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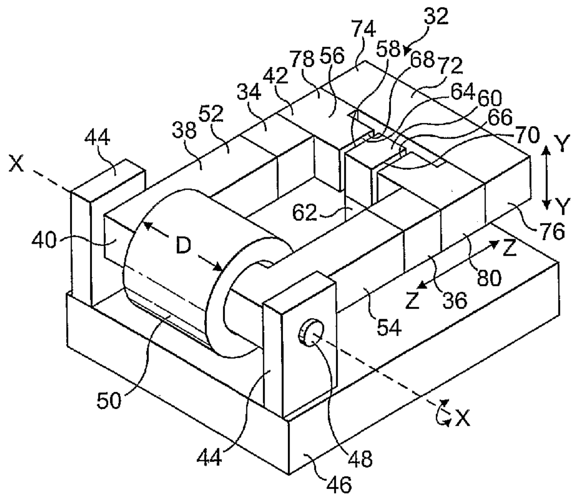
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: GENERATOR FOR CONVERTING MECHANICAL VIBRATIONAL ENERGY INTO ELECTRICAL ENERGY



(57) Abstract: An electromechanical generator (32) for converting mechanical vibrational energy into electrical energy, the electromechanical generator (32) comprising a substantially annular high-permeability core (38), the core (38) including at least one magnet (34, 36) therein to define a magnetic circuit, at least one rotatable bearing (48) mounting the core (38) to at least one bearing support (44), the at least one bearing (48) permitting the core (38) to pivot about a pivot axis (x-x), a gap (58, 68, 70) provided in the core (38), a body (60) of high-permeability material located in the gap (58, 68, 70), the body (60) being spaced from respective end faces (64, 66) of the core (38) by a respective spacing (58, 68, 70) whereby pivoting movement of the core (38) about the pivot axis (x-x) causes relative movement between the end faces (64, 66) of the core (38) and the body (60), and a rotationally fixed coil (50) surrounding a length of the core (60) coaxially with the pivot axis (x-x).

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GENERATOR FOR CONVERTING MECHANICAL VIBRATIONAL ENERGY INTO ELECTRICAL ENERGY

The present invention relates to an electromechanical generator for converting mechanical vibrational energy into electrical energy. In particular, the present invention relates to such a device which is a miniature generator capable of converting ambient vibration energy into electrical energy for use, for example, in powering intelligent sensor systems. Such a system can be used in inaccessible areas where wires cannot be practically attached to provide power or transmit sensor data.

There is currently an increasing level of research activity in the area of alternative power sources for micro electrical mechanical systems (MEMS) devices, such devices being described in the art as being used for 'energy harvesting' and as 'parasitic power sources'. Such power sources are currently being investigated for powering wireless sensors.

It is known to use an electromechanical generator for harvesting useful electrical power from ambient vibrations. A typical magnet-coil generator consists of a spring-mass combination attached to a magnet or coil in such a manner that when the system vibrates, a coil cuts through the flux formed by a magnetic core. The mass which is moved when vibrated is mounted on a cantilever beam. The beam can either be connected to the magnetic core, with the coil fixed relative to an enclosure for the device, or vice versa. The electromechanical generators are miniaturized. This makes them readily locatable in a variety of positions on or in a host apparatus for providing electrical power for driving single or plural components.

One such known miniature electromechanical generator is illustrated in Figure 1. The known design for the electromechanical generator 2 has magnets 4, 6 attached to a flexible spring-steel beam 8 adjacent to a fixed copper coil 10 located between the magnets 4, 6. An opening 12 is formed in the beam 8 at a free end 14 thereof and the magnets 4, 6 are located on opposite sides of the opening 12. The coil 10 is disposed in the opening 12, and is mounted on an arm 16 extending upwardly from a base 18. The other end 20 of the beam 8 is fixed to an upright support 22 extending upwardly from the base 18. Each magnet 4, 6 comprises a pair of magnet elements 24, 26, each element 24, 26 being located on a respective upper or lower side of the beam 8, with the two elements 24, 26 of each pair being connected together by a keeper 28 located at a side remote from the coil 10. This creates a region of magnetic flux between the magnets 4, 6 in which the coil 10 is disposed.

