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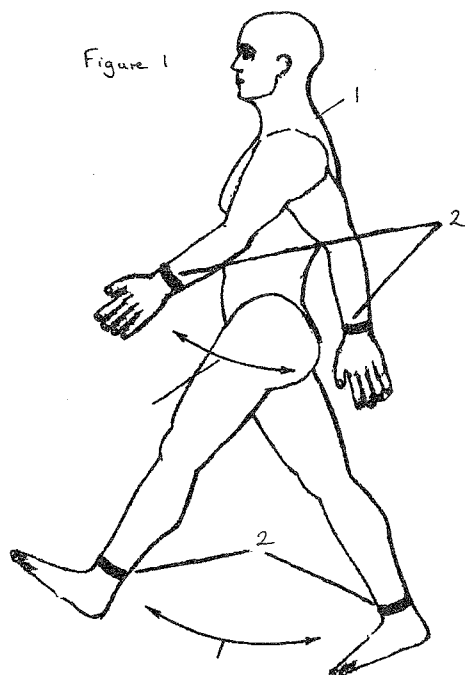
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(54) Title: METHOD AND APPARATUS FOR WEARER INITIATED BI-LATERAL STIMULATION OF THE BRAIN



(57) Abstract: An apparatus for bi-lateral stimulation of the brain comprising first and second stimulation devices adapted to be worn on the body to stimulate respective sides thereof, and first and second trigger devices adapted to be worn on respective limbs on either side of the wearer's body to detect movement thereof, where alternating movement of said limbs is detected by said first and said second trigger devices whereby the first and second stimulation devices are sequentially activated to sequentially stimulate the parts of the wearer's body to which they are attached, thereby generating bi-lateral stimulation of the wearer's brain as a result of said alternating movement of said limbs of the wearer's body.

Method and Apparatus for Wearer Initiated Bi-Lateral Stimulation of the Brain

This invention relates to a method and apparatus for wearer initiated bi-lateral stimulation which can be used to enhance certain types of brain therapy, including brain performance
5 enhancement.

Eye movement desensitization and reprocessing (EMDR) is a highly effective form of psychotherapy that was developed by Dr Francine Shapiro to resolve the development of trauma-related disorders caused by exposure to distressing events such as rape, military
10 combat or other highly stressful experiences.

The brain processes information, in the form of experiences, and stores such information as memories in an accessible and useful form. Memories are thought to be linked in networks connecting similar thoughts, images, emotions and sensations. Learning then takes place
15 whenever new thoughts or experiences connect with information already stored in memory. However, if trauma occurs in the brain the information processing can often be incomplete, whereby the similar networks in the memory are not connected.

Integral to EMDR therapy is the use of bi-lateral stimulation of the brain which is known to
20 aid addressing and treating psychological trauma. Currently accepted physiological methodology is that the consecutive stimulation of alternating sides of the brain encourages blood flow between either side of the brain, releasing endorphins and assisting in the information processing within the brain. During EMDR therapy, bi-lateral stimulation occurs whereby each side of the brain works alternately, enhancing the body's own
25 processing and healing mechanisms.

EDMR therapy has a scientifically proven and professionally accepted track record in treating patient's with various conditions, including post traumatic stress disorder (PTSD), depression, anxiety, phobias, pain associated with injury and various kinds of
30 underperformance.

Known EDMR therapies involve the following methods to create the required bi-lateral stimulation :-

1. Light bars - wherein a line of lights is sequentially controlled by the therapist to encourage the patient to follow the lights from side to side on the light bar, thus causing the patient's eyes to move from side to side;
 2. Tones - music or other sounds are played through headphones worn by the patient
5 with alternating beats or sounds in each ear to create bi-lateral stimulation;
 3. Hand held pulse device - wherein tactile stimulation devices are held by the patient's hands, the devices being alternately activated by the therapist to create bi-lateral stimulation via the patient's sense of touch;
 4. Waving of fingers by the therapist in front of the patient's eyes to encourage the
10 patient's eyes to move from side to side;
 5. Direct tapping or touching of the patient's body, such as on the hands, arms or shoulders on alternating sides of the patient's body to create the desired bi-lateral stimulation.
- 15 Each of the above methods requires the presence and actions of a therapist utilising a piece of equipment established solely to allow them to administer effective bi-lateral stimulation to an agreeable recipient. Therefore all of these prior art methods can be described as remote operator activated bi-lateral stimulation. An objective of the present invention is to provide bi-lateral stimulation of a patient generated by the patient themselves without requiring the
20 intervention of a therapist. Thus an object of the present invention is to enable a person to experience bi-lateral stimulation generated through their own physical actions without requiring supervision or assistance from a third party.

