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Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(54) Title: SPLINT

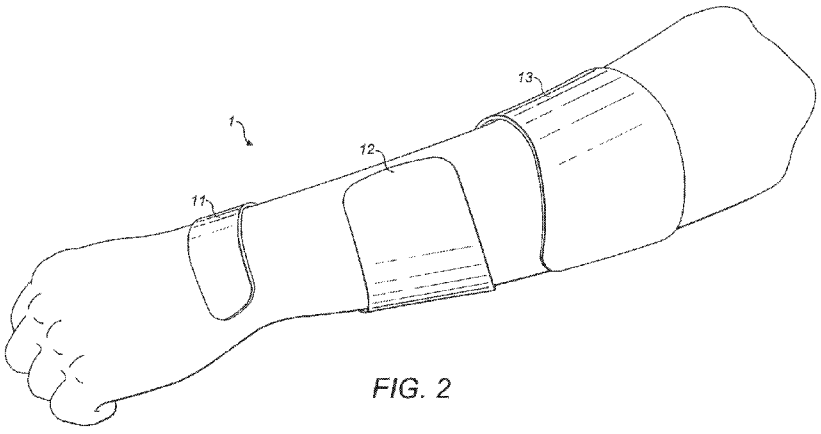

FIG. 2

(57) Abstract: There is provided a splint for supporting portions of bone to be set, the splint comprising first and second body-part engaging portions arranged with elastic bias there-between to provide support to portions of bone to be set and thereby in use hold the portions of bone to be set in place with a pressure above a predetermined minimum.

WO 2011/064588 A1

Splint

The present invention relates to splints, in particular to splints to aid bone setting. The present invention also relates to associated methods of manufacturing a splint and to associated methods of supporting bone portions using a splint.

Providing a rigid plaster cast splint to externally support portions of broken bones and thereby aid bone setting remains a widely practiced technique. However, when applying a plaster cast it is sometimes difficult to hold the portions of bone to be set in the correct position while at the same time avoiding application of excess pressure. Further problems arise when soft tissue swelling surrounds the portions of bone to be set, as a subsequent reduction in swelling within a finished plaster cast can allow the portions of bone to move within the cast in a way that is undesirable.

It is an aim of example embodiments of the present invention to address at least one disadvantage of the prior art, whether identified herein, or otherwise.

According to a first aspect of the present invention there is provided a splint for supporting portions of bone to be set, the splint comprising first and second body-part engaging portions arranged with elastic bias there-between to provide support to portions of bone to be set and thereby in use hold the portions of bone to be set in place with a pressure above a predetermined minimum.

In this way, the splint is able to accommodate a reduction in swelling around the portions of bones to be set while maintaining the pressure to the portions of bone to thereby hold the portions of bone in the correct position while healing occurs.

Suitably, the splint comprises a plastics material. Suitably, the body-part engaging portions are formed as one piece of flexible material. Suitably, the splint comprises a one-piece plastics form. Suitably, the splint comprises a heat-formable material.

Suitably, the body-part engaging portions are distributed along the splint and are arranged along the splint to extend in alternating directions away from one another. Suitably, the body-part engaging portions are arranged to wrap, or partially wrap around a body part, preferably a limb or limb portion. Suitably, the body-part engaging portions are arranged to partially wrap around a body part in alternating directions.

Suitably, the splint comprises first, second and third body-part engaging portions arranged with elastic bias there-between to provide three-point support to portions of bone to be set and

thereby in use hold the portions of bone to be set in place with a pressure above a predetermined minimum

Suitably, one of the first, second and third body-part engaging portions comprises a primary portion arranged to provide support proximate to the portions of bone to be set, and the others of the first, second and third body-part engaging portions comprise secondary portions arranged to provide support for the primary portions at a distance therefrom.

Suitably, the splint comprises a wrist splint. Suitably, the splint is arranged to support portions of bone from a distal radius fracture. Suitably, the predetermined minimum pressure applied to the site of the distal radius fracture corresponds to a force in the range 5-15N applied over the fracture site, preferably 10N. Suitably, the predetermined minimum pressure corresponds to that which a physician would typically apply when setting the portions of bone in a rigid cast.