When the electromechanical generator 2 is subjected to vibration in the vertical direction (see Figure 1) and at a frequency near the resonance frequency of the assembly of the beam 8 and the magnets 4, 6, the beam 8 and magnets 4, 6 carried thereon oscillate relative to the coil 10. This movement results in a changing magnetic flux through the coil 10, and hence an induced voltage along the wire of the coil 10.

This known design is magnetically very efficient because of the lack of any significant conductive elements in the flux path, which would otherwise tend to support eddy currents. However, the low permeability (and hence high reluctance) path between the magnets 4, 6 leads to a low flow of flux and hence a low induced voltage per turn of the coil 10. To attempt to counteract the low induced voltage, the coil 10 is required to have many turns in a small volume so that the output voltage is at a sufficient value for a useful power output. This in turn results in a high coil resistance, which reduces the electrical efficiency of the electromechanical generator 2.

Also, the known electromechanical generator 2 requires a sprung beam 8, which acts as a cantilever beam, supporting the vibratable magnet assembly. Such a beam requires a suitable spring material to be provided and for the beam supporting the vibratable magnet assembly to be carefully tuned. This can be difficult to achieve accurately, and the resonance characteristics of the sprung beam can vary over the design lifetime of the electromechanical generator 2.

DE29618015U discloses an electrical generator for bicycles in which a magnet is mounted on a leaf spring that reacts to vibration and moves relative to a core to induce a voltage in a coil. This rudimentary disclosure does not relate to miniature generators as discussed hereinabove, or address or solve the problems discussed above with respect to the known electromechanical generator that requires a sprung beam which acts as a cantilever beam.

SU1075357A discloses a body oscillatory motion electric generator for charging a battery. A hinged body having an E-shaped magnetic circuit with a winding on the middle core and a permanent magnet on an outer core is supported for oscillatory motion by a helical spring. This disclosure does not address or solve the problems discussed above with respect to the known electromechanical generator that requires a sprung beam which acts as a cantilever beam.

SU776487A discloses an electrical generator for charging a cardio-simulator battery. The generator incorporates a rotatable cylindrical armature with a coil and conical magnet poles at its ends. This disclosure does not address or solve the problems discussed above with respect to the known electromechanical generator that requires a sprung beam which acts as a cantilever beam.

US5180939 discloses a mechanically commutated linear alternator incorporating a pair of reciprocating elements. This disclosure does not address or solve the problems discussed above with respect to the known electromechanical generator that requires a sprung beam which acts as a cantilever beam.

Accordingly, there is still a need to enhance the efficiency of the conversion by an electromechanical generator, in particular a miniature electromechanical generator, of mechanical vibration energy into electrical energy, and thereby into useful electrical power.

There is also a need for an electromechanical generator, in particular a miniature electromechanical generator, which overcomes or obviates the problems of sprung cantilever beams described above.

The present invention aims to provide to an improved electromechanical generator for converting mechanical vibrational energy into electrical energy which can operate more efficiently than known devices and/or does not encounter problems of using a cantilever sprung beam as a resonant element.

The present invention accordingly provides an electromechanical generator for converting mechanical vibrational energy into electrical energy, the electromechanical generator comprising a substantially annular high-permeability core, the core including at least one magnet therein to define a magnetic circuit, at least one rotatable bearing mounting the core to at least one bearing support, the at least one bearing permitting the core to pivot about a pivot axis, a gap provided in the core, a body of high permeability material located in the gap, the body being spaced from respective end faces of the core by a respective spacing whereby pivoting movement of the core about the pivot axis causes relative movement between the end faces of the core and the body, and a coil surrounding a length of the core.

