

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
18 August 2005 (18.08.2005)

PCT

(10) International Publication Number
WO 2005/074371 A3(51) International Patent Classification⁷: **A61H 1/02**(21) International Application Number:
PCT/IL2005/000140

(22) International Filing Date: 4 February 2005 (04.02.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/542,022	5 February 2004 (05.02.2004)	US
60/566,079	29 April 2004 (29.04.2004)	US
60/566,078	29 April 2004 (29.04.2004)	US
60/604,615	25 August 2004 (25.08.2004)	US
60/633,428	7 December 2004 (07.12.2004)	US
60/633,442	7 December 2004 (07.12.2004)	US
60/633,429	7 December 2004 (07.12.2004)	US

(71) Applicant (for all designated States except US): **MOTORIKA INC.**; Nerine Chambers, P.O. Box 905, Road Town, Tortola (VG).

(72) Inventors; and

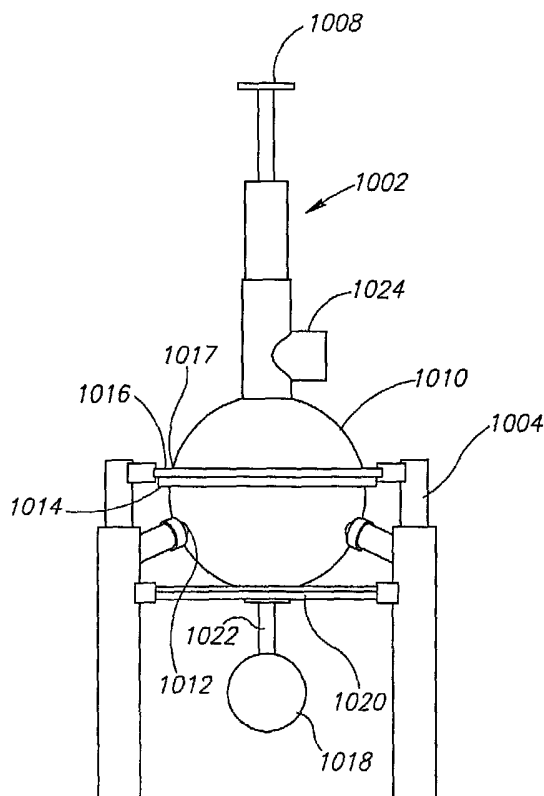
(75) Inventors/Applicants (for US only): **EINAV, Omer** [IL/IL]; 42875 Kfar Monash (IL). **EINAV, Haim** [IL/IL]; 28 Shlush Street, 65149 Tel-Aviv (IL). **ROUSSO, Benny**[IL/IL]; 12 Henry Bergson Street, 75801 Rishon Lezion (IL). **SHABANOV, Doron** [IL/IL]; 34 Hadkalim Boulevard, 44862 Zur Igal (IL). **KATZIR, Eran** [IL/IL]; 12 Amnon Vetamar Street, 48580 Rosh Ha'Ayin (IL). **BINYAMINI, Gad** [IL/IL]; 45870 Moshav Hagor (IL).(74) Agents: **FENSTER, Paul** et al.; FENSTER & COMPANY, INTELLECTUAL PROPERTY LTD., P.O. Box 10256, 49002 Petach Tikva (IL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

[Continued on next page]

(54) Title: METHODS AND APPARATUS FOR REHABILITATION AND TRAINING



(57) Abstract: The invention relates to a rehabilitation device which guides a patient to perform a motion with a correct spatial trajectory, by the device applying one or more pushing, assisting, reminding, responding and/or resisting forces during a motion (or intent to move) by the patient. The forces are applied by an actuator, for example, a robotic articulated arm or a spherically jointed lever. The applied forces act as a force fields, optionally continuous, which impeded and/or guides a patient. The device can be programmable with various trajectories (paths and/or velocities) and/or forces. The forces at one point in the trajectory can vary responsive to an actual trajectory by the patient and/or responsive to a rehabilitation plan and/or improvement of the patient. The device can learn a motion entered by a physiotherapist and replay it for the patient.



FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL, PT, RO,
SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:
16 March 2006

(15) Information about Correction:

Previous Correction:

see PCT Gazette No. 41/2005 of 13 October 2005, Sec-
tion II

Published:

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

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL05/00140

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A61H 1/02

US CL : 601/5, 33

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)

U.S. : 601/5, 23, 27-34; A61H 1/00, 1/02

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 practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,936,299 A (ERLANDSON) 26 JUNE 1990 (26.06.1990) see entire document	1-8
A	US 5,211,161 A (STEF) 18 MAY 1993 (18.05.1993)	
A	US 5,466,213 A (HOGAN et al) 14 NOVEMBER 1995 (14.11.1995)	
A	US 5,391,128 A (deBear) 21 FEBRUARY 1995 (21.02.1995)	
A	US 5,454,774 A (DAVIS) 03 OCTOBER 1995 (01.10.1995)	

☐ 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	"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
"E" earlier application or patent published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"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

04 November 2005 (04.11.2005)

Date of mailing of the international search report

03 FEB 2006

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Facsimile No. (571) 273-3201

Authorized officer

Danton DeMille

Telephone No. (571) 272-3700

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL05/00140

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.:
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:
Please See Continuation Sheet

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 additional fees, this Authority did not invite payment of any additional fees.
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.: 1-8

- 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

International application No.
PCT/IL05/00140

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-8, drawn to a rehabilitation device including a frame, an actuator and a joint interconnecting the frame and the actuator.

Group II, claim(s) 9-11, drawn to a method of setting up a rehabilitation system.

Group III, claim(s) 12-36, drawn to a rehabilitation device including a joint, a substantially rigid radial extension and a controller.

Group IV, claim(s) 37, drawn to a balance rehabilitation device including an actuator and a weight.

Group V, claim(s) 38-44, drawn to a method of rehabilitation comprising assisting motion, resistance to motion and compliance to motion without electro-mechanical feedback loop.

Group VI, claim(s) 45-49, drawn to a rehabilitation device including a motor which prevents back-driving of the motor.

Group VII, claim(s) 50-51, drawn to a rehabilitation device comprising a motor and slot to drive a lever with a spring providing resilience to motion.

Group VIII, claim(s) 52-53, drawn to a multi-axis resilient element with two sets of joints.

Group IX, claim(s) 54-57, drawn to a rehabilitation device including a motor and spring coupled to the motor that is settable.

Group X, claim(s) 58, drawn to a telescoping mechanism.

Group XI, claim(s) 59-65, drawn to a portable rehabilitation device that has two configurations.

Group XII, claim(s) 66-69, drawn to a rehabilitation device comprising a separable element interconnecting a motor and a lever.

Group XIII, claim(s) 70-73, drawn to a rehabilitation device with a controller adapted to identify a safety problem.

Group XIV, claim(s) 74-78, drawn to a rehabilitation docking station with a docking port adapted for locking to a patient carrier.

The inventions listed as Groups I-XIV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the rehabilitation devices recite their own specific requirement that is different from any of the other rehabilitation devices. The methods also require specific steps that are

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL05/00140

different from the other method claims and devices. The telescoping mechanism doesn't require any of the details of the rehabilitation devices.