Title: DEVICE FOR EXERCISING THE MUSCLES OF THE PELVIC FLOOR

Abstract: A device for exercising the muscles of the pelvic floor comprises a substantially cylindrical body (1) containing vibration generating means (3), characterised in that sensing means (11) is provided for detecting a force applied the outer surface of the body (1) and a control means (10) is provided whereby the speed and/or intensity of vibration produced by the vibration generating means (3) is varied in proportion to the magnitude of a force detected by the sensing means (11).
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,
GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,
NE, SN, TD, TG).

Published: before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
— with international search report

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.
DEVICE FOR EXERCISING THE MUSCLES OF THE PELVIC FLOOR

The present invention relates to an exercise device for exercising and strengthening the muscles of the pelvic floor, in particular the pubococcygeus muscle related to the female pelvic structure, so as to overcome and/or prevent various gynecological or urinary problems. The pelvic muscles are important for controlling the evacuation of the intestines and bladder and thus the condition of the pelvic muscles is important to the overall health of the patient. Such pelvic muscles can be weakened due to overstretching as a result of childbirth or due to illness and thus require toning and exercise in order to return them to condition.

WO 01/30457 discloses an exerciser for the muscles of the pelvic floor comprising an elongate member sized and shaped to simulate an erect male penis having a compressible shaft portion. The compressible shaft is actively functional in creating resistance to contraction of the muscles of the pelvic floor. Whilst the device disclosed in WO 01/30457 can help to exercise the muscles of the pelvic floor, such device is not particularly pleasant to use and provides no feedback to the user.

It is also known to provide massage devices or vibrators, primarily for sexual stimulation of the vagina. Such devices comprise a cylindrical body, at least a portion of which is sized and shaped to simulate an erect male penis. The cylindrical body contains an electric motor, having an output shaft to which is secured an eccentrically mounted mass, and a power source for the motor in the form of one or more batteries. A switch is provided on the cylindrical body for actuating the motor such that rotation of the eccentrically mounted mass causes the cylindrical body to vibrate. Frequently, a control means is also provided for enabling speed or intensity of the vibration to be varied, usually in the form of a manually operated rotatable control knob attached to a
potentiometer connected between the power source and the motor. In such prior art massage devices it is difficult and/or distracting to adjust the speed and/or intensity of the vibration while the device is in use since such adjustment required manual manipulation of a control knob or switch.

The object of the invention is to provide a device for exercising the muscles of the pelvic floor which provides feed back to the user to encourage the user to provide the necessary effort required to strengthen the muscles of the pelvic floor.

According to the invention there is provided a device for exercising the muscles of the pelvic floor, the device comprising a body and vibration generating means for vibrating said body, characterised in that sensing means is provided for sensing a force applied to at least a portion of the outer surface of the body and a control means is provided whereby the speed and/or intensity of vibration produced by the vibration generating means is varied in response to detection of a force by the sensing means.

Preferably, the speed and/or intensity of vibration produced by the vibration generating means is varied in proportion to the magnitude of the force sensed by the sensing means.

The vibration generating means may comprise an eccentrically mounted mass rotatable by an electric motor. The sensing means preferably comprises one or more pressure sensors mounted adjacent the surface of the body.

In one embodiment the one or more pressure sensors may each comprise a piezoresistive element.

In an alternative embodiment the one or more pressure sensors may each comprise means for detecting the deformation of a flexible cover provided over at least a portion of said body. Preferably said detecting means
comprises a light source, for example an LED, and a light detector, for example an LDR (Light Dependant Resistor), provided in a space between said flexible cover and a portion of said body such that deformation of the flexible cover into said space at least partially obscures the path between the light source and the light detector, thus reducing the amount of light that reaches the light detector, whereby output of the light detector is inversely proportional to the force applied to the flexible cover.

Preferably the control means comprises a microelectronic controller. Preferably the microelectronic controller measures the battery voltage and modifies a pulse width modulated voltage for driving the vibration generating means such that the speed of the electric motor is largely independent of the battery voltage.

At least a portion of the body may define a substantially cylindrical massaging portion simulating an erect male penis, the sensing means sensing a force applied to the sides of said massaging portion.

The present invention will be described further, by way of example, with reference to the accompanying drawings in which;

Fig. 1 is a sectional view through a massage device according to a first embodiment of the invention;
Fig. 2 is a sectional view through a massage device according to a second embodiment of the invention, and;
Fig. 3 is a sectional end elevation on line A-A of fig. 2.