According to the present invention there is provided an apparatus for bi-lateral stimulation
25 of the brain comprising first and second stimulation devices adapted to be worn on the body to stimulate respective sides thereof, and first and second trigger devices adapted to be worn on respective limbs on either side of the wearer's body to detect movement thereof, where alternating movement of said limbs is detected by said first and said second trigger devices whereby the first and second stimulation devices are sequentially activated to sequentially
30 stimulate the parts of the wearer's body to which they are attached, thereby generating bi-lateral stimulation of the wearer's brain as a result of said alternating movement of said limbs of the wearer's body.

Said first and second stimulation devices may be adapted to achieve tactile stimulation of the wearer's body. Said first and second stimulation devices may be applied to or attached to respective limbs on either side of the wearer's body.

- 5 In one embodiment said first and second trigger devices may be adapted to be attached to or applied to respective limbs on opposite sides of the wearer's body for detecting motion of such limbs. Preferably said first stimulation device is activated when said first trigger device detects movement of the limb to which it is attached, said second stimulation device being activated when said second trigger device detects movement of the limb to which it is
10 attached. This separately occurring sensory stimulation of opposing limbs is wearer initiated bi-lateral stimulation through the action of movement of the wearer.

Each of said first and second trigger devices may comprise a tilt switch or motion sensor, for example an accelerometer. Each of said first and second trigger devices may be mounted on
15 a strap or band to be worn on a respective limb of the wearer, for example on a leg or an arm of the wearer, for detecting movement of such limb.

In all cases, the bi-lateral stimulation may be generated by the action of the wearer moving opposing limbs or body areas to which the first and second trigger devices have been
20 attached. This may be through the actions of walking, running, swinging of the arms, or any other body movement.

Each of said first and second stimulation devices may comprise a vibration generating means or an oscillator adapted to apply tactile stimulation to the wearer's skin. Each of said
25 first and second stimulation devices may be mounted on a strap or band to enable the stimulation device to be attached to a limb of the wearer.

Said first and second trigger devices may communicate with said stimulation devices via wired or wireless communication means. The first and second stimulation devices may
30 each be mounted on a common strap or band with the respective first and second trigger device or may be mounted on a separate strap or band or other attachment device to enable the first and second stimulation devices to be mounted on the body remote from the first and second trigger devices.

Preferably a microprocessor or other electronic control means is provided for activating said first and second stimulation devices in response to activation signals received from said first and second trigger devices.

- 5 Preferably said control means is provided with a power supply, such as one or more batteries/capacitors.

Said control means may include a memory device for recording the operation of said first and second stimulation devices and/or said first and second trigger devices. Said memory
10 device may also store biometric information from other sensing devices associated with the wearer, such as the temperature of the wearer and/or the wearer's heart rate and/or the wearer's blood pressure and/or the wearer's heart rate variability and/or the wearer's blood oxygen levels and/or a pedometer.

15 According to a further aspect of the present invention there is provided method of brain therapy comprising applying first and second trigger devices to respective limbs on either side of the person's body, applying first and second stimulation devices to the person's body for providing sensory stimulation of respective sides of the person's brain, and operating said first and second stimulation devices to stimulate respective sides of the
20 person's brain in response to detection of movement of said respective limbs by said first and second trigger devices, whereby alternating movement of said limbs causes wearer initiated consecutive stimulation of either side of the patient's brain to create bi-lateral stimulation as a result of said alternating movement of said limbs of the person's body.

25 According to a further aspect of the present invention there is provided a method of brain therapy comprising stimulating respective sides of a person's brain in response to consecutive movement of the person's limbs on alternating sides of the person's body, thereby achieving bilateral stimulation of the person's brain.

30 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 view of a person wearing a bi-lateral stimulation apparatus according to an embodiment of the present invention fitted to the wrists and ankles of the wearer;

Figure 2 is a schematic view of a band of the apparatus of Figure 1;

Figure 3 is a schematic view of a person wearing a bi-lateral stimulation apparatus of Figure 1 fitted to the upper arms and thighs of a wearer;

5

Figure 4 is a schematic view of a person wearing a bi-lateral stimulation apparatus according to a further embodiment of the present invention;

Figure 5 is a schematic view of a person wearing a bi-lateral stimulation apparatus according to a further embodiment of the present invention; and

10

Figures 6 to 10 illustrate different stimulation devices for use with a bi-lateral stimulation apparatus according to an embodiment of the present invention.

