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PILOT DEVICE FOR INSERTING A SCREW INTO THE NECK OF THE FEMUR
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- (71) Applicant(s)
DIETMAR PENNIG
- (72) Inventor(s)
DIETMAR PENNIG
- (74) Attorney or Agent
GRIFFITH HACK & CO , GPO Box 1285K, MELBOURNE VIC 3001
- (56) Prior Art Documents
EP 514662
AU 16223/92 A61B 17/58
US 4911153
- (57) Claim

1. A drill-guide device for a drill to produce a bone-screw pilot hole extending substantially transverse to a longitudinally extending intramedullary nail which has been longitudinally installed in a femur having a fracture in the femoral neck thereof, wherein the intramedullary nail has a longitudinal axis and a proximal end, said device comprising a drill template and adjustable means for removably attaching of said template to the proximal end of the intramedullary nail, and for adjustably tilting said template about a horizontal axis extending transverse to the longitudinal axis of the intramedullary nail and transverse to the radial direction of the femoral neck, said adjustable means including means for vertically adjusting said template in a direction parallel to the longitudinal axis of the intramedullary nail, said drill template having at least two drill-guide holes which are at a horizontal spacing transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of the femoral neck, said spacing corresponding at least to the diameter of said intramedullary pin.

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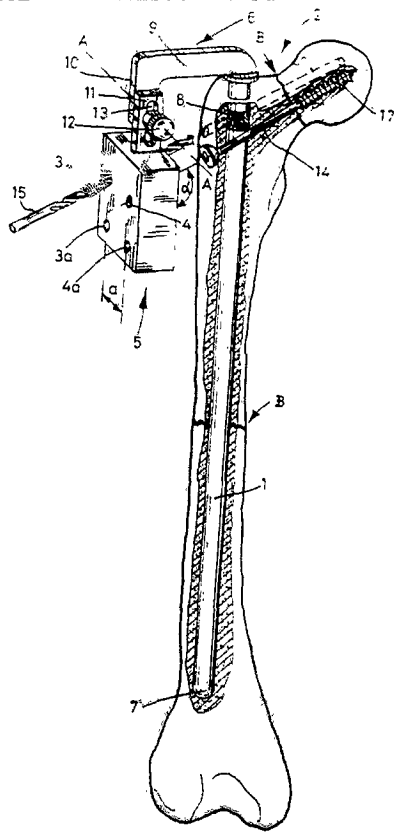
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9. A drill-guide device for a drill to produce a bone-screw pilot hole extending substantially transverse to a longitudinally extending intramedullary nail which has been longitudinally installed in a femur having a fracture in the femoral neck thereof, wherein the intramedullary nail has a proximal end, said device comprising a drill template and adjustable means for removably attaching said template to the proximal end of the intramedullary nail and for adjustably tilting said template about a horizontal axis extending transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of the femoral neck, said adjustable means including means for vertically adjusting said template in a direction parallel to the longitudinal axis of the intramedullary nail, said drill template being a block having at least two drill-guide holes which are at a horizontal spacing transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of the femoral neck, said spacing corresponding at least to the diameter of said intramedullary nail, said drill-guide holes being on axes which are inclined in substantial conformance with the slope of the femoral neck with respect to the shaft of the femur, said axes of the respective drill-guide bores converging in the direction of the alignment of the femoral neck in such manner that these axes geometrically intersect beyond the femoral head.

