

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/GB2014/051813

International filing date (day/month/year)
12.06.2014

Priority date (day/month/year)
13.06.2013

International Patent Classification (IPC) or both national classification and IPC
INV. A61M1/10 A61F2/00

Applicant
THE NOTTINGHAM TRENT UNIVERSITY

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application


2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of this opinion

see form
PCT/ISA/210

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed
 - a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)
 - on paper
 - in electronic form
 - b. (time)
 - in the international application as filed
 - together with the international application in electronic form
 - subsequently to this Authority for the purposes of search
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-15</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-15</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-15</u>
	No: Claims	
2. Citations and explanations
see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

INDEPENDENT CLAIMS

1. The prior art closest to the application is described in D1, see references cited in the search report. With reference to claim 1, this document discloses:

An actuator comprising:

an inner tubular structure (1226);

an outer tubular structure surrounding the inner tubular structure and comprising a layer (1226) of a dielectric elastomeric material

wherein the outer tubular structure is configured to contract in a radial direction around the inner tubular structure upon application of an actuation voltage signal across the dielectric elastomeric material layers.

The device described in claim 1 differs mainly from this disclosure in that:

The outer tubular structure further comprising a tubular elastic support structure, the elastic support structure configured to maintain a pre-stress in the layers of the dielectric elastomeric material.

In view of said difference the subject-matter of claim 1 is new and fulfils the requirements of Art. 33(2) PCT.

1.2 The purpose of the above mentioned features is *uniformly bringing the tubular outer structure back to its original, expanded form after actuating*.

Although D1 mentions the advantages of pre-straining the electro-active polymer layers in general ([0141]), and gives some specific examples (Figure 8C, spring 224; Figure 16, bias element 630; Figure 28, biasing material 690), none is in the form of the tubular elastic support as claimed. This would also not be straightforward, because the dielectric elastomeric material of the embodiment (of Figure 26 for example), are also not tubular, but C-shaped.

None of the other available prior art documents approaches this problem using the above mentioned features.

Therefore the subject-matter of claim 1 involves an inventive step and fulfils the requirements of Art. 33(3) PCT.

The same reasoning applies, mutatis mutandis, to independent claim 8, which describes a manufacturing method for an actuator as claimed in claim 1.

1.3. The device described in claim 1 is manufacturable and therefore is industrially applicable, Art. 33(4) PCT.

2. Claims 2 to 7, and 9-15 depend from claim 1 and 8, respectively, and refer to further embodiments of the device therein described. Therefore the subject-matter of said claims is new, involves an inventive step and is industrially applicable for the same reasons explained there above. The claims fulfil thus the requirements of Art. 33 (2),(3) and (4) PCT.