15 In the embodiment shown in Figure 1, a bi-lateral stimulation apparatus in accordance with an embodiment of the present invention is built into bands 2 to be worn around the arms and legs of a person 1. As shown in Figure 2, each band 2 incorporates a housing 3 containing a power source 4, which may comprise one or more batteries, possibly including a kinetic charging device for collecting kinetic energy during walking and utilising such energy to

20 charge the batteries. A sensor 5 is located in the housing 3 of each band 2 for detecting movements specific to the limb to which the band 2 is attached. The sensor 5 may comprise a tilt switch or accelerometer or any other suitable motion sensing device.

Each band 2 is provided with a stimulation device 6 in the form of an oscillating device

25 and/or motor device having vibration generating means which is provided for applying tactile sensory stimulation to the body area where the band 2 is worn.

Each band 2 includes a microprocessor controller 7 located within the housing 3 thereof for activating the associated stimulation device 6 in response to signals received from the

30 sensor. The microprocessor controller 7 may be provided with a memory store for recording the operation of the apparatus. Data recorded may include the activation of the stimulation device 6 and also biometric information associated with the wearer during such activation of the stimulation device 6, such as the wearer's temperature and/or heart rate and/or blood pressure.

The wearer's temperature and/or heart rate and/or blood pressure may be recorded by appropriate sensors or sensing devices. Data to be recorded may comprise the number of steps taken, duration of therapy, duration of each stimulation action, intensity of each stimulation action, and wearer's temperature, blood pressure and/or pulse rate during such operation of the apparatus.

The controller 7 may be provided with a suitable connector or other data communication means to enable data from the memory store to be downloaded to a computer.

10

As shown in Figure 3, where a person has missing or damaged limbs, the bands 2 may be fitted on the upper parts of the wearer's arms and legs or other suitable parts of the body. The strap 8 of each band 2 may be adjustable in length to enable the bands 2 to be used in this way. The strap 8 of each band 2 may be elasticated to allow free movement of the limb to which each band 2 is attached and to ensure that the band 2 remains in place on the limb to which it is fitted.

The stimulation device or devices 6 associated with each band 2 may also be remote from the respective band 2, to enable the stimulation device to be attached to a limb or other part of the patient's body remote from the area upon which the band 2 is worn e.g. where said limb is missing or damaged or not capable of accepting tactile sensory stimulation at a specific point. This may enable the apparatus to be used during actions other than walking, for example by swinging or alternating motion of the wearer's arms or legs. This also allows the apparatus to be used by wearer's having disabilities, such as person's who have lost one or both legs, and thus may not be able to walk.

Figures 4 to 10 illustrate a selection of alternative stimulation devices 10,12,13,14,17 that may be associated with a given band 2. Such stimulation devices may communicate with the controller 7 of a respective band 2 via a wired or wireless connection, for example via Bluetooth. Such stimulation devices may be provided on respective supports, which may be adapted to be attached to the body at desired locations, for example by means of tape or suitable adhesive.

As shown in Figure 6, a first type of stimulation device 10 may comprises a single oscillator 11 mounted on a support tape, which may communicate with a respective band 2 via a wired connection or a wireless connection.

- 5 As shown in Figure 7, a further type of stimulation device 12 may include multiple oscillators 11, which may be controlled by a programmable controller or CPU to operate in a predetermined sequence or pattern in response to a control signal from the controller 7 of a respective band 2 in response to a signal from the sensor 5 thereof.
- 10 As shown in Figure 8, groups of oscillators 11 may be provided on separate supports, connected together by a wired (or wireless) connection to be activated by the controller 7 of a common band 2.

In addition to or as an alternative to a tactile sensor, auditory or visual stimulation devices
15 may be provided. In the version shown in Figure 9, the stimulation device 14, adapted to be mounted adjacent a respective one of the wearer's eyes, comprises a series of light emitting devices, such as LEDs, controlled via a programmable controller 15 programmed to provide visual stimulation to a respective eye of the wearer in response to a signal from the controller 7 of a respective band 2, preferably via a wireless connection.

20

Figure 10 illustrated an auditory stimulation device 17 adapted to be mounted adjacent a respective ear of the wearer and incorporating a noise or sound emitting device 18 and a controller 19, wherein the controller 19 is programmed to emit an audible stimulation to the adjacent ear of the wearer in response to a signal received from the controller 7 of a
25 respective band 2 of the apparatus, preferably via a wireless connection.