Preferably, the core is mounted to the support by two of the rotatable bearings which are mutually spaced along the pivot axis.

Preferably, the coil is coaxial with the pivot axis.

Preferably, the coil is rotationally fixed, so that it does not rotate as the core pivots.

Preferably, two magnets are provided in the core, one on each side of the coil.

Preferably, a body of low-permeability material is attached to the core at a position remote from the pivot axis.

Preferably, the body of high permeability material is mounted on a support that is adapted selectively to be movable towards and away from the pivot axis.

Preferably, the annular core is substantially rectangular in shape, having a pivoted end on which the coil is mounted, an opposite free end including the gap, and two opposed sides extending therebetween, each side including a respective magnet.

Preferably, the electromechanical generator further comprises a base on which the at least one bearing support and the body of high-permeability material are carried.

The present invention also provides a method of converting mechanical vibrational energy into electrical energy using an electromechanical generator, the method comprising the steps of: providing an electromechanical generator comprising a substantially annular high-permeability core, the core including at least one magnet therein to define a magnetic circuit, at least one rotatable bearing mounting the core to at least one bearing support, the at least one bearing permitting the core to pivot about a pivot axis, a gap provided in the core, a body of high-permeability material located in the gap, the body being spaced from respective end faces of the core by a respective spacing whereby pivoting movement of the core about the pivot axis causes relative movement between the end faces of the core and the body, and a coil surrounding a length of the core; vibrating the electromechanical device so as to pivot the core about the pivot axis and move the end faces of the core relative to the body; and obtaining an output electrical power from the coil; wherein the magnetic flux in the core passes through the body and provides a restoring force on the pivotable core to urge the end faces of the core into alignment with the body.

The body of high magnetic material may be mounted on a support that is adapted selectively to be movable towards and away from the pivot axis, and the method may further comprise the step of moving the support towards and away from the pivot axis thereby to vary the restoring force.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of a known electromechanical generator for converting mechanical vibrational energy into electrical energy; and

Figure 2 is a schematic perspective view of an electromechanical generator for converting mechanical vibrational energy into electrical energy in accordance with an embodiment of the present invention.

Figure 2 shows an electromechanical generator 32 for converting mechanical vibrational energy into electrical energy for use in accordance with an embodiment of the present invention. The electromechanical generator 32 has magnets 34, 36 located in a substantially annular core 38 of a magnetic circuit of high-permeability material. The core 38 is laminated to avoid eddy currents and typically comprises low-loss (low-hysteresis) steel. The core 38 includes two ends 40, 42. At one hinged end 40 the core 38 is pivotally mounted between two upright supports 44 extending upwardly from a base 46, the pivotal mounting being about two opposed rotatable bearings 48. The two bearings 48 define a pivot axis X-X about which the core 38 can rotate, the bearings 48 being mutually spaced along the pivot axis. Typically, the pivot axis X-X is horizontal so that the core can oscillate in a pivoting motion in a vertical direction. A coil 50 surrounds a length of the core 38 between the bearings 48, and is coaxial with the pivot axis X-X. The coil 50 is rotationally fixed, so that it does not rotate as the core 38 pivots. Two opposed sides 52, 54 of the core 38 extends towards the other free end 56 of the core 38. Within each side 52, 54 is disposed a respective magnet 34, 36. Alternatively, only a single magnet is provided, which is located within the core. At the other free end 56 of the core 38 a gap 58 is formed. A stator 60 of high-permeability material is located in the gap 58 and is mounted on a support 62 extending upwardly from the base 46. The two end faces 64, 66 of the core 38 facing the stator 60 have opposite magnetic polarity, as a result of the disposition of the two magnets 34, 36 within the core 38. The support 62 is adapted to be selectively movable in a direction towards or away from the pivot axis X-X, thereby to vary the degree of coincidence between the stator 60 and the end faces 64, 66 of the core 38. There is a narrow spacing 68, 70 between the end faces 64, 66 and the respective opposed faces of the stator 60.

