cutting tool (11), **characterised in** that the body (9) forming the instrument is disc shaped and that the slots (3) are provided in an oblique form relative each other and in predetermined, fixed angles, which converge in a common origin of coordinates (0) in the disc shaped body (9), at the same time as the cutting tool (11) is extendable from the lower side of the disc shaped body (9) at an outlet for a guide pin (13) in origin (0) without the pieces of cake (2) in the body (9) therebetween falling off.

2. A mitre instrument according to claim 1, **characterised in** that the holes (5) for the guide pin (13) in question are provided on fixed distances from origin (0).

3. A mitre instrument according to claim 1, **characterised in** that the fixed angles are formed on a mutual angle distance with a positive displacement from each other of +0,5° each 15^{th} degree, with a negative displacement of -0,5° each 15^{th} degree or without said displacements.

4. A mitre instrument according to claim 1, **characterised in** that the lower side (4) of the disc shaped body (9), show a bevel (8) in the form of a facet, which form an inclination of about 20° relative its lower side (4).

5. A mitre instrument according to claim 1, **characterised in** that an angled handle formation (10) is balanced attached at the upper side (7) of the disc shaped body (9), close behind the converging point in origin (0) of the slots (3) and mainly in an area close above the inclination of the facet (8) away from the lower side (4) of the body (9).

6. A mitre instrument according to claim 5, **characterised in** that the handle formation (10) is gripfriendly and shows an ergonomically optimal angle and length at the same time as a balancing of the instrument (1) is made possible.

7. A mitre instrument according to claim 1, **characterised in** that respective slot or score (3) has an inclination within the disc shaped body (9) from the upper side (7) towards the lower side (4) of about 45° for the facilitating of the handling of the cutting tool (11).

8. A mitre instrument according to claim 1, **characterised in** that the facet (8) shows a grooved lower side.

9. A mitre instrument according to claim 1, **characterised in** that the instrument (1) is balanced, so that its point of gravity is positioned in origin (0).

10. A mitre instrument according to claim 1, **characterised in** that the holes in the disc shaped body (9) for the guide pins (13) are arranged parallel relative each other for the possibility of parallel displacement of the guide pins (13).

