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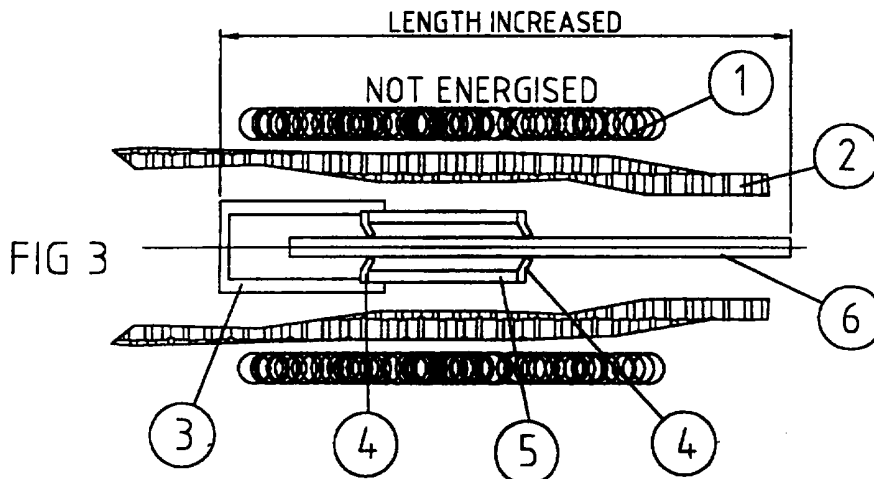
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(56) Documents Cited
EP 0346247 A1 WO 96/25117 A1 WO 96/15377 A1
WO 95/11635 A1 US 5704939 A US 5704938 A
US 5626581 A US 5575790 A US 5415660 A