The core 38 containing the magnets 34, 36 creates a region of magnetic flux between the end faces 64, 66 of the core 38, and the stator 60 is located within that region. The presence of the stator 60 within the gap 58 causes the magnetic flux preferentially to flow through the stator 60. This applies a force on the free end 56 of the core 38, vertically aligning the end faces 64, 66 with the stator 60. In the embodiment the force is upwardly directed, against the action of gravity, and the end faces 64, 66 are vertically aligned with the stator 60. In this way, the core 38 is held in a substantially horizontal orientation although hingedly supported at only the hinged end 40.

A high-mass body 72 of low-permeability material is attached to the core 38 at a position remote from the pivot axis X-X. In the embodiment, the high-mass body 72 is an elongate rectangular block with the two ends 74, 76 attached to respective extending parts 78, 80 of the free end 42 of the core 38, the extending parts 78, 80 being oriented so as to extend from the sides 52, 54. The high-mass body 72 and the core 38 are coplanar. The high-mass body 72 is parallel with the free end 42, and so spaced from the gap 58 containing the stator 60 on a side remote from the pivot axis X-X. Alternatively, the high-mass body 72 may be substantially U-shaped with the two ends attached to the free end 42 of the core 38 so as to extend from the sides 52, 54 and with a central portion parallel with the free end 42, and so spaced from the gap 58 containing the stator 60. The low-permeability material is provided so as not to short circuit the magnetic circuit containing the gap 58 and the stator 60. The addition of the high-mass body 72 to the device remote from the pivot axis X-X increases the power output of the electromechanical generator 32, by increasing the inertial mass of the assembly which is rotationally oscillated, but without increasing the high-permeability material which would otherwise tend to increase the possibility of eddy currents, and consequent loss of efficiency.

When the electromechanical generator 32 is subjected to a source of external vibration that causes the core 38 to pivot about the pivot axis X-X in turn causing vertical movement of the free end 42 relative to the stator 60 in the direction Y-Y, this causes differing flows of magnetic flux through the core 38 as a result of the variable relative position of the stator 60 in the air gap 58 between the end faces 64, 66. This causes an electrical current to be induced in the coil 50, which can be use to drive an external device (not shown). A magnetic restoring force causes the core 38 to oscillate together with the applied vibratory motion about the horizontal configuration. Tuning of the restoring force (and hence the resonant frequency of the electromechanical generator 32) can be accomplished by moving the stator 60 in the direction towards and away from the coil 50 in the direction Z-Z.

As compared to the known device described with reference to Figure 1, no spring is necessary because of the magnetic restoring force present. This is advantageous because the sprung beam of the known device may tend to have variable spring properties in its useful lifetime, which may cause inadvertent variation in the resonant frequency, degrading the power output and/or requiring difficult adjustment of the device. In the electromechanical generator 32 of the present invention, not only is no spring required, but also the tuning of the resonant frequency can readily be accomplished.

However, in an optional modification of electromechanical generator of the present invention a biasing element, such as a spring, for example, may additionally be provided to apply an additional restoring force to the pivotable core. Such a biasing element could be disposed between the base and the core. The magnetic restoring force would tend to be non-linear with respect to amplitude and accordingly such an additional biasing element may be employed for the purpose to increase the linearity of the restoring force.

Also, due to the much higher flux flow through the core as compared to the flux flow through the coil of the known device described with reference to Figure 1, the voltage generated at resonance can be much higher. This results from the provision of a smaller air gap, and consequently narrower spacings, between the end faces 64, 66 and the stator 60, as compared to between the magnets of the known device described with reference to Figure 1.

