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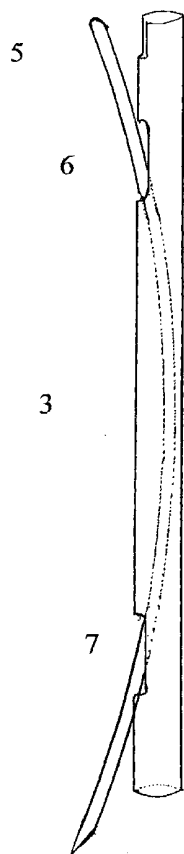
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(54) Title: INTERLOCKING NAILS BY INTERSECTION TO OSTEOSYNTHESIS



(57) Abstract: The present model associating two metallic nails consists in a device able to fix long broken bones (humeral, femoral and tibial) with less surgical trauma, at lower costs, easy application and more resistant than the current techniques. This system resulting by the adjoining of two nails by intersection is constituted by a massive metallic semi-flexible nail (1) with a sharpened tip (2) and a metallic tube (3) with a crevasse (4) on the upper extremity (5) and it has two holes, one in the upper (6) and another in the lower segment (7). To introduce the semi-flexible nail (1) inside the tubular nail (3) a guide (8) leads the semi-flexible nail (1) which was inserted through the upper hole (6) of the tube is forced until it reaches the lower hole (7), from where it emerges and reaches the tip (2) of the bone, preventing the axis and rotational movements on the site of the fracture.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

“INTERLOCKING NAILS BY INTERSECTION TO OSTEOSYNTHESIS”

The present invention is a system for fixation of linear, axis and rotational fractures on long bones. (humeral, femoral and tibial).

The apparatus for intramedullary osteosynthesis for long bones fractures have been used all around the world and renowned “Interlocking Nail.” In Brazil, this has been called “Hastes Bloqueadas.” The nails made with titanic are massive and triangular, and the nails made with stainless are tubular.

In general these nails are nearly the length of the fractured bone. The nail is implanted through an incision in the skin, muscle, and a perforation on the bone. This procedure promotes linear stability of bending movements on the site of the fracture. However, only the tubular nail is incapable of allowing movements on the axis, and consequently it permits movements that cause shortening of the fractured bone and also rotational movements that cause serious deformities. This can prevent or delay healing of the fracture, and the instabilities also increase the probability of post-operation infection.

To control axis and rotation instabilities, utilize the locking screws that pass transversally across the bone and the holes of the appropriate nails. A guide and complementary incisions are

necessary when locking screws. The method described has the following inconveniences:

1. The screw guides are not precise and even through accurate training, difficulties can be found when inserting the screws.
2. The necessity of additional incisions and perforations on the bone increase the surgical trauma.
3. The hole is large in diameter and weakens the segment of the nail.
4. There may be difficulty in removing the apparatus in the case of complications like infection or broken nails or screws.
5. The high cost of the apparatus is due to the special kind of surgical instruments and screws.

By means of these inconveniences, another treatment was also used with the prismatic intramedular nail, (BR PI 900 3700) although a solution was not obtained because the shortening of the bone could not be avoided. The Semi-tube Nail System (MU7502665-1) only promotes the locking of the lower extremity of the fractured bone segment, and it is necessary to use the screws for locking the upper extremity.

With the intention to find a solution to this inconvenience, the present model obtains stability of the upper and lower extremity,

with just only one surgical incision. The procedure is simple, cheap, and can be used on the humeral, femoral, and tibial. The system for locking by intersection is formed by two metallic nails. One is tubular and on the upper extremity it has a crevasse on the lateral side. The nail also has two aligned longitudinal holes; one in the upper segment and the other in the lower segment. The other metallic nail is massive and semi-flexible. It is inserted by a guide and enters across the upper extremity of the bone and reaches the nail hole. When introduced inside, the tubular nail is inserted until the lower hole, where it emerges.

The model can be better understood according to the following description and attached figures.