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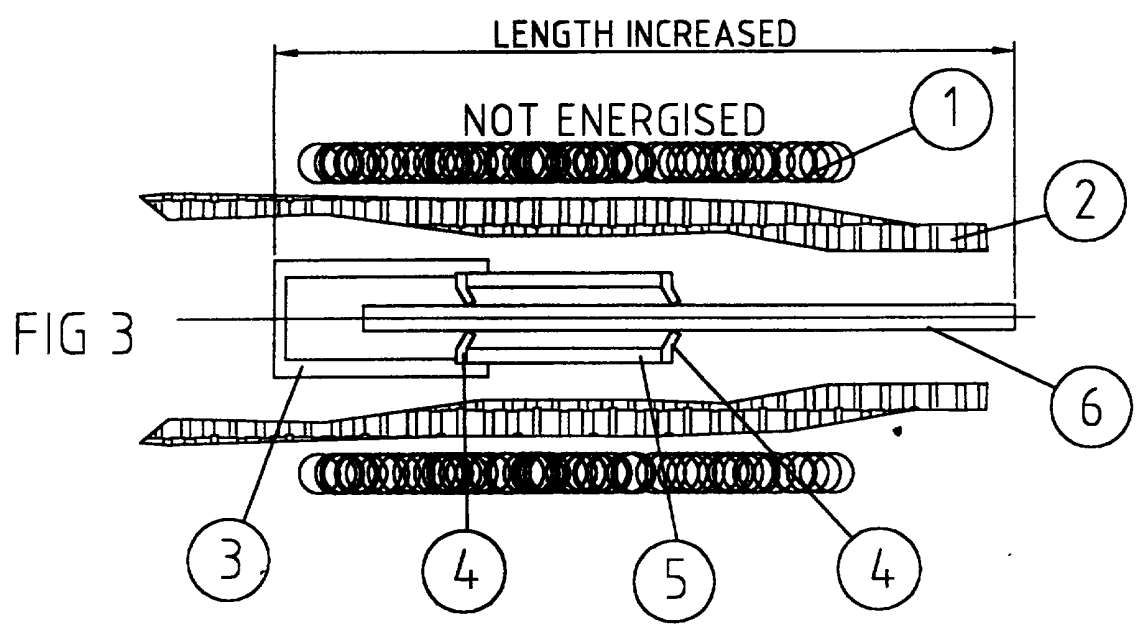
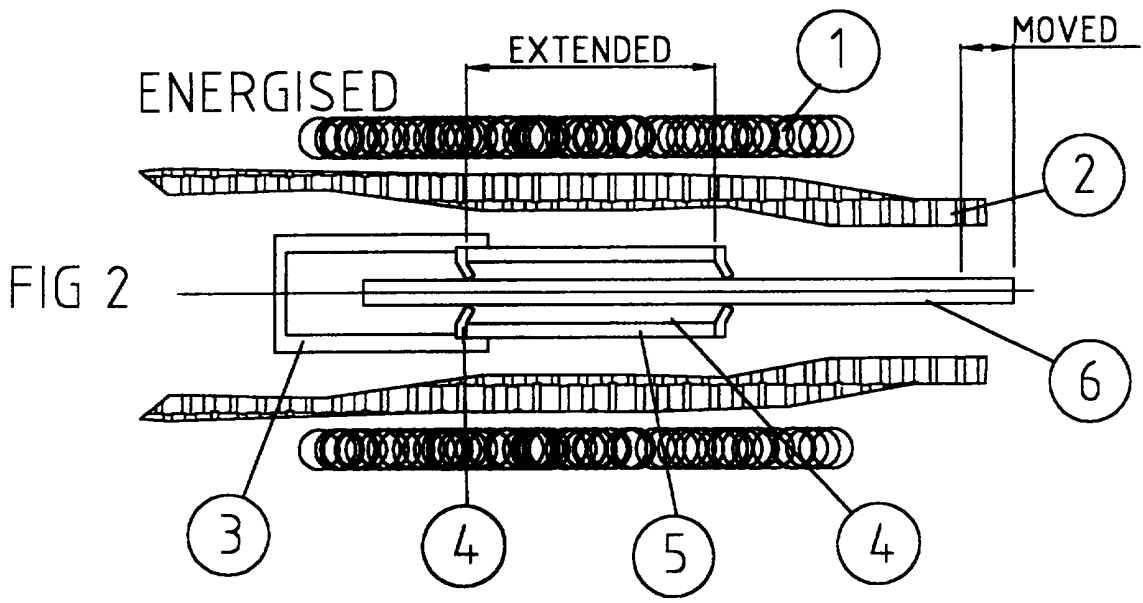
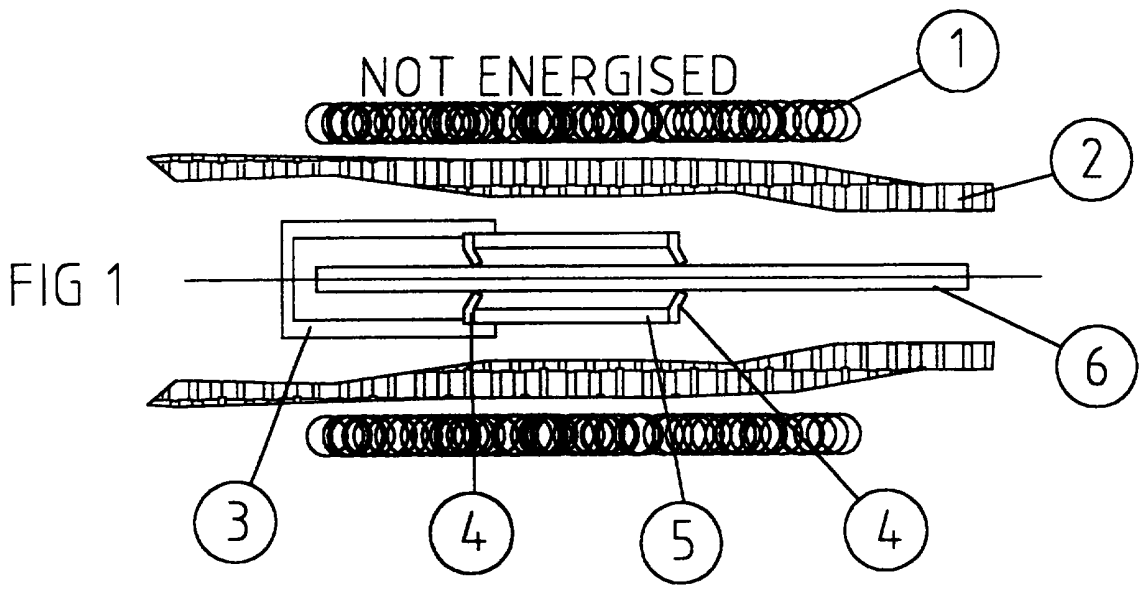
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(54) Abstract Title
EXTENDIBLE ARM INCLUDING MAGNETO-STRICTIVE ELEMENT