According to a second aspect of the present invention there is provided a method of manufacturing a splint, the method comprising: forming first and second body-part engaging portions and providing elastic bias there-between, such that in use the splint is arrangeable to provide support to portions of bone to be set and thereby in use hold the portions of bone to be set in place with a pressure above a predetermined minimum.

According to a third aspect of the present invention there is provided a method of supporting bone portions using a splint, the method comprising arranging first and second body-part engaging portions of the splint to provide support to the bone portions to hold the bone portions in place with a pressure above a predetermined minimum, as determined by elastic bias between first and second body-part engaging portions.

Suitably, the method employs the splint of the first aspect of the present invention or a splint manufactured according to the method of the second aspect of the present invention

According to the present invention in other aspects there is provided an apparatus and method as set forth in any appended claims. Other features of the invention will be apparent from any dependent claims, and the description which follows.

For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

Figure 1 shows a perspective view from a first side and above a splint according to an example embodiment of the present invention, in use;

Figure 2 shows a perspective view from a first side and above a splint according to an example embodiment of the present invention, in use, this view from a lower point than that of Figure 1;

Figure 3 shows a perspective view from a second side and above the splint of Figure 1, in use; and

Figures 4 and 5 show further perspective views of the splint of Figure 1 in use.

Referring now to Figures 1 to 5 there is shown a splint 1. The splint 1 comprises a wrist splint, and is shown in use arranged to support portions of bone formed by a distal radius fracture.

The splint 1 comprises first, second and third body-part engaging portions 11, 12, 13 arranged with elastic bias there-between to provide support to portions of bone to be set. In this way the splint 1 holds the portions of bone to be set in place with a pressure above a predetermined minimum, even when swelling under the splint subsides or is reduced. The splint is able to accommodate a reduction in swelling around the portions of bones to be set while maintaining the pressure to the portions of bone. Maintaining pressure holds the portions of bone in the desired position while healing occurs, resisting any tendency of the bone portions to move within the splint 1.

The first, second and third body-part engaging portions 11, 12, 13 are distributed along the splint 1, and are arranged along the splint 1 to extend in alternating directions away from one another and generally perpendicular to the axial length of the splint 1. In use the body-part engaging portions 11, 12, 13 partially wrap around a body part, here the wrist to provide three-point support to the portions of bone to be set. In other embodiments the body-part engaging portions may be provided in other arrangements to provide the support, for example in one or more loops or broken loops substantially encircling the body part of interest, and arranged unevenly along the length of the splint and unevenly between opposite sides of the splint.

The first body-part engaging portion 11 comprises a primary portion arranged to support at the fractured portion of bone to be set, and the second and third body-part engaging portions 12, 13 comprise secondary portions arranged to provide support for the primary portion 11. The secondary portions engage the wrist at a distance from the portions of bone to be set, and cooperate with the primary portion to provide the three-point support.

As shown in Figures 1 to 5, the splint, including the body-part engaging portions 11-13 is formed as one piece of flexible plastics material, and are heat-formed to provide the correct

size and deformation for the patient's personal requirements. In other embodiments the splint may be provided in a range of sizes, with the correct size from the range of sizes being selected according to the requirements of a patient. In such embodiments the process of heat-forming to provide conformance with the anatomy of a patient may not be needed at all, and the material used for such embodiments need not be heat-formable at the fitting stage.

Although the specific embodiment shown is a wrist splint comprising three body-part engaging portions, other embodiments are envisaged. For example embodiments comprising two, four or more body part engaging portions are envisaged. In particular, the example embodiments of the present invention may also be particularly suited to ankle fractures.

Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A splint for supporting portions of bone to be set, the splint comprising first and second body-part engaging portions arranged with elastic bias there-between to provide support to portions of bone to be set and thereby in use hold the portions of bone to be set in place with a pressure above a predetermined minimum.

2. The splint of claim 1, wherein the body-part engaging portions are formed as one piece of flexible material.

3. The splint of claim 2, comprises a plastics material.

4. The splint of claim 3, comprises a one-piece plastics form.

5. The splint of any preceding claim, comprises a heat-formable material.

6. The splint of any preceding claim, wherein the body-part engaging portions are distributed along the splint and are arranged along the splint to extend in alternating directions away from one another.

7. The splint of any preceding claim, wherein the body-part engaging portions are arranged to wrap, or partially wrap around a body part, preferably a limb or limb portion.