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(21) Internationales Aktenzeichen: PCT/DE92/01043 (22) Internationales Anmeldedatum: 14. Dezember 1992 (14.12.92) (30) Prioritätsdaten: P 41 41 153.6 13. Dezember 1991 (13.12.91) DE (71)(72) Anmelder und Erfinder: PENNIG, Dietmar [DE/DE]; Hans-Driesch-Str. 12, D-5000 Köln 41 (DE). (74) Anwälte: HABEL, Hans-Georg usw. ; Am Kanonengraben 11, D-4400 Münster (DE). (81) Bestimmungsstaaten: AU, CA, JP, NO, US, europäisches Patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).			Veröffentlicht <i>Mit internationalem Recherchenbericht. Vor Ablauf der für Änderungen der Ansprüche zugelassenen Frist. Veröffentlichung wird wiederholt falls Änderungen eintreffen.</i> 657830
(54) Title: PILOT DEVICE FOR INSERTING A SCREW INTO THE NECK OF THE FEMUR (54) Bezeichnung: FÜHRUNGSVORRICHTUNG ZUM EINBRINGEN EINER SCHENKELHALSSCHRAUBE (57) Abstract <p>The invention relates to a pilot device for a drill for making the drilling for the insertion of a screw into the neck of the femur, an intramedullary nail being already inserted in the femur, comprising a pivotable drilling template adjustable for height removably fitted at the proximal end of the intramedullary nail and having at least two drilling holes at a horizontal distance from each other of at least the diameter of the intramedullary nail.</p> (57) Zusammenfassung <p>Die Erfindung bezieht sich auf eine Führungsvorrichtung (5, 6) für einen Bohrer zur Herstellung der Bohrung zum Einbringen einer Schenkelhalsschraube (14) bei eingebrachtem Marknagel (1) im Oberschenkel, wobei eine schwenkbar und höhenverstellbar an das proximale Ende des Marknagels abnehmbar angeschlossene Bohrschablone (5) vorgesehen ist, die wenigstens zwei Bohrerlöcher (3, 4, 3a, 4a) aufweist, die einen horizontalen Abstand voneinander aufweisen, der mindestens dem Durchmesser des Marknagels entspricht.</p>			
			

"Guide Device for Inserting a Screw into the
Neck of the Femur"

5 The invention relates to a drill guide device for use in producing holes for bone screws in the neck of a femur.

10 A guide device for drilling into the neck of a femur is known from U.S. Pat. No. 4,733,654, which discloses a drill template adapted to be placed on a proximal-end part of an intramedullary nail; the device is completely rigid, so that neither turning nor swinging movements are possible. Therefore, the alignment of holes to be drilled is determined once and for all, and adaptation to different conditions of an individual person are not possible.

15 The primary object of the invention is to provide an improvement in a drill-guide device of the character indicated such that, in the event of a fractured femur in which an intramedullary nail has been installed, a fractured femoral neck can be set without the need to align drilled holes with holes in the intramedullary nail.

20 According to one aspect of the present invention there is provided a drill-guide device for a drill to produce a bone-screw pilot hole extending substantially transverse to a longitudinally extending intramedullary nail which has been longitudinally installed in a femur having a fracture in the femoral neck thereof, wherein the intramedullary nail has a longitudinal axis and a proximal end, said device comprising a drill template and adjustable means for removably attaching of said template to the proximal end of the intramedullary nail, and for adjustably tilting said template about a horizontal axis extending transverse to the longitudinal axis of the intramedullary nail and transverse to the radial direction of the femoral neck, said adjustable means including means for vertically adjusting said template in a direction parallel to the longitudinal axis of the intramedullary nail, said drill

template having at least two drill-guide holes which are at a horizontal spacing transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of the femoral neck, said spacing corresponding at least to the diameter of said intramedullary pin.

According to another aspect of the present invention there is provided a drill-guide device for a drill to produce a bone-screw pilot hole extending substantially transverse to a longitudinally extending intramedullary nail which has been longitudinally installed in a femur having a fracture in the femoral neck thereof, wherein the intramedullary nail has a proximal end, said device comprising a drill template and adjustable means for removably attaching said template to the proximal end of the intramedullary nail and for adjustably tilting said template about a horizontal axis extending transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of the femoral neck, said adjustable means including means for vertically adjusting said template in a direction parallel to the longitudinal axis of the intramedullary nail, said drill template being a block having at least two drill-guide holes which are at a horizontal spacing transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of the femoral neck, said spacing corresponding at least to the diameter of said intramedullary nail, said drill-guide holes being on axes which are inclined in substantial conformance with the slope of the femoral neck with respect to the shaft of the femur, said axes of the respective drill-guide bores converging in the direction of the alignment of the femoral neck in such manner that these axes geometrically intersect beyond the femoral head.

In other words, it is proposed that a conventional intramedullary pin or locking pin should be provided at its proximal end with a connecting device to which it is possible to connect a guide or aiming device which guides the drills in such a way that the drills pass

into the neck or head of the femur on both sides of the inserted intramedullary pin, so that screwing in of the bone-screws is then possible, despite the inserted intramedullary pin.