As shown in Fig. 1, in a first embodiment of the invention, the device comprises a body 1 including a substantially cylindrical elongate massaging portion 2 and a blunt head portion 3, at least the massaging portion 2 of the body being formed from a flexible or compliant material such as a silicone based elastomer. The head portion 3 contains a vibration generating means 3
adjacent one end thereof, in the form of an electric motor 4 having an eccentrically mounted mass 5 secured to the output shaft thereof. A power source is mounted within the body 1, in the form of one or more batteries 6 mounted in a rigid battery holder 7. A power switch 8 and a speed/intensity selection switch 9, in the form of a potentiometer, are provided at the end of the device furthest from the vibration generating means 3. A microelectronic controller 10 is provided between the battery holder 7 and the electric motor 4.

A pressure sensor 11 is provided beneath the surface of the housing 2 for sensing the magnitude of a force applied to the surface of the body 1 in the region of the cylindrical massaging portion. In the first embodiment, the pressure sensor 11 comprises a layer of piezoresistive foam trapped between an electrically conductive coating 12 on the outer surface of the battery holder and a flexible electrically conducting layer 13 adjacent the inner surface of the flexible housing 2.

In use, closing the power switch 8 connects the power source 6 to the microelectronic controller 10. The microelectronic controller 10 measures the battery voltage, the voltage from the potentiometer 9 and the voltage at the junction of a series connected resistor and the piezoresistive foam pressure sensor 11, the series combination of which is placed across the battery. In response to these measurements, the microelectronic controller 10 sends a pulse width modulated drive signal to the electric motor 4. The microelectronic controller 10 operates the electric motor 4 at a speed that is largely independent of the battery voltage. The sensed voltage from the potentiometer 9 is used to set a base speed for the electric motor 4 and any change in output from the pressure sensor 11 is used to modify this base speed.

In use, when a force is applied to outer surface of the housing 2 this force is transmitted to the pressure sensor 11 via the flexible housing 2 and causes the piezoresistive foam 11 to be compressed against the rigid battery holder.
7, thus producing a drop in resistance of the piezoresistive foam 11 which is detected by the microelectronic controller 10. The microelectronic controller 10 responds by increasing the speed of the electric motor 4 in proportion to the force applied to the pressure sensor 11. In an alternative embodiment the microelectronic controller 10 may vary the speed of the electric motor 4 in inverse proportion to the force applied to the pressure sensor 11.

Figs. 2 and 3 show a second embodiment of the invention similar in construction to the first embodiment but incorporating a different pressure sensing means. Again, the device comprises a body including a substantially cylindrical elongate massaging portion 101 and a blunt head portion 102, the massaging portion 101 of the body having an annular recess 103 covered by an elastomeric cover 104 formed from a resilient material such as a silicone based elastomer such that an annular space is defined between the body and the cover 103. The head portion 102 of the body 100 defines a housing containing a vibration generating means, in the form of an electric motor 105 having an eccentrically mounted mass 106 secured to the output shaft thereof. A power source, in the form of one or more batteries 107 mounted in a rigid battery holder, is provided within the body of the device. A power switch 108 and a speed/intensity selection switch 109 are provided at the end of the device furthest from the vibration generating means. A microelectronic controller 110 is provided between the battery holder and the electric motor 105.

An array of light emitting diodes (LEDs) 111 are provided at one end the annular recess 103, directed towards a corresponding array of light sensors 112 provided at the opposite end of the annular recess. Diffusers 113 of opaque material are provided between the LEDs 111 and the light sensors 112. The arrangement of LEDs 111 and light sensors 112 define a pressure sensor for sensing the magnitude of a force applied to the surface of the body. When a force is applied to the body of the device in the region of the cover 104, such force causes the cover 104 to deform into the annular recess 103.
therebeneath. Such deformation partially blocks the annular recess 103, reducing the amount of light from the adjacent LED 111 that reaches its corresponding light sensor 112. Since the amount of deformation of the elastic cover 104 is proportional to the force applied thereto, the reduction of light received by the light sensor 112 adjacent to the position where the force is applied is inversely proportional to the force applied to the cover 104.

The light sensors 112 are connected in series with a resistor across the battery supply 107 to provide a voltage at the junction of the resistor and sensor that is representative of the force applied to the cover 104. A further resistor may be placed in parallel with each sensor to substantially linearise the relationship between the output voltage and the force applied to the cover 104. This voltage is utilised by the microelectronic controller 110 to control the speed of the motor 105.

Preferably, as shown in Fig. 3, an array of five equally spaced LEDs (and corresponding light detectors) are provided to ensure that the deformation of the cover 104 by an applied force is detected irregardless of the position on the cover 104 at which the force is applied.