FIGURE 1 shows a frontal view of the massive nail;

FIGURE 2 shows a frontal view of the tube;

FIGURE 3 shows a frontal view of the guide;

FIGURE 4 shows the nail for connection

FIGURE 5 shows the guide and nail attached

FIGURE 6 shows the intersection between the nails

FIGURE 1 is a view of the frontal plane showing the first component of the system which is constituted by one massive metallic nail (1), semi-flexible, with a sharp lower tip (2).

FIGURE 2 shows the drawing of the metallic tube (3) which represents the upper extremity (5), a short longitudinal crevasse (4) and upper (6) and lower holes (7), longitudinal alignment on the same side.

FIGURE 3 shows the guide that introduces the semi-flexible nail. (5) It consists of two tubes united by one triangular plate (8) that has in the lower vertex an extension (9) that encloses on the crevasse (4) of the tubular nail (3). The lateral tube (10) has the diameter of the semi-flexible nail (1) and the other tube (11) has the diameter of the tubular nail (3).

FIGURE 4 shows the adjoining nail (12) that unites the tube to the guide (11) and tubular nail (3).

FIGURE 5 is a complete view of the system's components where the guide is enclosed in the crevasse, (4) the adjoining nail (12) is enclosed inside the tube guide, (11) and in the upper extremity (5) of the tubular nail (3) and the massive nail (1) is enclosed in the guide (10) and in the upper hole (6) of the tubular nail (3).

FIGURE 6 shows the intersection of the nails, with the semi-flexible nail (1) represented inside the tubular nail (3) by the dotted lines and the exterior extremities of the upper (6) and lower hole (7).

Vindication

“Interlocked nails by the intersection to osteosynthesis,” is understood by nails to promote the fixation of the humeral, femoral and tibial fractures, characterized by two metallic nails adjoined by intersection, one being solid and semi-flexible (1) sharpened on the lower tip (2) and the other tubular (3) with a crevasse (4) on the upper tip (5), there is a hole on the upper segment (6) and another one on the lower segment (7) exactly on the width of the diameter of the semi-flexible nail (1), permitting the entrance and the exit of the semi-flexible nail (1) inside the tube (3), a guide (8) adjoined with the upper tip (5) of the tubular nail (3), it is used to guide the semi-flexible nail (1) to reach the upper hole (6) of the tube, the semi-flexible nail (1) is introduced inside the tubular nail (3) and its sharpened lower tip emerges through the lower hole (7) of the tube (3).

