



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.04.2018 Bulletin 2018/14

(51) Int Cl.:
A61H 3/04 (2006.01)

(21) Application number: **17193862.4**

(22) Date of filing: **28.09.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(71) Applicant: **Majoe, Dennis**
Eastleigh, Hampshire SO50 9LH (GB)

(72) Inventor: **Majoe, Dennis**
Eastleigh, Hampshire SO50 9LH (GB)

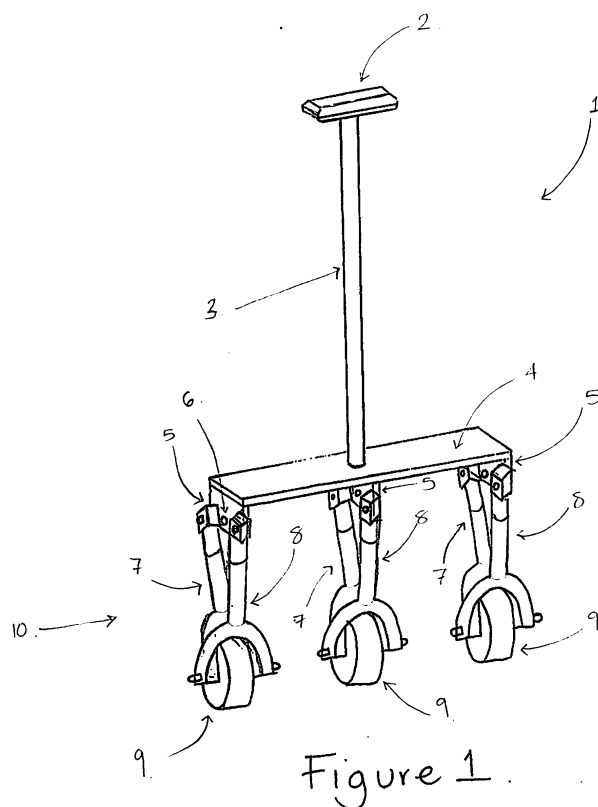
(74) Representative: **Brooks, Nigel Samuel**
Hill Hampton
East Meon
Petersfield, Hampshire GU32 1QN (GB)

(30) Priority: **28.09.2016 GB 201616457**

(54) **ELECTROMECHANICAL WALKING AID**

(57) There is a walking aid (1), comprising a handle (2) for a user to grip and a shaft (3) extending downwards when in use from the handle. At the end of the shaft there is an actuator support (4), having extent transverse of the shaft and six linear actuators (7, 8) connected as triangular pairs to the actuator support at their top end, and at the bottom ends pivotally connected to 3 direct

drive wheels (9). The position of each wheel can be individually adjusted with respect to another wheel to help a user on an inclined surface, to get up or sit down or to navigate a step. The walking aid can also include a processor, Wifi capabilities, voice recognition services and emergency communication to a third party.



Description

[0001] The present invention relates to a walking aid particularly although not exclusively for the elderly.

[0002] Walking aids with motorised elements are well known in the art. People currently use "Rollators" to walk assisted. "Rollators" are supportive walkers with wheels to help movement on a flat surface. These devices tend to be quite large in comparison to a traditional walking stick and can therefore cause problems when trying to move around indoors.

[0003] "Couch Canes" are also a popular aid for the elderly in helping people to get on and off the toilet or a chair. These devices tend not to have wheels or rollers to improve the stability of the device when force is applied to it by the user. "Couch Canes" are therefore difficult for the user to take everywhere with them. They can be a fixed height or can have an adjustable element to change the height depending on the user's requirements.

[0004] There are walking aids which enable someone to get upstairs, however in practice it is unlikely that an elderly person would use a hand held device to walk up a flight of stairs when there many known stair lifts available. It would however be helpful if one or a few steps could be navigated such as a step up to a door, a pavement edge or even the threshold of a doorway.