5 Thus, the drilling template is adjustably supported by a suspension bar, one end of which engages with the proximal end of the intramedullary pin, while the other end of the suspension bar bears the drilling template adjustably in height, i.e. it can be moved in the direction
10 of the longitudinal axis of the intramedullary pin, so that a direction of the drilling template with regard to both angle and height is possible through this.

 After the insertion of the screws passing through the fracture of the neck of the femur the suspension bar
15 can be removed and the threaded drilled hole then present in the intramedullary pin can be closed by an appropriate plug or a screw.

 One embodiment of the invention is explained below by means of the drawing.

20 The drawing shows in

Fig. 1 relatively diagrammatically and partially opened a femur with an intramedullary pin and a connected drilling template and in

25 Fig. 2 diagrammatically a section to show the axes of the drilling holes._____

In the drawing an intramedullary pin is shown at 1 which is inserted in a femur, a fracture of the femur which is to be immobilized by the intramedullary pin being shown at B. In addition, a fracture B in the neck of the femur is shown and now, despite the inserted intramedullary pin, bone-screws must be passed through the femur and the neck of the femur as far as the head of the femur, in order in this way to immobilize the fracture of the neck of the femur.

The proximal end of the intramedullary pin is labelled 2 and here a threaded connection 8 is provided, into which a corresponding counter-thread of a suspension bar 6 can be screwed, so that this suspension bar 6 is then borne by the proximal end 2 of the intramedullary pin 1.

The term "vertical" is understood hereinafter to mean a direction running parallel to the longitudinal axis of the intramedullary pin 1 and the term "horizontal" to mean a direction running at right angles to the longitudinal axis of the intramedullary pin 1, and in some cases also at right angles to the direction of the neck of the femur or in the direction of the neck of the femur.

The suspension bar 6, in the embodiment shown, consists of an angular part with the two arms 9 and 10, the arm 10 being directed vertically downwards - essentially parallel to the intramedullary pin 1 - while the arm 9 is shown as horizontal - i.e. essentially at right angles to the intramedullary pin 1 and in the direction of the axis of the neck of the femur - and has at one end the threaded connection 8. A support 11 is connected vertically and adjustably in height to the arm 10 - i.e. adjustable in the longitudinal axis of the arm 10 and the intramedullary pin 1 - by the fact that a corresponding screw 12 runs through a slot 13 to the arm 10 and the support 11 can be secured with this screw 12, the screw at the same time forming the axis of articulation for the horizontal axis A - A. The support 11 itself bears a drilling template 5 which has drilling holes 3 and 4 or 3a and 4a, these drilling holes 3 and 4 and 3a and 4a having a horizontal distance a from each other and being inclined in a vertical direction in relation to the horizontal running in the direction of the neck of the femur. The angle of inclination α is

preferably 130° . Apart from this vertical inclination the two drilling holes 3 and 4 or 3a and 4a coincide in the horizontal plane in such a way as is shown in fig. 2, i.e. the axes $5x$ and y intersect behind the head of the femur, the two drilling holes 3 and 4 or 3a and 4a, however, being at a transverse distance apart such that the screws pass by the inserted intramedullary pin 1 without any problems.

A femur neck screw 14 with thread 17 is shown in the drawing as an embodiment, the reference 15 indicating a drill which has previously drilled the hole needed to receive the screw.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A drill-guide device for a drill to produce a bone-screw pilot hole extending substantially transverse to a longitudinally extending intramedullary nail which has
5 been longitudinally installed in a femur having a fracture in the femoral neck thereof, wherein the intramedullary nail has a longitudinal axis and a proximal end, said device comprising a drill template and adjustable means for removably attaching of said template to the proximal end of
10 the intramedullary nail, and for adjustably tilting said template about a horizontal axis extending transverse to the longitudinal axis of the intramedullary nail and transverse to the radial direction of the femoral neck, said adjustable means including means for vertically
15 adjusting said template in a direction parallel to the longitudinal axis of the intramedullary nail, said drill template having at least two drill-guide holes which are at a horizontal spacing transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of
20 the femoral neck, said spacing corresponding at least to the diameter of said intramedullary pin.

2. A drill-guide device according to claim 1, in which the drill template is a block and the drill-guide holes are on axes which are inclined above the horizontal,
25 extending generally transverse to the intramedullary nail, wherein the inclination substantially conforms to the slope of the femoral neck with respect to the shaft of the femur.