Furthermore, the coil 50 of the electromechanical generator 32 of the present invention is disposed about the pivot axis X-X and is mounted about a pivoting section of the core 38, although the coil 50 is itself rotationally fixed. Consequently, the coil 50 can have a significant axial length D, which can be as much as the spacing between the core sides 52, 54. The is permits the volume of the core to be larger as compared to the known device described with reference to Figure 1, which in turn allows the use of thicker, less resistive wire. This reduces the electrical resistance of the coil, which can increase device efficiency.

Various modifications to the electromechanical generator of the present invention will be apparent to those skilled in the art. In the illustrated embodiment the core has a rectangular configuration. However, other shapes may be employed.

CLAIMS:

1. An electromechanical generator for converting mechanical vibrational energy into electrical energy, the electromechanical generator comprising a substantially annular high-permeability core, the core including at least one magnet therein to define a magnetic circuit, at least one rotatable bearing mounting the core to at least one bearing support, the at least one bearing permitting the core to pivot about a pivot axis, a gap provided in the core, a body of high-permeability material located in the gap, the body being spaced from respective end faces of the core by a respective spacing whereby pivoting movement of the core about the pivot axis causes relative movement between the end faces of the core and the body, and a coil surrounding a length of the core.

2. An electromechanical generator according to claim 1 wherein the core is mounted to the support by two of the rotatable bearings which are mutually spaced along the pivot axis.

3. An electromechanical generator according to claim 1 or claim 2 wherein the coil is coaxial with the pivot axis.

4. An electromechanical generator according to claim 3 wherein the coil is rotationally fixed.

5. An electromechanical generator according to any foregoing claim wherein two magnets are provided in the core, one on each side of the coil.

6. An electromechanical generator according to any foregoing claim wherein the body of high-permeability material is mounted on a support that is adapted selectively to be movable towards and away from the pivot axis.

7. An electromechanical generator according to any foregoing claim wherein the annular core is substantially rectangular in shape, having a pivoted end on which the coil is mounted, an opposite free end including the gap, and two opposed sides extending therebetween, each side including a respective magnet.

8. An electromechanical generator according to any foregoing claim wherein a body of low-permeability material is attached to the core at a position remote from the pivot axis.

9. An electromechanical generator according to any foregoing claim further comprising a base on which the at least one bearing support and the body of high-permeability material are carried.

10. A method of converting mechanical vibrational energy into electrical energy using an electromechanical generator, the method comprising the steps of:

providing an electromechanical generator comprising a substantially annular high-permeability core, the core including at least one magnet therein to define a magnetic circuit, at least one rotatable bearing mounting the core to at least one bearing support, the at least one bearing permitting the core to pivot about a pivot axis, a gap provided in the core, a body of high-permeability material located in the gap, the body being spaced from respective end faces of the core by a respective spacing whereby pivoting movement of the core about the pivot axis causes relative movement between the end faces of the core and the body, and a coil surrounding a length of the core;

vibrating the electromechanical device so as to pivot the core about the pivot axis and move the end faces of the core relative to the body; and

obtaining an output electrical power from the coil;

wherein the magnetic flux in the core passes through the body and provides a restoring force on the pivotable core to urge the end faces of the core into alignment with the body.

11. A method according to claim 10 wherein the core is mounted to the support by two of the rotatable bearings which are mutually spaced along the pivot axis.

12. A method according to claim 10 or claim 11 wherein the coil is coaxial with the pivot axis.

13. A method according to claim 12 wherein the coil is rotationally fixed.

14. A method according to any one of claims 10 to 13 wherein two magnets are provided in the core, one on each side of the coil.

15. A method according to any one of claims 10 to 14 wherein the body of high magnetic material is mounted on a support that is adapted selectively to be movable towards and away from the pivot axis, and further comprising the step of moving the support towards and away from the pivot axis thereby to vary the restoring force.

16. A method according to any one of claims 10 to 15 wherein the annular core is substantially rectangular in shape, having a pivoted end on which the coil is mounted, an opposite free end including the gap, and two opposed sides extending therebetween, each side including a respective magnet.