[0005] There are walking aids in the prior art which teach a variable wheel base with the adjustment of a third central wheel, for example US 2013/0306120 A1. This, like others, has a single wheel axis for the two outer wheels which can cause stability issues when walking along a slope. For example most pavements in the UK experience a gentle incline towards the road for ease of drainage.

[0006] The object of the present invention is to provide an improved walking aid.

[0007] According to the invention there is provided a walking aid, comprising:

- a handle,
- a shaft extending downwards in use from the handle, to
- an actuator support, having extent transverse of the shaft
- 6 linear actuators connected as triangular pairs to the actuator support at their top end, and at the bottom ends pivotally connected to,
- 3 direct drive wheels,

wherein the position of each wheel can be individually adjusted with respect to another.

wherein the triangular arrangement is that the actuator support provides bases for triangles having actuators extending at either sides.

[0008] Preferably the actuator support has 3 integral brackets with a plurality of apertures. The apertures provide a location for each linear actuator to be pivotally connected and the plurality allows for adjustment of the

device. An alternative is that the brackets are separate components to the actuator support, they may also contain only two apertures.

[0009] The brackets are located equally spaced along the actuator support, however it can be envisaged that they are spaced unequally. The brackets are also orientated along the same centreline, however they can be spaced with the middle bracket off centre.

[0010] The walking aid can comprise sensors to detect, particularly although not exclusively, changes in the users strength, force applied by the user, position of the device including pitch, roll, tilt and acceleration, and extension of the linear actuators.

[0011] The walking aid comprises a processor to receive communication from each sensor and to instigate adjustment of the device.

[0012] It can be envisaged that the device could have more than 3 wheels, however preferably there are 3.

[0013] The walking aid may also comprise a Wifi connection, this enables the processor to access cloud services. The cloud services could include speech recognition services, access to audio files and emergency numbers as well as other health related services.

[0014] Elderly people often find it difficult to use modern technology to make regular phone calls to their loved ones, especially in emergency situations. The walking aid may also consist of further sensors and transmitters so that loved ones are able to check whether the user is weaker than usual, whether they have been for a walk that day and other such variables remotely. There may also be the capability of a loved one being alerted if something changes for the user that could cause concern.

[0015] Often a user may not need a walking aid at all times and could leave it somewhere remote from where they are. The walking aid can have speech recognition and voice direction finding capabilities. The processor can digitise local binary audio and instigate an adjustment to the device or cause the device to move towards the user.

[0016] Whilst it can be envisaged that the walking aid could have 3 linear actuators paired with a fixed leg which is pivotally connected to the direct drive wheel it is preferable that it has 6 linear actuators arranged in pairs and connected to the direct drive wheel.

[0017] To help understanding of the invention, a specific embodiment thereof will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is an isometric view of a walking aid of the present invention,

Figure 2 is a side view of the walking aid navigating a step,

Figure 3 is a side view of the walking aid helping a user to stand,

Figure 4 is a front view of the walking aid helping a user to walk on a slope,

Figure 5 is a plan view of cut through X-X on Figure 4,

Figure 6 is a flow chart representing the control of the present invention.

[0018] Referring to the Figures there is a walking aid which can be used by an elderly person. The walking aid 1 consists of a handle 2, a shaft 3 and an actuator support 4. The actuator support has three integral brackets 5 with a plurality of apertures 6. The apertures are for pivotally connecting six linear actuators arranged in pairs consisting of a rear actuator 7 and a front actuator 8. Each pair of actuators is pivotally connected to a direct drive wheel 9 arranged in a triangular arrangement where the actuator support provides one side of the triangle. Each pair of linear actuators and a direct drive wheel can be collectively referred to as a leg 10.

[0019] The front and rear actuators are arranged in the same plane as seen in Figure 5. One actuator corresponds to a single assembly including an armature 11 and an axle 12 on which the other actuator is connected. This assembly fixes one actuator with respect to the axle where the other actuator is allowed to rotate relative to the first actuator. This also prevents the motor from rotating. In the centre of the wheel 9 is a series of coils 13 which when energised attract permanent magnets 14, housed in a cylinder 15. This cylinder revolves around the armature on ball bearings 16 when the coils are activated. The cylinder is then surrounded by rubber completing the tyre 17.

