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[Continued on next page]

(54) Title: ELECTROACTIVE POLYMER ENERGY CONVERTER

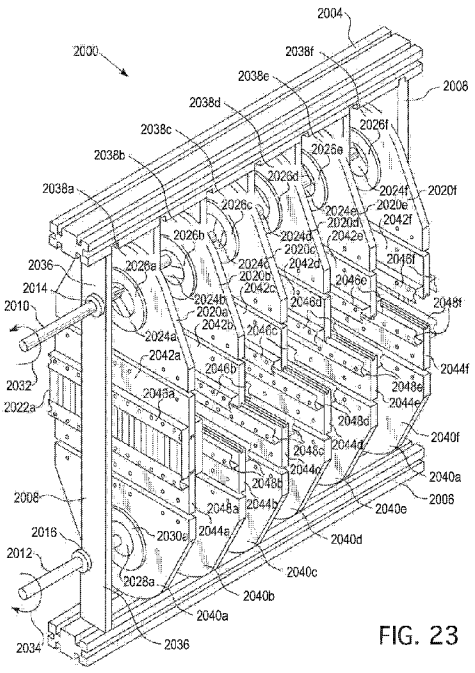

FIG. 23

(57) Abstract: An energy conversion apparatus configured to convert energy from a mechanical energy source into electrical energy is provided. The energy conversion apparatus includes a transducer comprising a dielectric elastomer module made of stretchable electroactive polymer material. The dielectric elastomer module comprising at least one dielectric elastomer film layer is disposed between at least first and second electrodes. A transmission coupling mechanism is configured to couple the mechanical energy source and is operatively attached to the transducer to cyclically strain and relax the transducer in response to the mechanical energy acting on the transmission coupling mechanism. A conditioning circuit is coupled to the at least first and second electrodes and configured to apply an electric charge to the dielectric elastomer film when the dielectric elastomer film is in a strained state, to disconnect from the dielectric elastomer film when the dielectric elastomer film transitions from the strained state to a relaxed state, and to remove electrical charge from the dielectric elastomer film when the dielectric elastomer film reaches a relaxed state.

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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

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))*

(88) Date of publication of the international search report:
22 November 2012

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/028406

A. CLASSIFICATION OF SUBJECT MATTER

H02N 2/18(2006.01)i

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)

H02N 2/18; H02N 2/04; H02P 9/04; H01L 41/08; F03B 13/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: generation, electroactive, wave

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007-0257490 A1 (ROY D. KORNBLUH. et al.) 08 November 2007 See paragraphs [0097],[0099],[0136],[0158], claims 1-5 and figures 1-3,10,12,	1-2,5
X	16A,16B,24.	3,18,20
A		4,17,19
A	US 2005-0162042 A1 (JERRY A. KRILL) 28 July 2005 See abstract, claims 1,2 and figures 1A,1B,2,3,9.	1-5,17-20
A	US 6768246 B2 (RONALD E. PELRINE. et al.) 27 July 2004 See abstract, figures 1,2A,2B,6A,6B.	1-5,17-20
A	US 2009-0315431 A1 (JAHANGLR S. RASTEGAR) 24 December 2009 See abstract, claims 1-3 and figures 3,4a,4b,4c,5.	1-5,17-20

☐ 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 application or patent 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 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
27 SEPTEMBER 2012 (27.09.2012)	**28 SEPTEMBER 2012 (28.09.2012)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea

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Telephone No. 82-42-481-8186

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/028406

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

2. ☐ Claims 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. ☒ Claims Nos.: 6-16
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 addtional 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.:

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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/028406

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