17. A method according to any one of claims 10 to 16 wherein a body of low-permeability material is attached to the core at a position remote from the pivot axis.

18. A method according to any one of claims 10 to 17 further comprising a base on which the at least one bearing support and the body of high magnetic material are carried.

19. An electromechanical generator substantially as hereinbefore described with reference to Figure 2 of the accompanying drawings.

20. A method of converting mechanical vibrational energy into electrical energy using an electromechanical generator substantially as hereinbefore described with reference to Figure 2 of the accompanying drawings.

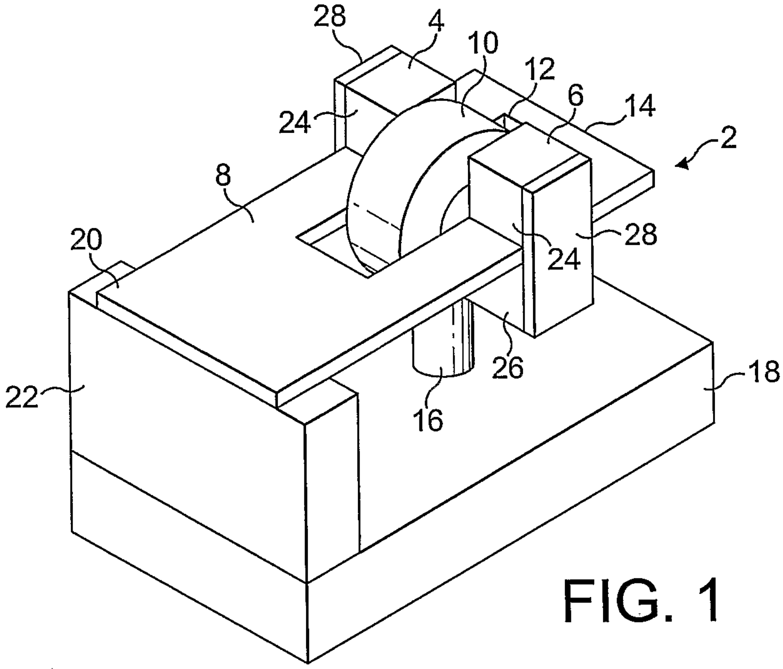
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FIG. 1

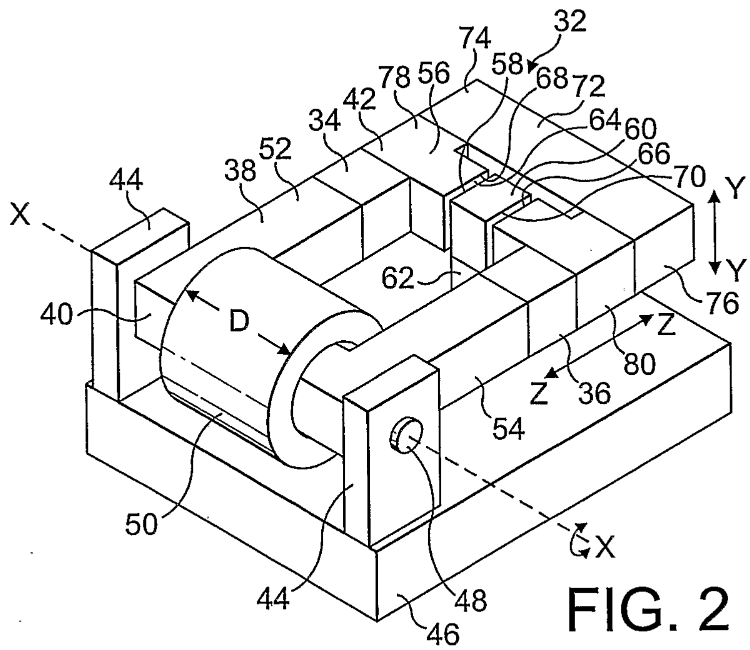
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FIG. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2006/001300

