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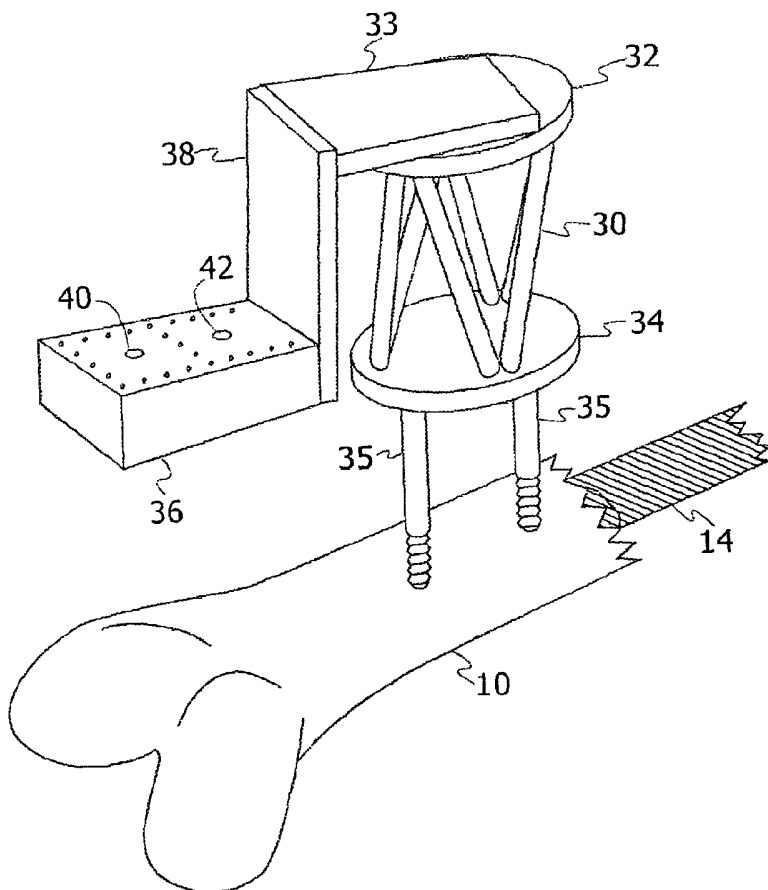
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[Continued on next page]

(54) Title: ROBOT FOR USE WITH ORTHOPAEDIC INSERTS



(57) Abstract: A robot-guided system to assist orthopaedic surgeons in performing orthopaedic surgical procedures on pre-positioned inserts, including for the fixation of bone fractures, and especially for use in long bone distal intramedullary locking procedures. The system provides a mechanical guide for drilling the holes for distal screws in intramedullary nailing surgery. The drill guide is automatically positioned by the robot relative to the distal locking nail holes, using data derived from only a small number of X-ray fluoroscopic images. The system allows the performance of the locking procedure without trial and error, thus enabling the procedure to be successfully performed by less experienced surgeons, reduces exposure of patient and operating room personnel to radiation, shortens the intra-operative time, and thus reduces post-operative complications.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL03/00515

| A. CLASSIFICATION OF SUBJECT MATTER | | | | |
|--|--|--|--|--|
| IPC(7) : A61B 17/00, 19/00; G06F 19/00; G05B 19/04 | | | | |
| US CL : 606/80, 96; 700/245, 259 | | | | |
| 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) U.S. : 606/80, 96; 700/245, 259 | | | | |
| 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. | | |
| Y | US 2002/0038118 A1 (SHOHAM) 28 March 2002 (28.03.2002), See entire document. | 1-18 | | |
| Y | US 5,690,635 A (MATSEN, III et al.) 25 November 1997 (25.11.1997), See entire document. | 1-18 | | |
| A | US 4,979,949 A (MATSEN, III et al.) 25 December 1990 (25.12.1990), See entire document. | | | |
| E | US 6,675,068 B1 (KAWASAKI) 06 January 2004 (06.01.2004), See entire document. | 1-18 | | |
| T, E | US 6,792,335 B2 (ROSS et al.) 14 September 2004 (12.09.2004), See entire document. | 1-18 | | |
| Y | US 2002/0188380 A1 (ROSS et al.) 12 December 2002 (12.12.2002), See entire document. | 1-18 | | |
| T, E | US 2004/0133316 A1 (DEAN) 08 July 2004 (08.07.2004), See entire document. | 1-18 | | |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex. | | | | |
| <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; border: none;"> "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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family </td> </tr> </table> | | | * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family |
| * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family | | | |
| Date of the actual completion of the international search | | Date of mailing of the international search report | | |
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| Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner of Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 | | Authorized officer <i>Sharon A. Greeneyer</i> Kevin P Shaver | | |
| Facsimile No. (703) 305-3230 | | Telephone No. 703.308.0873 | | |

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL03/00515

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
 2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
 3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

 4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-18
- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-18, drawn to surgical system.

Group II, claim(s) 19-30, drawn to an imaging system.

Group III, claim(s) 31-39, drawn to a method.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group I does not require the use of a radiation source, a target, or a target guide.

The inventions listed as Groups I and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group III does not require the invention of Group I and can use many known or generic surgical systems.

The inventions listed as Groups II and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group III does not require the invention of Group II and can use many known or generic imaging systems.