3. A drill-guide device according to claim 1 or 2, in which said adjustable means for removably attaching
30 said template to said nail comprises a suspension bar removably connected to the proximal end of the intramedullary nail and rotatable about the longitudinal axis of the intramedullary nail, said suspension bar extending radially outward of the intramedullary nail and
35 having a free end, and said free end carrying said means for vertically adjustable positioning of the template

parallel to the longitudinal axis of the intramedullary nail.

4. A drill-guide device according to claim 3, in which the drill template is selectively adjustable with respect to the intramedullary nail and the suspension bar about said horizontal axis transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of the femoral neck.

5. A drill-guide device according to claim 3 or 4, in which the means for removable attachment includes threaded attachment means at the proximal end of the intramedullary nail and at an end of the suspension bar.

6. A drill-guide device according to claim 5, in which the threaded attachment means at the proximal end of the intramedullary nail is adapted for closure after the threaded attachment means at the end of the suspension bar has been removably disconnected.

7. A drill-guide device according to any one of claims 1 to 6, in which said at least two drill-guide holes are part of a greater plurality of drill-guide holes, said plurality of drill-guide holes being arranged one vertically below the other in transversely spaced vertical planes parallel to the longitudinal axis of the intramedullary nail.

8. A drill-guide device according to any one of claims 1 to 6, in which said at least two drill-guide bores define a horizontally spaced pair which is one of a plurality of vertically spaced pairs of drill-guide bores, wherein corresponding bores of each pair are aligned in first and second vertical planes having said horizontal spacing.

9. A drill-guide device for a drill to produce a bone-screw pilot hole extending substantially transverse to a longitudinally extending intramedullary nail which has been longitudinally installed in a femur having a fracture in the femoral neck thereof, wherein the intramedullary nail has a proximal end, said device comprising a drill

template and adjustable means for removably attaching said template to the proximal end of the intramedullary nail and for adjustably tilting said template about a horizontal axis extending transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of the femoral neck, said adjustable means including means for vertically adjusting said template in a direction parallel to the longitudinal axis of the intramedullary nail, said drill template being a block having at least two drill-guide holes which are at a horizontal spacing transverse to the longitudinal axis of the intramedullary nail and transverse to the direction of the femoral neck, said spacing corresponding at least to the diameter of said intramedullary nail, said drill-guide holes being on axes which are inclined in substantial conformance with the slope of the femoral neck with respect to the shaft of the femur, said axes of the respective drill-guide bores converging in the direction of the alignment of the femoral neck in such manner that these axes geometrically intersect beyond the femoral head.

10. A drill-guide device according to claim 9, in which said at least two drill-guide holes constitute a first pair of a plurality of pairs of drill-guide holes, said pairs being vertically spaced from each other and similarly convergent.

11. A drill-guide device substantially as herein described with reference to and as illustrated in the accompanying drawings.

Dated this 11th day of January, 1995.

30 DIETMAR PENNIG
By its Patent Attorneys:

GRIFFITH HACK & CO.
Fellows Institute of Patent
Attorneys of Australia.