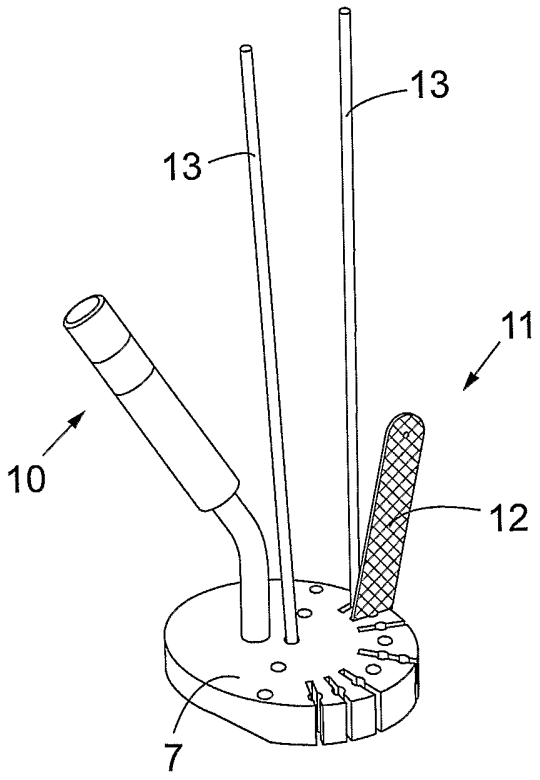

Fig. 1

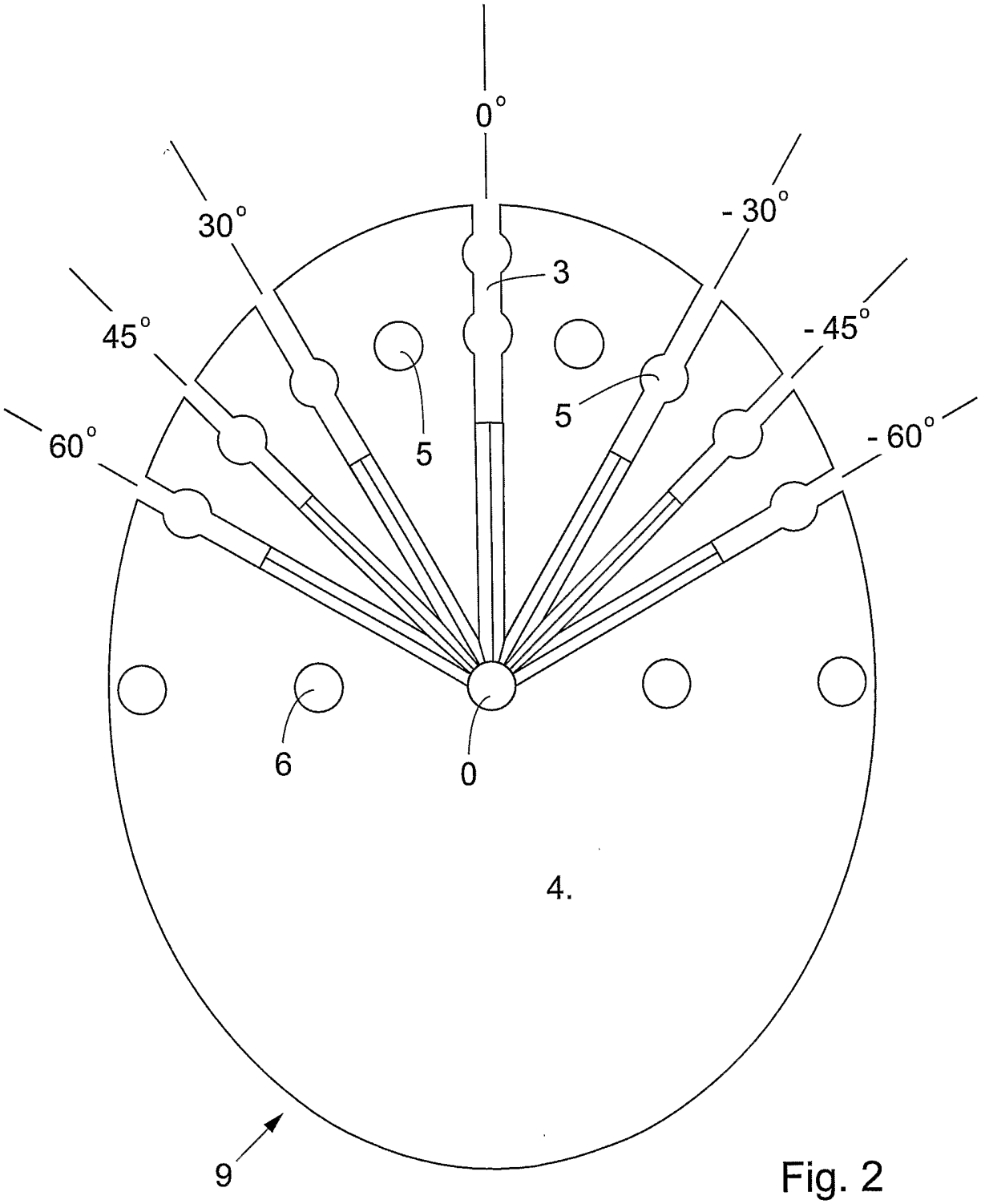

Fig. 2

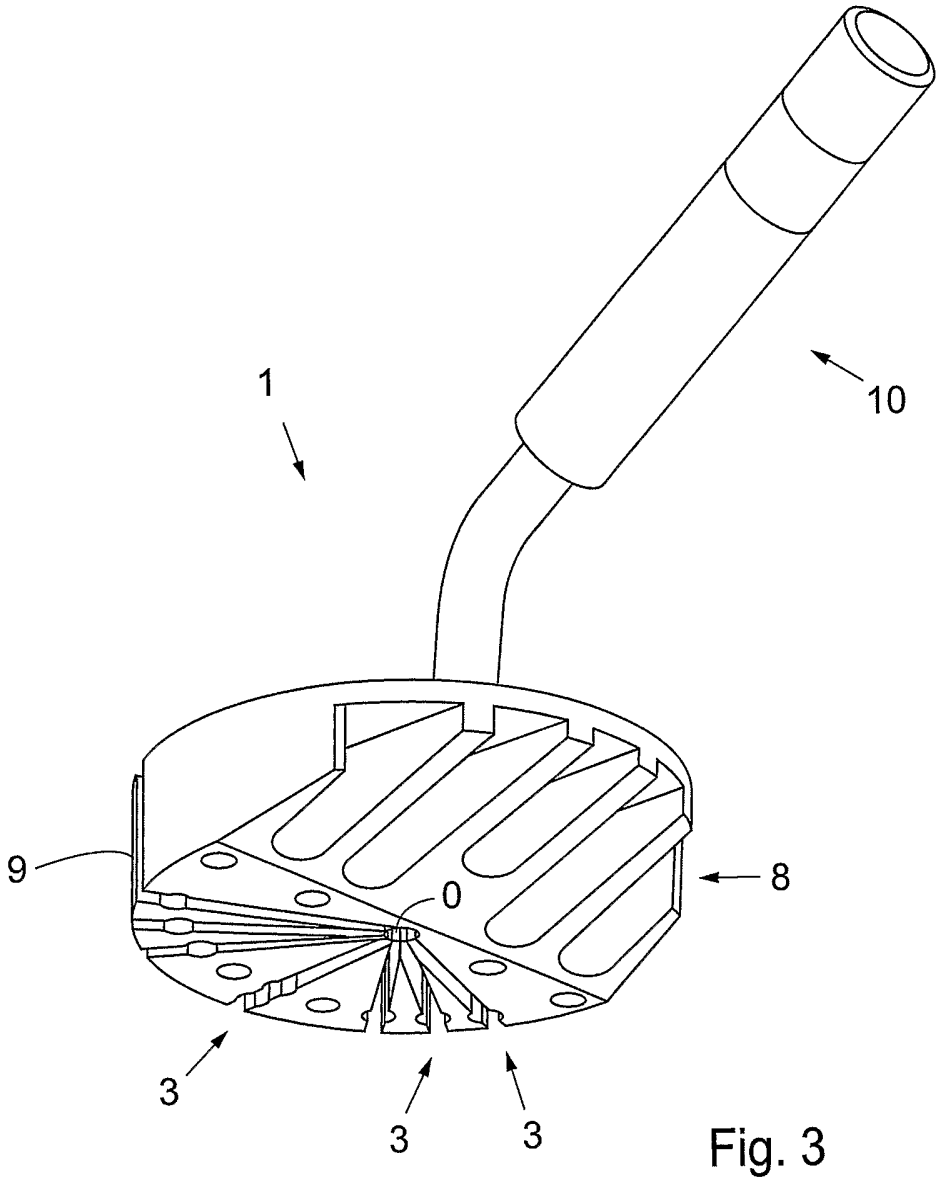

Fig. 3

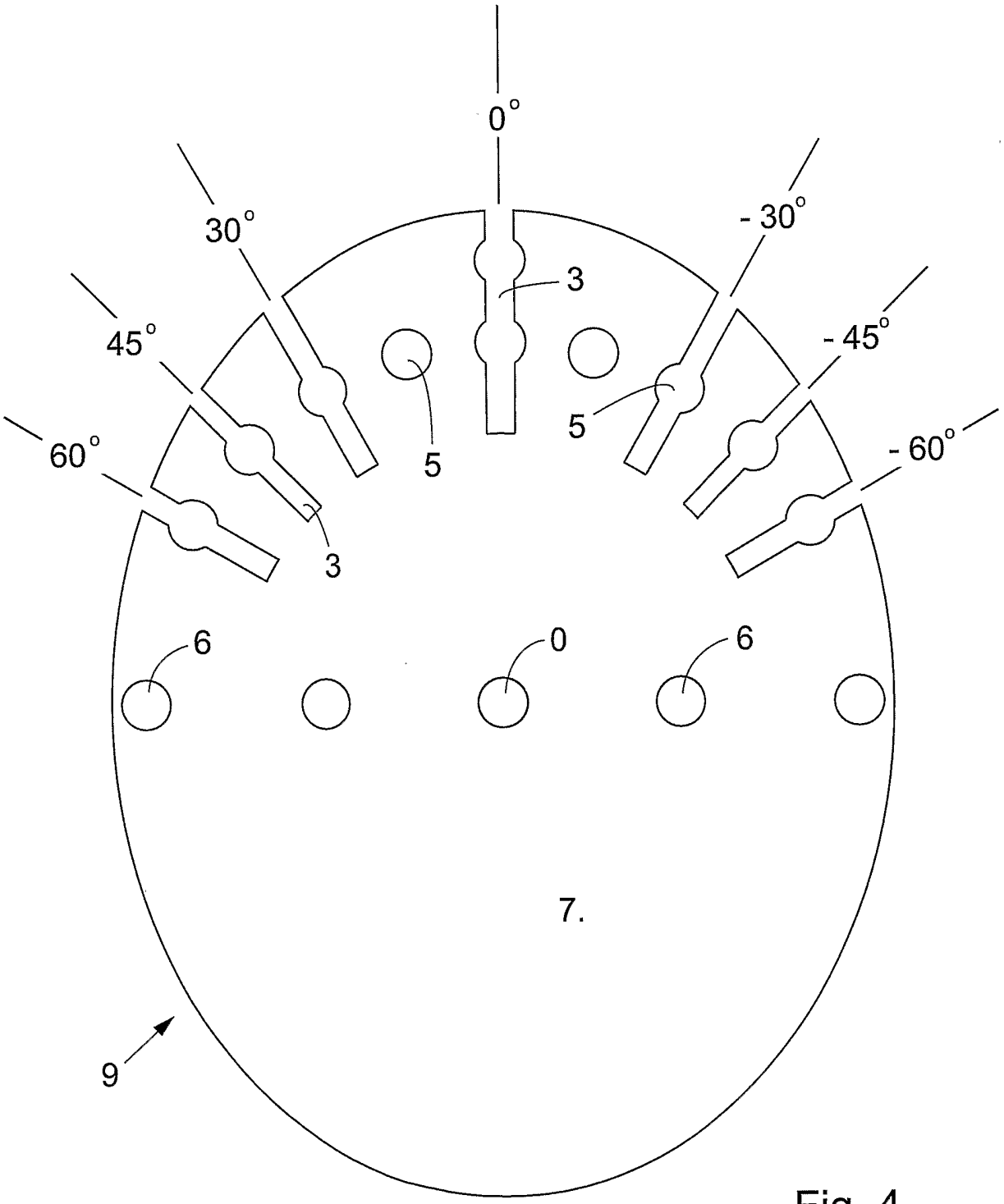

Fig. 4

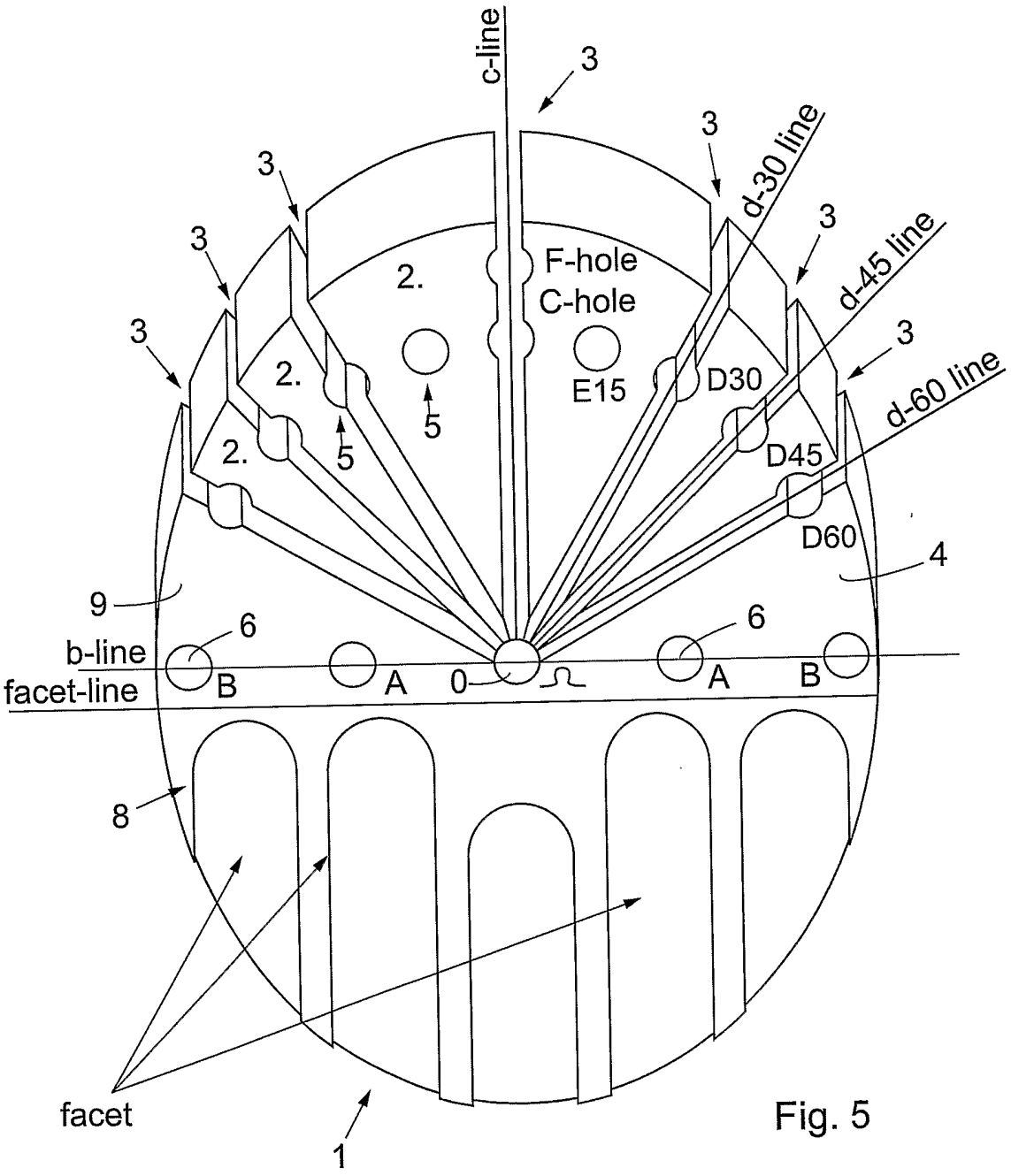
c-line
3
d-30 line
d-45 line
d-60 line
F-hole
C-hole
E15
D30
D45
D60
2.
5
4
9
6
b-line
facet-line
B
A
0
8
facet
1

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 03/00841

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61B 17/15
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)

IPC7: A61B

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, 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.
A	US 5613969 A (JOSEPH R. JENKINS, JR.), 25 March 1997 (25.03.97), abstract, fig. --	1-10
A	US 5449360 A (SAUL N. SCHREIBER), 12 Sept 1995 (12.09.95), abstract, fig. --	1-10
A	US 5843085 A (ROBERT E. GRASER), 1 December 1998 (01.12.98), abstract, fig. --	1-10
A	US 4421112 A (DOUGLAS B. MAINS ET AL), 20 December 1983 (20.12.83), abstract, fig. --	1-10

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
28 August 2003	01 -09- 2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Hélène Erikson/Els Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 03/00841

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6500179 B1 (MICHAEL A. MASINI), 31 December 2002 (31.12.02), abstract, fig. --	1-10
A	EP 0570187 A1 (TECHNOLOGY FINANCE CORPORATION (PROPRIETARY) LIMITED), 18 November 1993 (18.11.93), abstract, fig. -- --------	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

26/07/03

International application No.
PCT/SE 03/00841

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