[0020] The walking aid is driven by three brushless direct drive DC motors 18 which drive the wheels 9. The linear actuators are based on stepper motors 19 for leg rotation and elongation. Each of the three legs includes rotation and extension sensors 20. They are all driven by the main electronics and computation module 21 which receives sense data from the users hand and fingers and motion and orientation sensors. Low level stability control is performed within the local processor 22.

[0021] Each actuator is individually lengthened or shortened to suit the user's environment, to either rotate the legs forward or backwards, reduce or increase the wheel base or reduce or increase the overall height of the legs. The way in which the walking aid can achieve this is described by the following examples.

[0022] One function of the walking aid is to help a user to sit on a toilet or sofa for example, or to stand from a seated position. To sit, a user would bring the walking aid to near where they wanted to sit, the walking aid would then increase its wheelbase to enable a more stable foundation for the user to lean against while sitting. In increasing the wheel base you are also reducing the overall height of the walking aid to follow the user into a sitting position. An example of this is shown in Figure 3.

[0023] Once a user is stood up, the walking aid requires a smaller wheelbase to be able to navigate indoors, which also avoids the requirement for specially adapted housing.

[0024] When the user is walking, either indoors or outside, the walking aid senses the pressure of a user's hand

on the handle, the walking aid then moves in the desired direction at the speed required for the hand to always be fully supported. The walking aid can reduce its wheelbase to the minimum and act like a Segway (RTM), a self-supported inverse pendulum.

[0025] The walking aid can navigate steps, for example the threshold of a doorway or a pavement edge. For support on a step as shown in Figure 2, the walking aid can shorten and extend forward its middle wheel, while lengthening and stabilising the outer two legs to ensure a stable tripod wheelbase to support the user. Once the user has taken the step, the back legs shorten and move forward to be in the desired position for walking again. The user does not have to lift the walking aid, or walk unsupported at any time.

[0026] The walking aid is also beneficial when walking on a slope. For example pavements in the UK are sloped to help drainage into the gutters of the road. The fact that each leg of the walking aid is individually adjustable allows the road to be sloped but the actuator support to remain horizontal to best support the user as shown in Figure 4.

[0027] An advantage to the preferred embodiment is that the walking aid can assist the user in walking, moving around indoors, helping to stand or sit, navigate a step and remain stable while walking along a slope among others features all in one ergonomic device.

[0028] The invention is not intended to be restricted to the details of the above described embodiment. For instance, the processor could also digitise local binary audio for use in speech recognition and voice direction finding.

[0029] The walking aid can also replay audio received as MP3 files.

[0030] The walking aid can be Wifi enabled which allows the processor to access cloud services where amongst other health related services, speech recognition services and access to entertaining audio files is performed.

[0031] The walking aid can have an adjustable handle or shaft to suit the height of any user without amending the wheelbase to compensate.

[0032] The walking aid can have 3 linear actuators paired with 3 fixed legs which are pivotally connected to the direct drive wheel, however it is preferable that it has 6 linear actuators arranged in pairs as described hereinbefore.

Claims

1. A walking aid, comprising:

- a handle,
- a shaft extending downwards in use from the handle, to
- an actuator support, having extent transverse of the shaft

- at least 3 linear actuators connected to the actuator support at their top end, and at the bottom end each pivotally connected to one of,
- at least 3 direct drive wheels,

wherein the position of each wheel can be individually adjusted with respect to the others.

2. A walking aid as claimed in claim 1, wherein the walking aid has 6 linear actuators connected as triangular pairs to the actuator support at their top end, and at the bottom end connected to the at least 3 direct drive wheels.

3. A walking aid as claimed in claim 1 or claim 2, wherein the actuator support has integral brackets for each linear actuator to be connected to.