FIG. 1

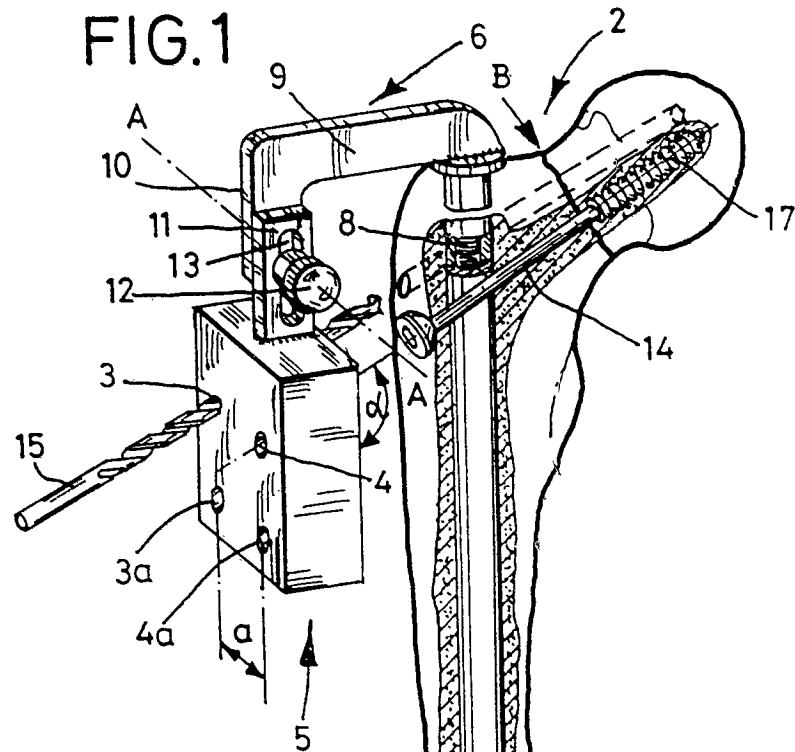
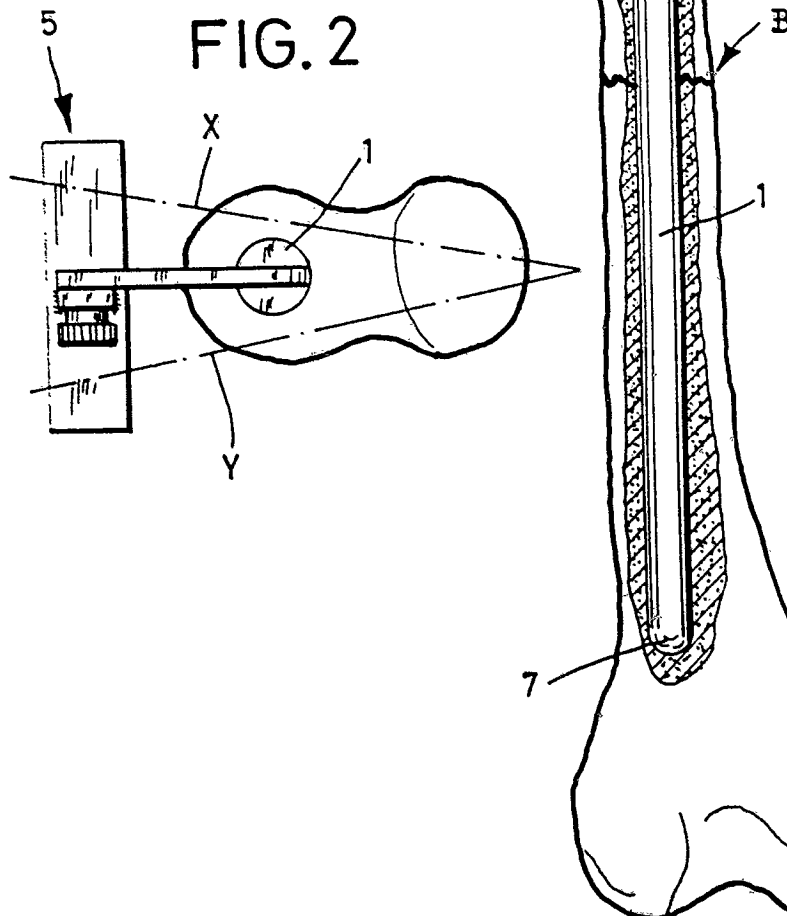


FIG. 2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/DE 92/01043

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ⁵ A61B17/56; A61B17/16

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)

Int. Cl. ⁵ A61B

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

Electronic data base consulted during the international search (name of data base and, where 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,A, 4 911 153 (BORDER) 27 March 1990, see abstract; figure 3	1
A	EP,A, 0 095 296 (3M) 30 November 1983, see abstract; figures 1,2,3	1
A	CH,A, 248 631 (FAVARGER) 16 February 1948, see page 1, line 38 - line 44; figures 1,3	1
A	EP,A, 0 059 044 (HOWMEDICA) 1 September 1982	
P,X	EP,A, 0 514 662 (SYNTHESE) 25 November 1992, see claim 1; figures 2,8	1

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

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Date of the actual completion of the international search

26 March 1993 (26.03.93)

Date of mailing of the international search report

28 April 1993 (28.04.93)

Name and mailing address of the ISA/

European Patent Office
Facsimile No.

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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

DE 9201043
SA 68094

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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