8. The splint of claim 7, wherein the body-part engaging portions are arranged to partially wrap around a body part in alternating directions.

9. The splint of any preceding claim comprises first, second and third body-part engaging portions arranged with elastic bias there-between to provide three-point support to portions of bone to be set and thereby in use hold the portions of bone to be set in place with a pressure above a predetermined minimum

10. The splint of claim 9, wherein one of the first, second and third body-part engaging portions comprises a primary portion arranged to provide support proximate to the portions of bone to be set, and the others of the first, second and third body-part engaging portions comprise secondary portions arranged to provide support for the primary portions at a distance therefrom.

11. The splint of any preceding claim comprises a wrist splint.

12. The splint of claim 11, comprising body part engaging portions arranged to support portions of bone from a distal radius fracture.

13. The splint of claim 12, wherein the predetermined minimum pressure applied to the site of the distal radius fracture corresponds to a force in the range 5-15N applied over the fracture site, preferably 10N.

14. A method of manufacturing a splint, the method comprising: forming first and second body-part engaging portions and providing elastic bias there-between, such that in use the splint is arrangeable to provide support to portions of bone to be set and thereby in use hold the portions of bone to be set in place with a pressure above a predetermined minimum.

15. A method of supporting bone portions using a splint, the method comprising arranging first and second body-part engaging portions of the splint to provide support to the bone portions to hold the bone portions in place with a pressure above a predetermined minimum, as determined by elastic bias between first and second body-part engaging portions.

16. The method of claim 15 employing the splint of any one of claims 1 to 13, or a splint manufactured according to claim 14.