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02K35/06

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)
H02K

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 A	FR 336 445 A (ACTIENGESELLSCHAFT MAGNETA) 4 November 1903 (1903-11-04) page 1, column 2, line 31 - page 2, column 1, line 5; figures 1-3	1,2, 9-11,18 4,13
X A	DE 183 725 C (EDMUND RENZ) 28 October 1905 (1905-10-28) page 1, column 1, line 18 - column 2, line 72; figures 1,2,4,5	1,2, 9-11,18 4,5,7, 13,14,16
X A	WO 99/49556 A (DETRA S.A; TU, MAI, XUAN; SCHWAB, MICHEL) 30 September 1999 (1999-09-30) page 4, line 6 - page 5, line 15; figures 1,2	1,5,7, 9-11,14, 16,18 4,13

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[X] Further documents are listed in the continuation of Box C.

[X] 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
8 June 2006	21/06/2006

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, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	von Rauch, E.M.

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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2006/001300

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	DE 35 35 143 C1 (MESSERSCHMITT-BOELKOW-BLOHM GMBH, 8012 OTTOBRUNN, DE) 9 April 1987 (1987-04-09) column 4, line 12 - column 6, line 24; figures 1-3	1,5,7, 10,11, 14,16 4,9,13, 18
X A	DE 16 13 713 A1 (BRAUN AG) 23 April 1970 (1970-04-23) page 3, paragraph 2 - paragraph 4 page 11, paragraph 2 - page 12, paragraph 2; figures 8,11-13	1,5,7, 10,11, 14,16 4,13
A	BOLDEA I ET AL: "New linear reciprocating machine with stationary permanent magnets" INDUSTRY APPLICATIONS CONFERENCE, 1996. THIRTY-FIRST IAS ANNUAL MEETING, IAS '96., CONFERENCE RECORD OF THE 1996 IEEE SAN DIEGO, CA, USA 6-10 OCT. 1996, NEW YORK, NY, USA,IEEE, US, vol. 2, 6 October 1996 (1996-10-06), pages 825-829, XP010201393 ISBN: 0-7803-3544-9 the whole document	1,4,5,7, 10,11, 13,14,16
A	EP 0 977 345 A (EPCOS AG) 2 February 2000 (2000-02-02) page 3, paragraph 19 - page 4, paragraph 22; figures 1-3	1,10

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2006/001300

Box 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.: 6, 15, 19, 20
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 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 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.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 6, 15, 19, 20

The representative was informed that the search is the responsibility of the ISA under Chapter I of the PCT, the procedure before the ISA is closed and that there is no provision in the PCT for a review of or an appeal against the findings of the ISA by the IPEA.

Present claims 6 and 15 relate to an apparatus and a corresponding method which has a given desired property or effect, namely a movement of the body (60) being mounted on a support (62) towards and away from the pviot axis (x-x). However, the description does not provide support and disclosure in the sense of Article 6 and 5 PCT for any such apparatus or method having the said property [a support (62) being fixed to the base (46) which is fixed to supports (44) carrying bearings (48) which are forming the pivot axis (x-x) and at the same time a support (62) being movable towards the pivot axis (x-x)] and there is no common general knowledge of this kind available to the person skilled in the art. This non-compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non-compliance in determining the extent of the search of the claim (PCT Guidelines 9.19 and 9.20).

Present claims 19 and 20 relate to an extremely large number of possible apparatus or methods. Support and disclosure in the sense of Article 6 and 5 PCT is to be found however for only a very small proportion of the apparatus or methods claimed, see claim 1 and claim 10 respectively. The non-compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non-compliance in determining the extent of the search of claims 19 and 20 (PCT Guidelines 9.19 and 9.23).

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, 8.5), 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/GB2006/001300

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
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