The annular recess 103 may be hermetically sealed such that deformation of the cover 104 into the annular recess 103 causes an increase in pressure within the annular recess 103, providing additional resistance to said deformation. It is also envisaged that a compressible foam material (not shown) may be provided within the annular recess 103 to support the cover 104, gaps being provided between separate sections of the foam material or elongate apertures being provided through a single tubular section of foam material to provide passages for the transmission of light from each LED to each corresponding light sensor.
CLAIMS

1. A device for exercising the muscles of the pelvic floor, the device comprising a body and vibration generating means for vibrating said body, characterised in that at least one sensing means is provided for sensing a force applied to at least a portion of the outer surface of the body and a control means is provided whereby the speed and/or intensity of vibration produced by the vibration generating means is varied in response to detection of a force by the sensing means.

2. A device as claimed in claim 1, wherein the speed and/or intensity of vibration produced by the vibration generating means is varied in proportion to the magnitude of the force sensed by the sensing means.

3. A device as claimed in claim 1, wherein the vibration generating means comprises an eccentrically mounted mass rotatable by an electric motor.

4. A device as claimed in claim 1, wherein the sensing means comprises one or more pressure sensors mounted adjacent the surface of the body.

5. A device as claimed in claim 4, wherein the one or more pressure sensors each comprise a piezoresistive element.

6. A device as claimed in claim 4, wherein the one or more pressure sensors each comprise means for detecting the deformation of a flexible cover provided over at least a portion of said body.

7. A device as claimed in claim 6, wherein said detecting means comprises a light source, for example an LED, and a light detector, for example an LDR (Light Dependant Resistor), provided in a space
between said flexible cover and a portion of said body such that deformation of the flexible cover into said space at least partially obscures the path between the light source and the light detector, thus reducing the amount of light that reaches the light detector, whereby output of the light detector is inversely proportional to the force applied to the flexible cover and the resulting deformation caused thereby.

8. A device as claimed in claim 1, wherein the control means comprises a microelectronic controller.

9. A device as claimed in claim 8, wherein the microelectronic controller measures a battery voltage and modifies a pulse width modulated voltage for driving the vibration generating means.

10. A device as claimed in claim 1, wherein at least a portion of the body defines a substantially cylindrical massaging portion simulating an erect male penis, the sensing means sensing a force applied to the sides of said massaging portion.

11. A device as claimed in claim 10, wherein the vibration generating means, the sensing means and the control means are located within said massaging portion of said body.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
   IPC 7  A63B23/20

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)
   IPC 7  A63B  A61F  A61H

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>WO 01 37732 A (OLSEN OLE ; LEIVSETH GUNNAR (NO); MEDSCAND MEDICAL AB (SE)) 31 May 2001 (2001-05-31) page 12, line 24 - page 15, line 31; figures 1,3</td>
<td>1, 4, 8, 10</td>
</tr>
<tr>
<td>Y</td>
<td>US 4 476 880 A (GIEM DAVID A ET AL) 16 October 1984 (1984-10-16) column 4, line 47 - line 61</td>
<td>6, 7</td>
</tr>
<tr>
<td>A</td>
<td>WO 01 30457 A (STEIN DANIEL S) 3 May 2001 (2001-05-03) cited in the application abstract</td>
<td>1</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

"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

Date of the actual completion of the international search 6 November 2002

Name and mailing address of the ISA
   European Patent Office, P.B. 5016 Patentshuis 2
   NL - 2280 HV Rijswijk
   Tel. +31-70 340-2000, Tx. 31 651 epo nl
   Fax. (+31-70) 940-3015

Authorized officer
   Pille, S
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 6 063 045 A (HOSKINS MATTHEW W ET AL) 16 May 2000 (2000-05-16) abstract; figures 1,6</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>DE 197 52 730 A (HANNIG JUN GERHARD) 2 June 1999 (1999-06-02) the whole document</td>
<td>1</td>
</tr>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>WO 0137732 A</td>
<td>31-05-2001</td>
<td>AU 1749401 A</td>
</tr>
<tr>
<td>EP 1231859 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO 0137732 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE 9904262 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE 0001960 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US 4476880 A</td>
<td>16-10-1984</td>
<td>NONE</td>
</tr>
<tr>
<td>US 6394939 B1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AU 3729200 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AU 8019100 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP 1229968 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO 0130456 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO 0130457 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US 2002142901 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US 2002142902 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US 2002142895 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US 2002142896 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AU 1520799 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CA 2312401 A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DE 19752730 A</td>
<td>02-06-1999</td>
<td>DE 19752730 A1</td>
</tr>
</tbody>
</table>

Form PCT/IBA/210 (patent family annex) (July 1992)