17. A splint or method substantially as herein-described, with particular reference to the accompanying drawings.

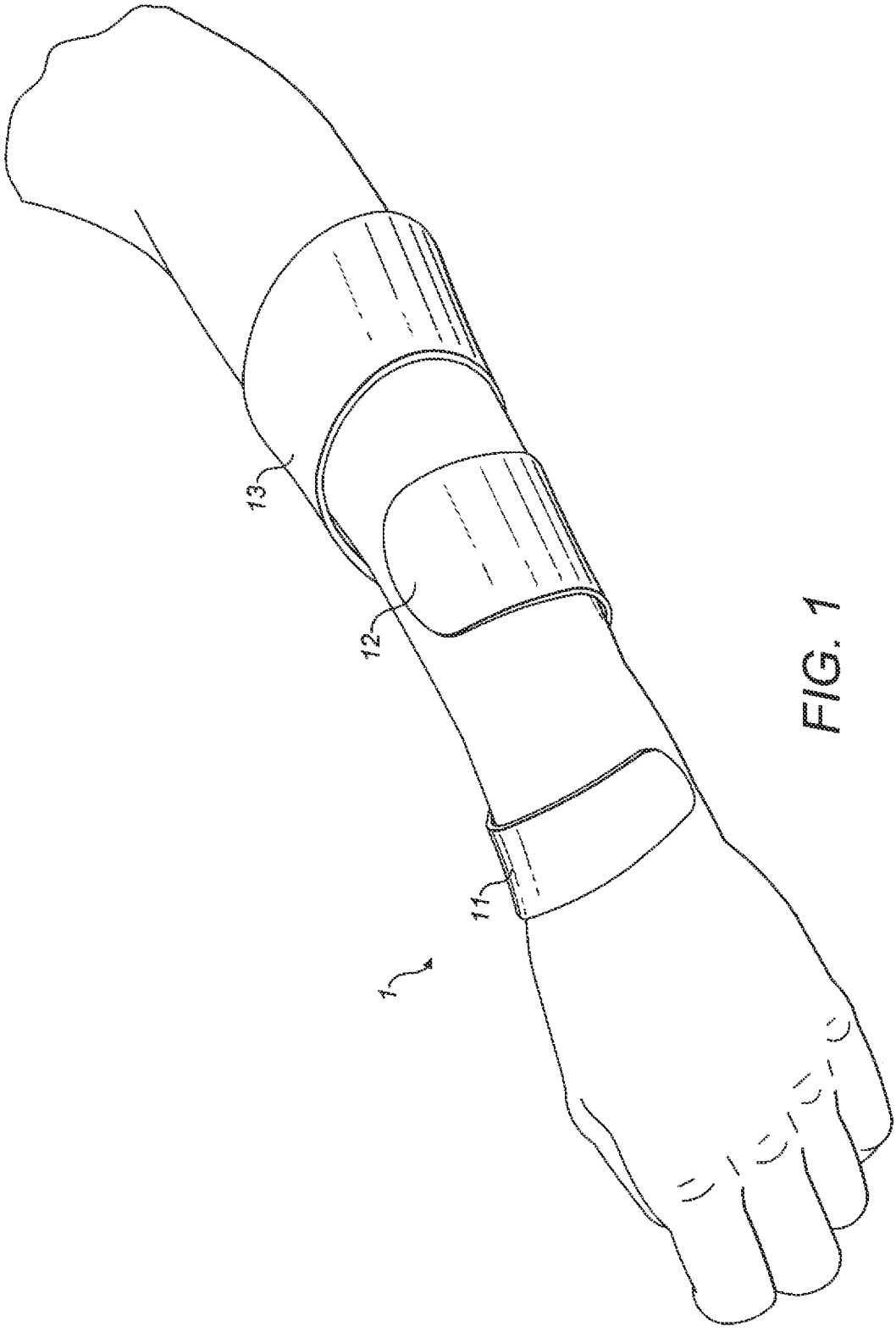

FIG. 1

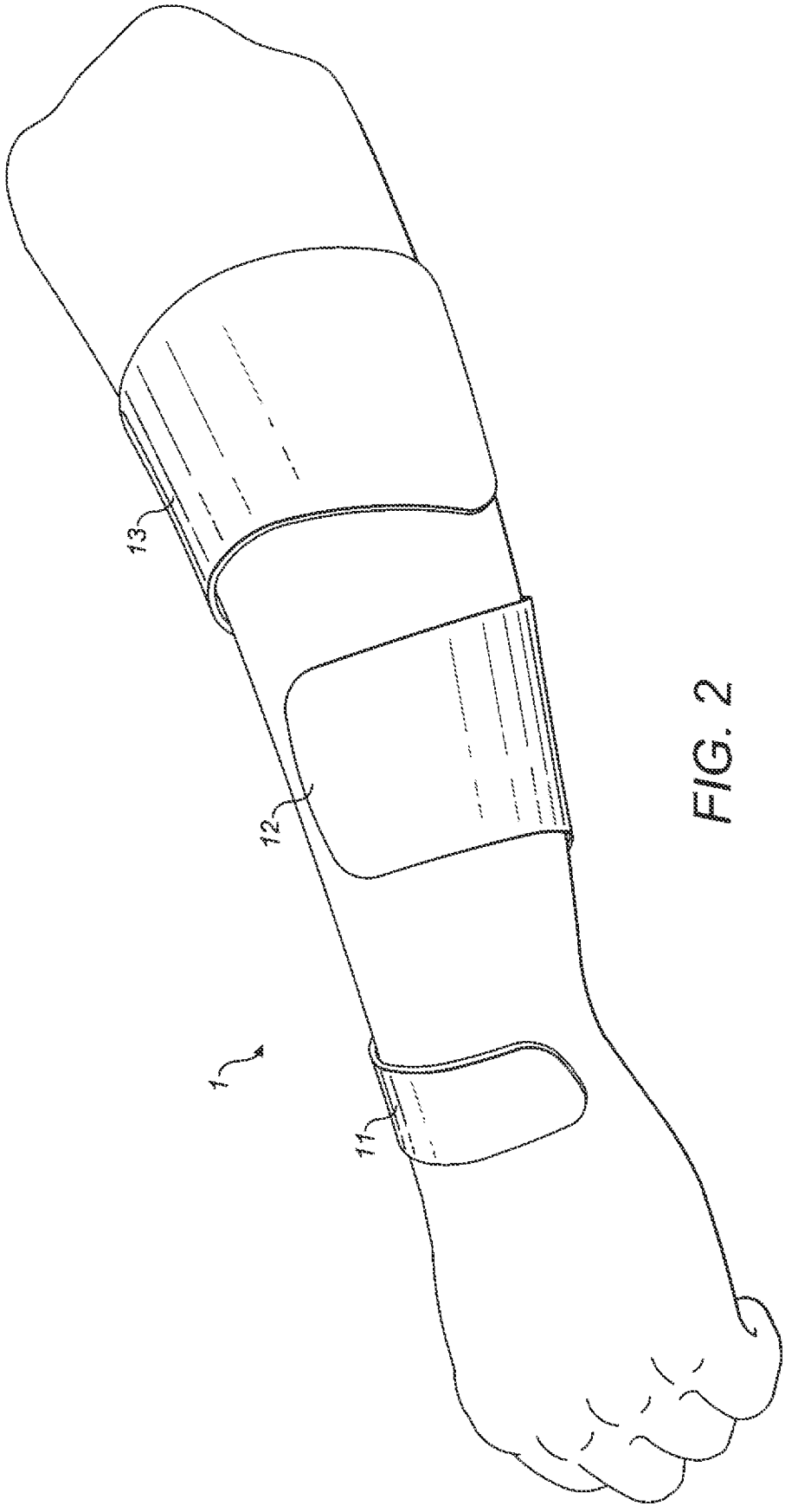

FIG. 2

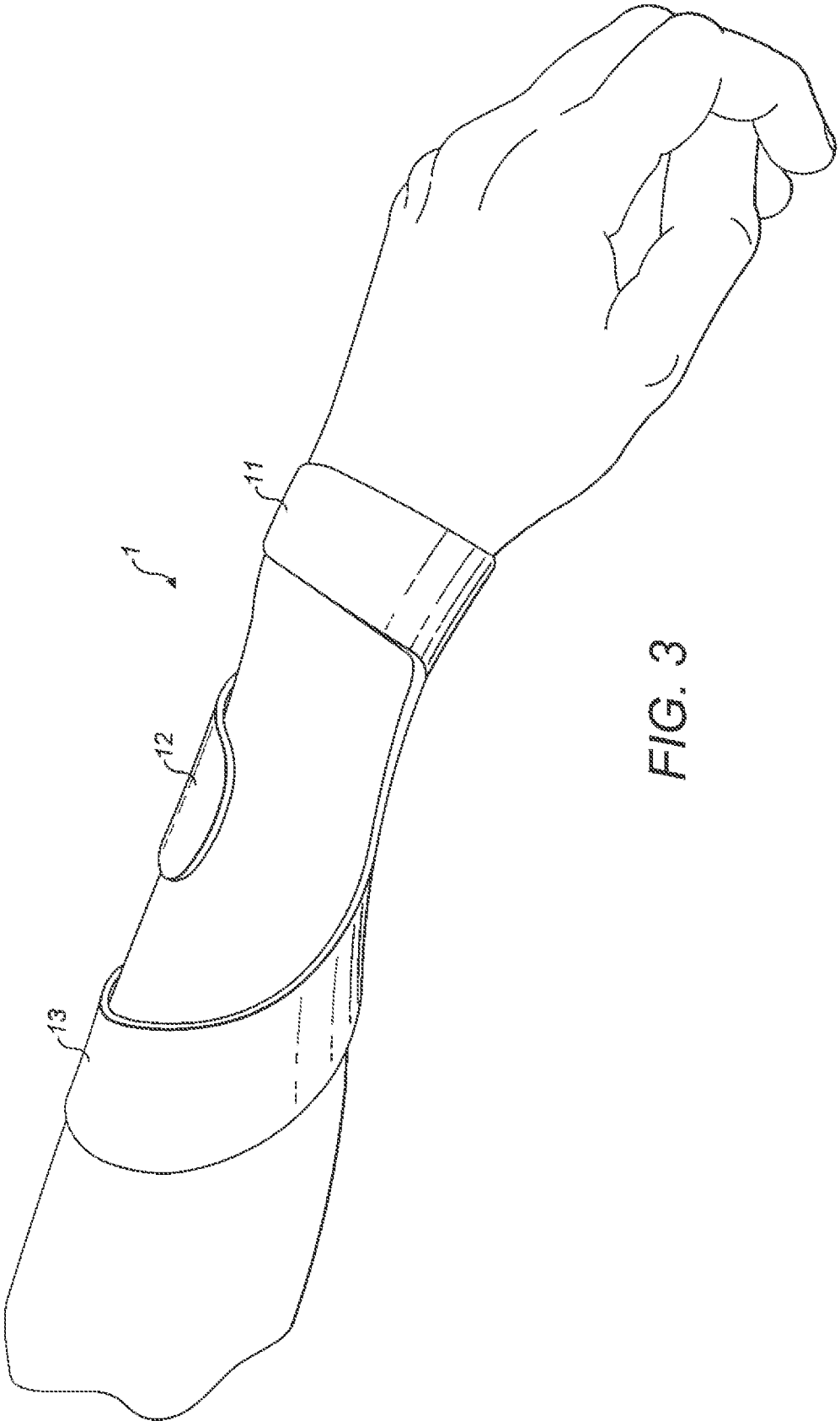

FIG. 3

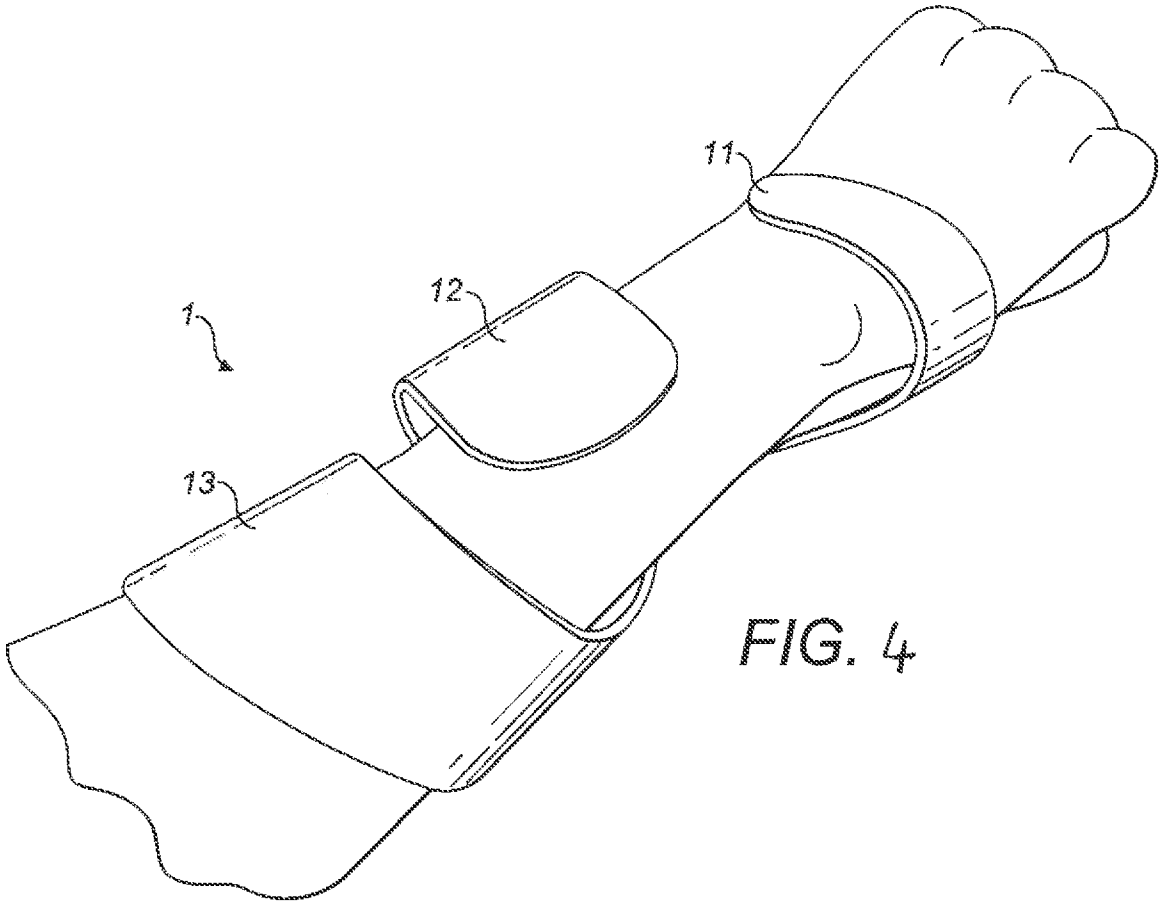

FIG. 4

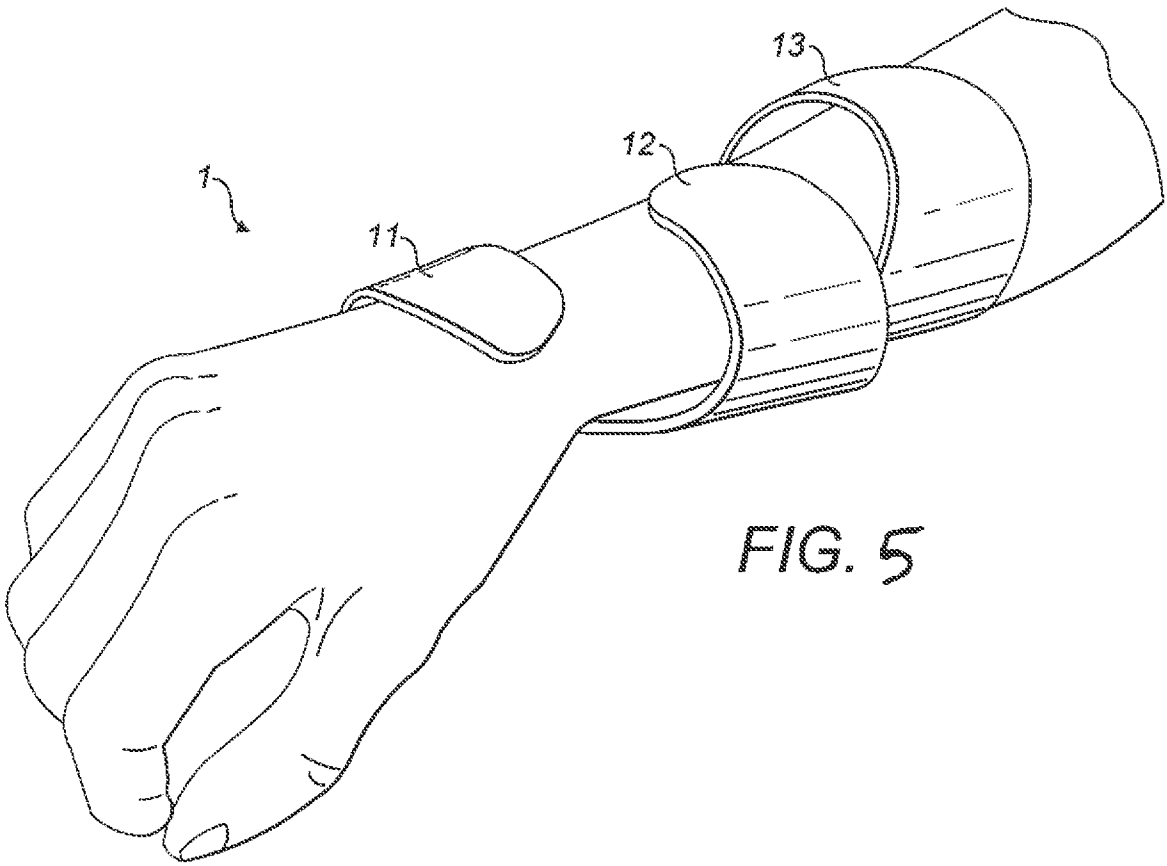

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/051968

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F5/058
ADD.

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)
A61F

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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 3 906 943 A (ARLUCK ELMER M) 23 September 1975 (1975-09-23) * abstract; figures column 3, line 36 - column 4, line 66 column 12, line 40 - line 68	1-5,7, 11-16 6,8-10
Y	WO 94/28830 A1 (ORTHOPEDIC TECHNOLOGY INC [US]) 22 December 1994 (1994-12-22) figures	6,8-10
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☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* 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 document but 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
11 March 2011	24/03/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Sánchez y Sánchez, J

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2010/051968

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

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

1. [X] Claims Nos.: 17
because they relate to subject matter not required to be searched by this Authority, namely:

The application does not meet the requirements of Article 6 PCT, because claim 17 is not clear. See Rule 6.2(a) PCT.

2. [X] Claims Nos.: 17
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:

see FURTHER INFORMATION sheet PCT/ISA/210

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

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

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 fees, this Authority did not invite payment of additional fees.

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.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

[ ] The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

[ ] No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 17

The application does not meet the requirements of Article 6 PCT, because claim 17 is not clear. See Rule 6.2(a) PCT.

Continuation of Box II.2

Claims Nos.: 17

Rule 6.2(a) PCT

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2010/051968

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