4. A walking aid as claimed in claim 1 or claim 2, wherein the actuator support has separate brackets for each linear actuator to be connected to.

5. A walking aid as claimed in claim 3 or claim 4, wherein the brackets have at least two apertures adapted to adjust the walking aid to suit a user.

6. A walking aid as claimed in any preceding claim, wherein the walking aid can further comprise sensors to detect at least one of:

- changes in the users strength, and/or
- force applied by the user, and/or
- the position of the device including pitch, roll, tilt and acceleration, and/or
- the extension of the linear actuators.

7. A walking aid as claimed in claim 6, wherein the walking aid comprises a processor to receive communication from each sensor and to instigate adjustment of the walking aid.

8. A walking aid as claimed in claim 7, wherein the walking aid comprises a Wifi connection adapted to enable the processor to access cloud services.

9. A walking aid as claimed in any preceding claim, wherein the walking aid is adapted to comprise GPS or an alternative location or tracking system.

10. A walking aid as claimed in any preceding claim, wherein the walking aid is adapted to comprise at least one of:

- speech recognition services, and/or
- access to audio files, and/or
- access to emergency phone numbers, and/or
- access to other health related services.

11. A walking aid as claimed in any preceding claim, wherein the walking aid is adapted to communicate to a third party whether:

- the user is weaker than usual,
- they have been for a walk that day and
- other such variables related to a user's health or wellbeing.

12. A walking aid as claimed in any preceding claim, wherein the walking aid is adapted to alert automatically a third party if something changes for the user that could cause concern.

13. A walking aid as claimed in any preceding claim, wherein the walking aid further comprises:

- voice direction finding capabilities, and
- a processor, adapted to digitise local binary audio and instigate:

- an adjustment to the device; and/or
- the device to move towards the user.