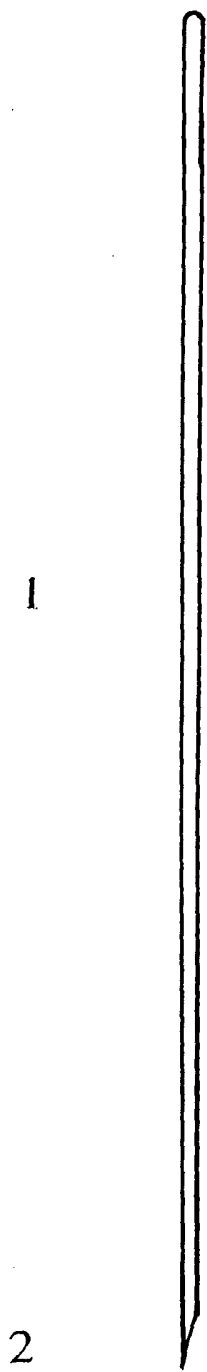


FIG. 1

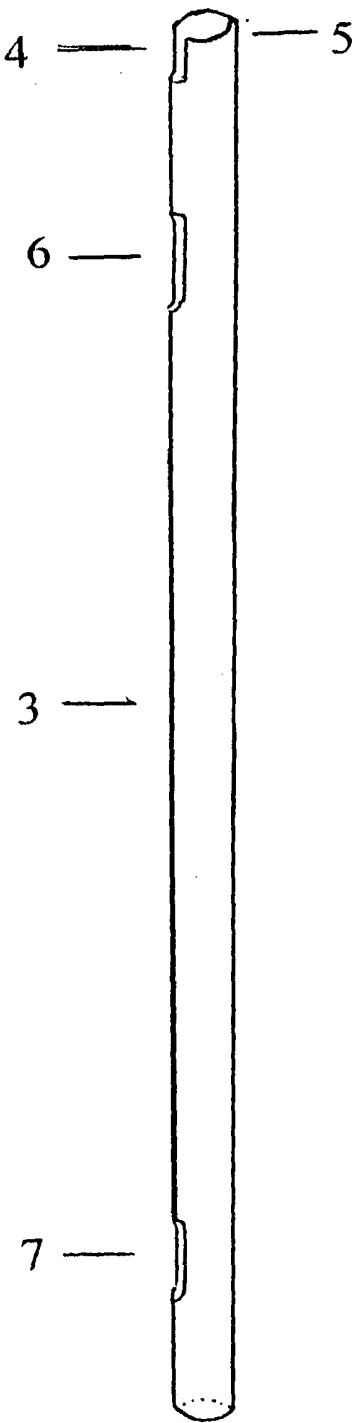


FIG. 2

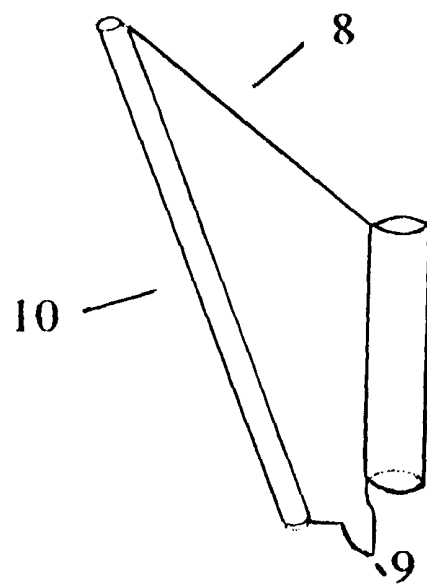


FIG. 3

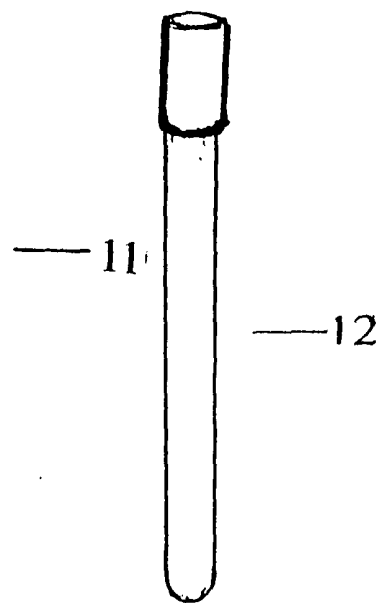


FIG. 4

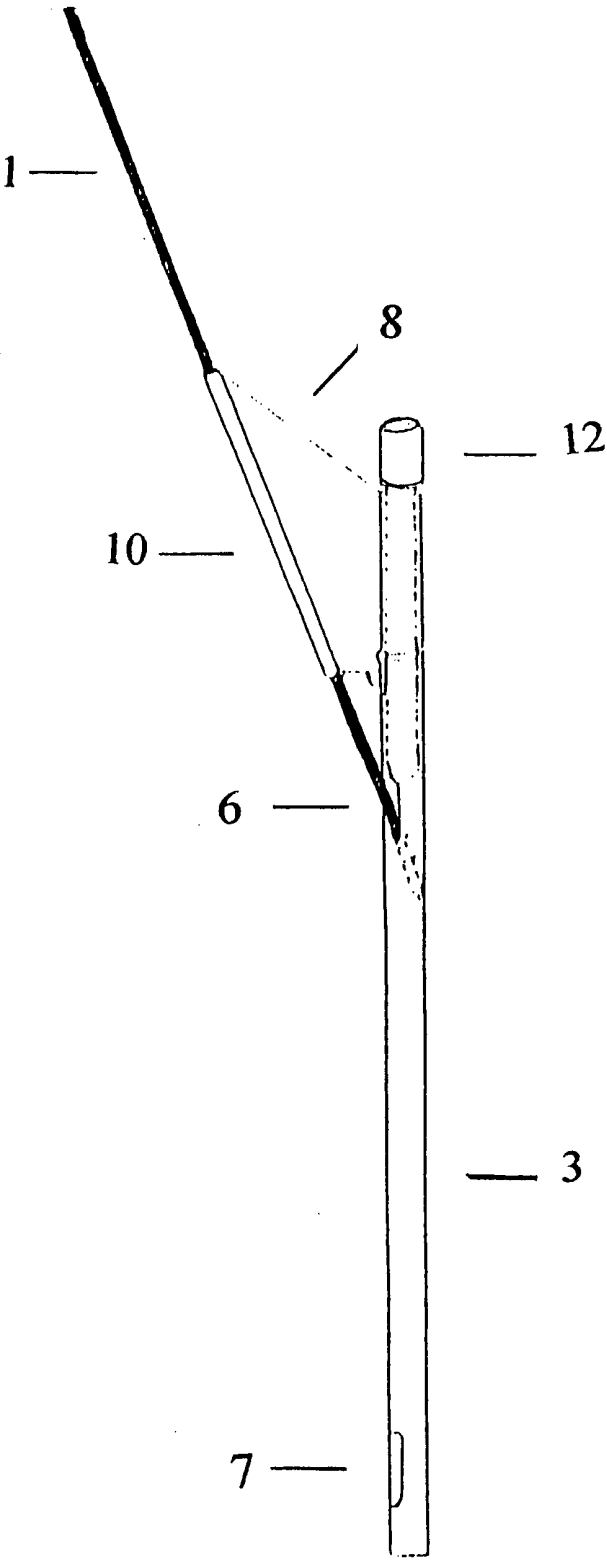


FIG. 5

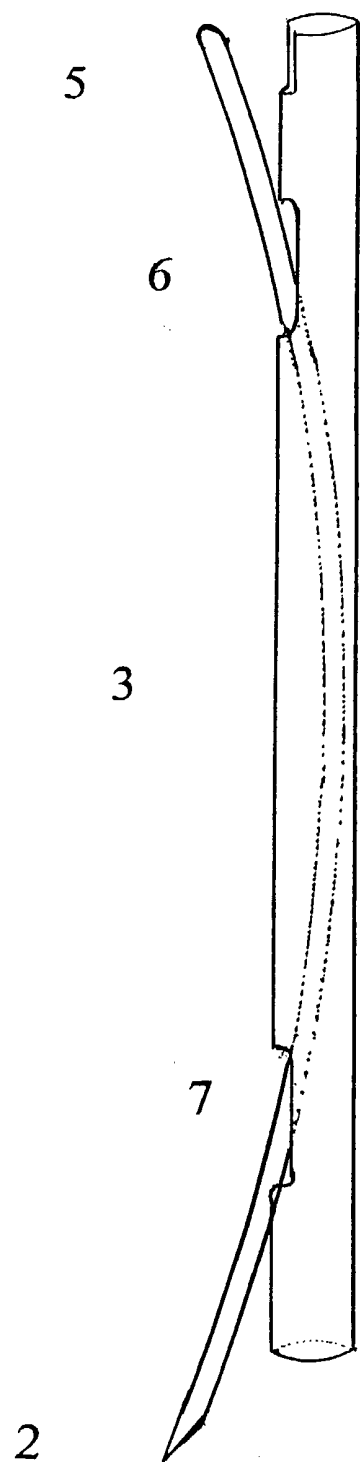


FIG. 6

INTERNATIONAL SEARCH REPORT

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CLASSIFICATION OF SUBJECT MATTER

IPC⁷: A61B 17/72, 17/90

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 17/58, 17/68, 17/72, 17/90

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	FR 2668920 A1 (SOC. MEDIC. INSTR.) 15 May 1992 (15.05.92) <i>figures 1,2; abstract; claims 1,2,5.</i>	1
A	US 2998007 A (HERZOG K.) 29 August 1961 (29.08.61) <i>the whole document; especially figure 3; column 3, lines 33-47.</i>	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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..&.. document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/BR 02/00042-0

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
FR	A1	2668920	15-05-1992	none	
US	A	2998007		none	