(57) This is an arm which does not require direct access to it (such as leads or mechanisms) in order to perform controlled extensions. An example is in the medical application where link arms are used to extend limb bones. Here regular extension of the bone is needed without perforation of the surrounding tissue. This link arm is secured to the bone, and completely encased within the limb. Placing the limb in a strong cycled magnetic field energises the magnetostrictive element 5, which allows part 6 to move with respect to part 3. The unit has lock mechanisms 4 which allow movement in only in the extension direction.



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EXTENDIBLE ARM

This invention relates to an extendible arm.

Extendible arms are used in many applications ranging from precision actuators to coarse adjusters. In powered applications the energy is provided by direct connection to the arm. Magneto-strictive actuators are self-contained units, with leads by which their coil is energised. Applications exist where extendible arms are required, where connection to the arms is inconvenient.

An example is in medical applications such as bone links. Extendible bone links are often made to protrude the patients skin, where extender mechanisms can access the link for extension.

The present invention allows powering of the extendible link without the need for direct connection, as long as the intervening material is permeable to the energising medium.

The accompanying schematic drawings show the principle of operation of the invention. In the example of a link to extend the bone of a limb, components 3 and 6 would be attached to the bone, and part 2 would be tissue between the bone and up to the skin. To extend the arm the coil is repeatedly energised and de-energised. Each time this is done the arm extends in length. This is done in small extension steps of a controllable size, which are proportional to the magnetic field strength..

In Figs. 1, 2 and 3 the arm length is determined by the relative positions of parts 3 and 6. Part 5 is the magneto-strictive section, which changes length with the application of the magnetic field of part 1, the coil. Part 2 is obstructing material which is permeable to the magnetic field. Parts 4 are locking mechanisms. These can move only in one direction along part 6, and will lock when forces try to compress the assembly.

The arm can be extended, even when completely encapsulated in the material of part 2.

CLAIMS

1. An arm, which can be extended in length when completely encased in a magnetic field permeable material.
2. An arm, as in claim 1, which can be extended without need for perforation of the encasing material.
3. An extendible arm, as in claim 1, which self-locks upon reaching a new extended length.
4. An extendible arm, as in claim 1, which extends in controlled extension steps.
5. An extendible arm, as in claim 1, whose operating principle is schematically represented by figures 1, 2 and 3 of the accompanying drawing.



Application No: GB 9801480.6
Claims searched: 1-5

Examiner: Mrs Susan Chalmers
Date of search: 19 March 1999

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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): A5R: RFB (RX4)

Int Cl (Ed.6): A61B: 17/72

Other: ONLINE: EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0346247 A1 (MEDINOV) see Figures and eg column 6 lines 60 - 64	1-4
X	WO 96/25117 A1 (MEDINOV) see Figure 1, Abstract, page 6 line 1 to page 7 line 10 and page 17 lines 16-21	1-4
X	WO 96/15377 A1 (SOUBEIRAN) see eg Figures 3-6 and page 7 line 24 to page 8 line 15 and page 10 line 33 to page 11 line 2	1-4
X	WO 95/11635 A1 (JUSTIN) see eg the Figures and page 14 line 33 to page 15 line 17	1-4
X	US 5704939 (JUSTIN) see eg the Figures and column 9 line 30 to page 10 line 33	1-4
X	US 5704938 (VOLUNTEERS) see eg the Figures and column 3 lines 23-58	1-4
X	US 5626581 (VOLUNTEERS) see eg the Figures and column 7 line 57 to page 8 line 17	1-4

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.



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Mrs Susan Chalmers
Date of search: 19 March 1999

Category	Identity of document and relevant passage	Relevant to claims
X	US 5575790 (RENSELAER) see the Figures and eg column 5 line 37 to column 6 line 33	1-4
X	US 5415660 (UNIVERSITY OF MINNESOTA) see the Figures and eg column 7 lin 66 to column 8 line 18 and column 11 lines 32-48	1-4
X	US 5074882 (MEDINOV) see the Figures and eg column 6 lines 18 -52	1-4

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