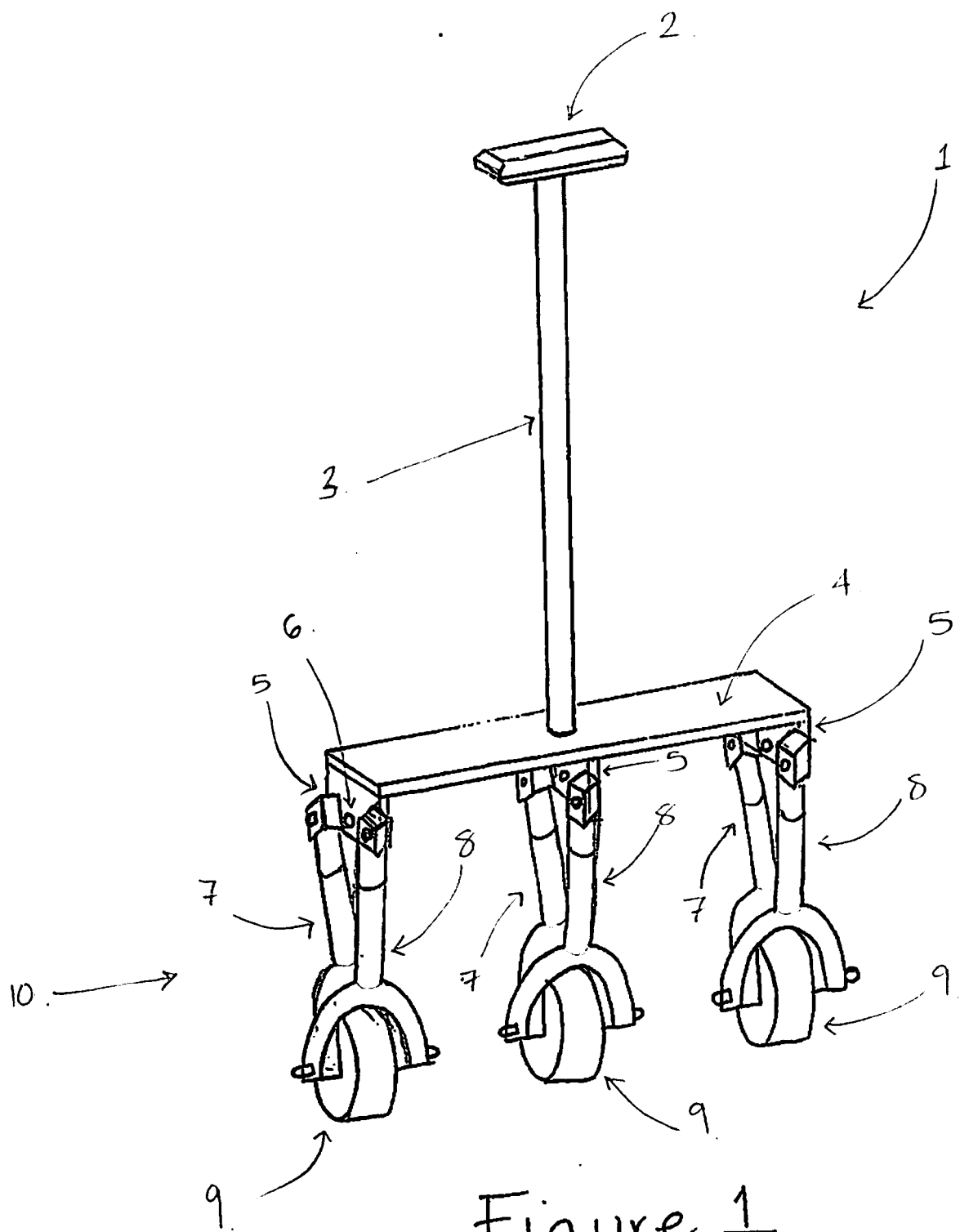


Figure 1

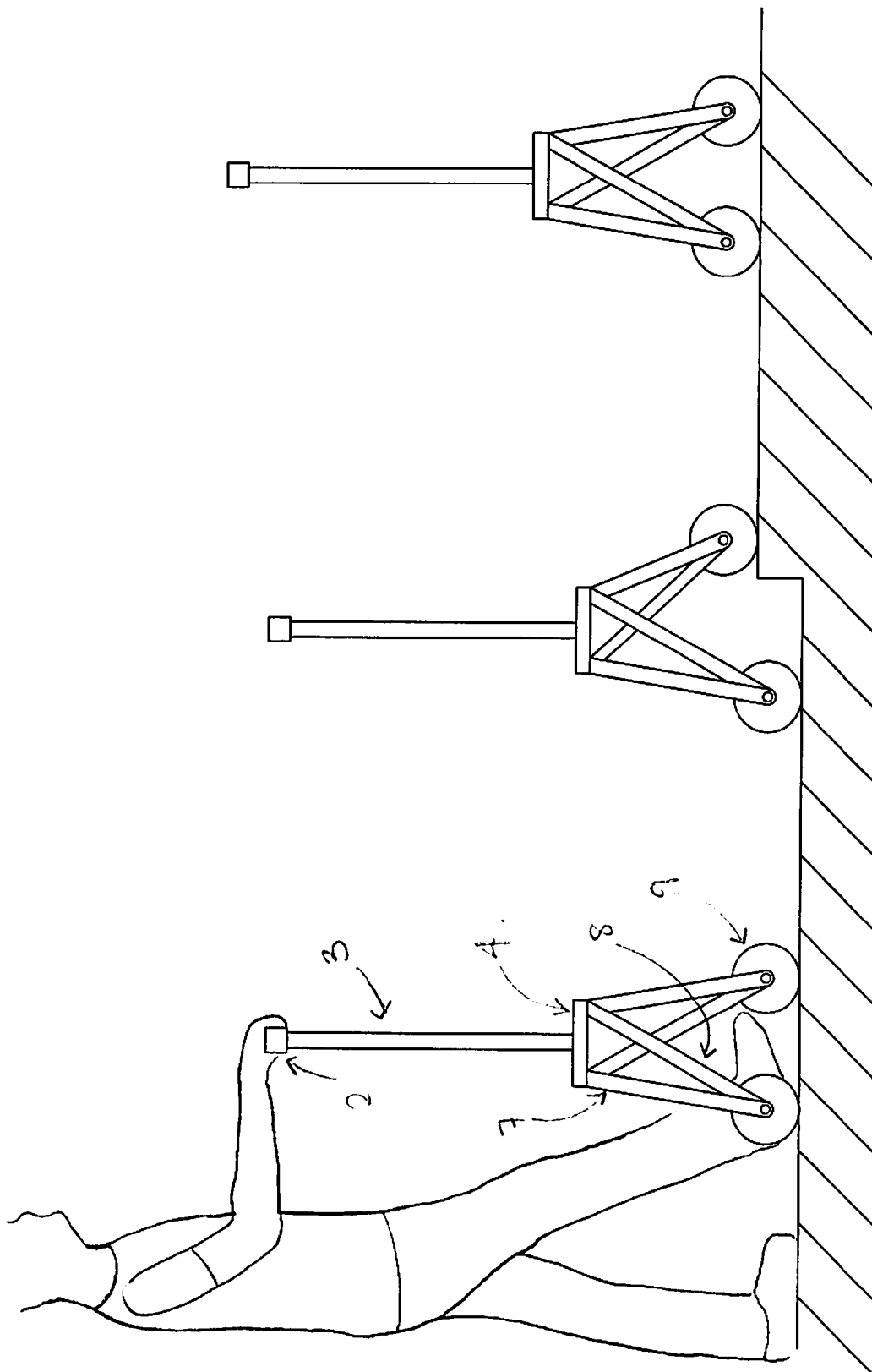


Figure 2

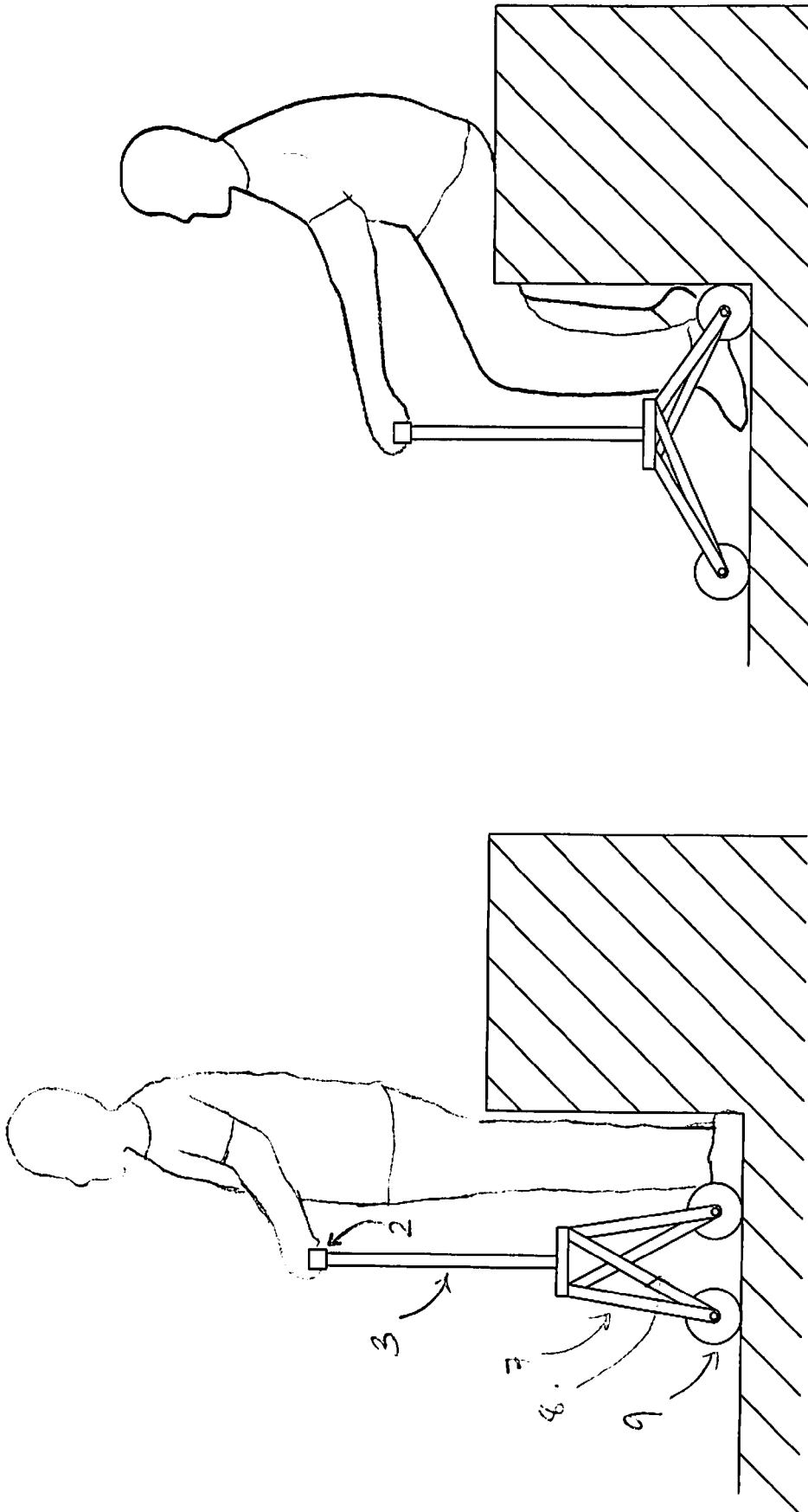


Figure 3

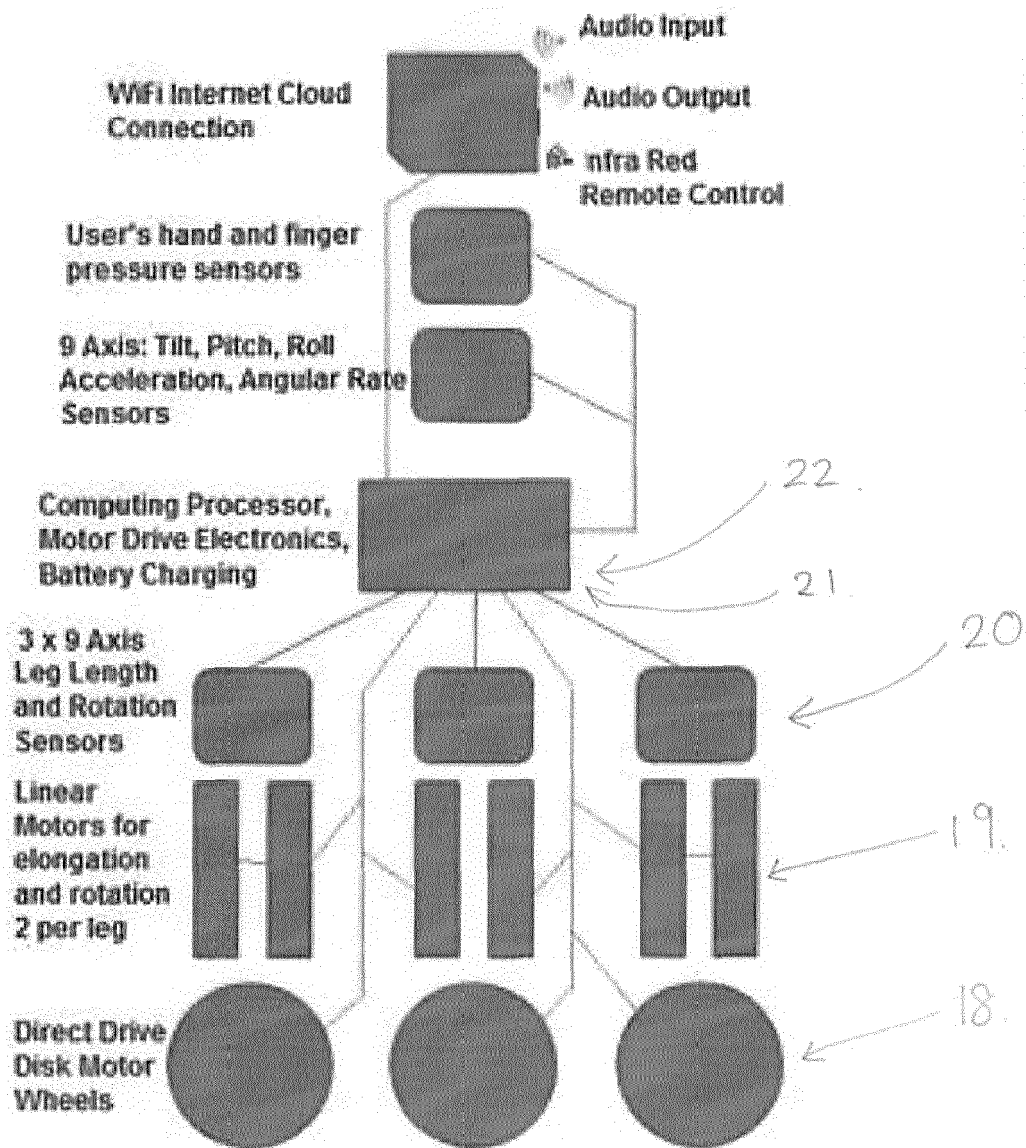


Figure 6.



EUROPEAN SEARCH REPORT

Application Number
EP 17 19 3862

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2012/018233 A1 (CHANG YOON YOUNG [KR] ET AL) 26 January 2012 (2012-01-26)	1,3-7,9	INV. A61H3/04
Y	* paragraph [0014]; figures *	6-13	
A	* paragraph [0084] - paragraph [0090] *	2	
Y	US 2016/074262 A1 (MOSES SOPHIA VASILIKI [US] ET AL) 17 March 2016 (2016-03-17)	6-13	
A	* paragraph [0015] - paragraph [0017] *		
	* paragraph [0047] *		
	* paragraph [0051] *		
A	US 2015/183463 A1 (SHIRATO KENICHI [JP] ET AL) 2 July 2015 (2015-07-02)	1	TECHNICAL FIELDS SEARCHED (IPC) A61H A45B
	* paragraph [0048] *		
	* paragraph [0034] - paragraph [0037] *		
A	US 2003/205265 A1 (NASCO MIKE [US]) 6 November 2003 (2003-11-06)	1	
	* figures *		
A	WO 2012/118263 A1 (LG ELECTRONICS INC [KR]; LEE JAEHOON [KR]) 7 September 2012 (2012-09-07)	1	
	* paragraph [0042] - paragraph [0043] *		
	* paragraph [0063] *		
	* paragraph [0096] - paragraph [0098]; figures *		
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		8 December 2017	Lundblad, Hampus
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 19 3862

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-12-2017

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012018233 A1	26-01-2012	DE 102011079143 A1 US 2012018233 A1	08-03-2012 26-01-2012
-----	-----	-----	-----
US 2016074262 A1	17-03-2016	NONE	
-----	-----	-----	-----
US 2015183463 A1	02-07-2015	JP 5716874 B2 JP 5884930 B2 JP 2015128991 A JP W02014045859 A1 US 2015183463 A1 WO 2014045859 A1	13-05-2015 15-03-2016 16-07-2015 18-08-2016 02-07-2015 27-03-2014
-----	-----	-----	-----
US 2003205265 A1	06-11-2003	NONE	
-----	-----	-----	-----
WO 2012118263 A1	07-09-2012	KR 20120098050 A WO 2012118263 A1	05-09-2012 07-09-2012
-----	-----	-----	-----

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 20130306120 A1 [0005]