In an alternative embodiment (not shown) the tactile bi-lateral stimulation apparatus may be incorporated into a pair of socks. In such embodiments, when the apparatus is incorporated in a pair of socks, bi-lateral stimulation can be achieved during normal walking of the
30 wearer, each leg movement of the wearer triggering activation of a respective stimulation device on alternating sides of the body to sequentially stimulate each side of the brain one after the other.

The invention is not limited to the embodiment(s) described herein but can be amended or modified without departing from the scope of the present invention.

Claims

1. An apparatus for bi-lateral stimulation of the brain comprising first and second stimulation devices adapted to be worn on the body to stimulate respective sides thereof, and
5 first and second trigger devices adapted to be worn on respective limbs on either side of the wearer's body to detect movement thereof, where alternating movement of said limbs is detected by said first and said second trigger devices whereby the first and second stimulation devices are sequentially activated to sequentially stimulate the parts of the wearer's body to which they are attached , thereby generating bi-lateral stimulation of the
10 wearer's brain as a result of said alternating movement of said limbs of the wearer's body.
2. An apparatus as claimed in claim 1, wherein said first and second stimulation devices are adapted to achieve tactile stimulation of the wearer's body.
- 15 3. An apparatus as claimed in claim 2, wherein said first and second stimulation devices are applied to or attached to respective limbs on either side of the wearer's body.
4. An apparatus as claimed in any preceding claim, wherein said first and second trigger devices are adapted to be attached to or applied to respective limbs on opposite sides of the
20 wearer's body for detecting motion of such limbs.
5. An apparatus as claimed in claim 5, wherein said first stimulation device is activated when said first trigger device detects movement of the limb to which it is attached, said second stimulation device being activated when said second trigger device detects
25 movement of the limb to which it is attached.
6. An apparatus claimed in claim 5, wherein each of said first and second trigger devices comprise a tilt switch or motion sensor.
- 30 7. An apparatus as claimed in claim 6, wherein each of said first and second trigger devices comprise an accelerometer.

8. An apparatus as claimed in any of claims 5 to 7, wherein each of said first and second trigger devices is mounted on a strap or band to be worn on a respective limb of the wearer, for example on a leg or an arm of the wearer, for detecting movement of such limb.
- 5 9. An apparatus as claimed in any preceding claim, wherein each of said first and second stimulation devices comprise a vibration generating means or an oscillator adapted to apply tactile stimulation to the wearer's skin.
- 10 10. An apparatus as claimed in any preceding claim, wherein each of said first and second stimulation devices are mounted on a strap or band to enable the stimulation device to be attached to a limb of the wearer.
- 15 11. An apparatus as claimed in any preceding claim, wherein said first and second trigger devices communicate with said stimulation devices via wired or wireless communication means.
- 20 12. An apparatus as claimed in any preceding claim, wherein a microprocessor or other electronic control means is provided for activating said first and second stimulation devices in response to activation signals received from said first and second trigger devices.
13. An apparatus as claimed in claim 12, wherein said control means is provided with a power supply, such as one or more batteries/capacitors.
- 25 14. An apparatus as claimed in claim 12 or claim 13, wherein said control means includes a memory device for recording the operation of said first and second stimulation devices and/or said first and second trigger devices.
- 30 15. An apparatus as claimed in claim 14, wherein said memory device is adapted to store biometric information from other sensing devices associated with the wearer, such as the temperature of the wearer and/or the wearer's heart rate and/or the wearer's blood pressure and/or the wearer's heart rate variability and/or the wearer's blood oxygen levels and/or a pedometer.

16. A method of brain therapy comprising applying first and second trigger devices to respective limbs on either side of a person's body, applying first and second stimulation devices to the person's body for providing sensory stimulation of respective sides of the person's brain, and operating said first and second stimulation devices to stimulate
5 respective sides of the person's brain in response to detection of movement of said respective limbs by said first and second trigger devices, whereby alternating movement of said limbs causes wearer initiated consecutive stimulation of either side of the person's brain to create bi-lateral stimulation as a result of said alternating movement of said limbs of the person's body.

10

17. A method of brain therapy comprising stimulating respective sides of a person's brain in response to consecutive movement of the person's limbs on alternating sides of the person's body, thereby achieving bilateral stimulation of the person's brain.

15 18. A method as claimed in claim 17, wherein said stimulation of respective sides of the person's brain is achieved by sensory stimulation of the person on respective sides of the person's body, preferably tactile stimulation and/or visual stimulation and/or audio stimulation.

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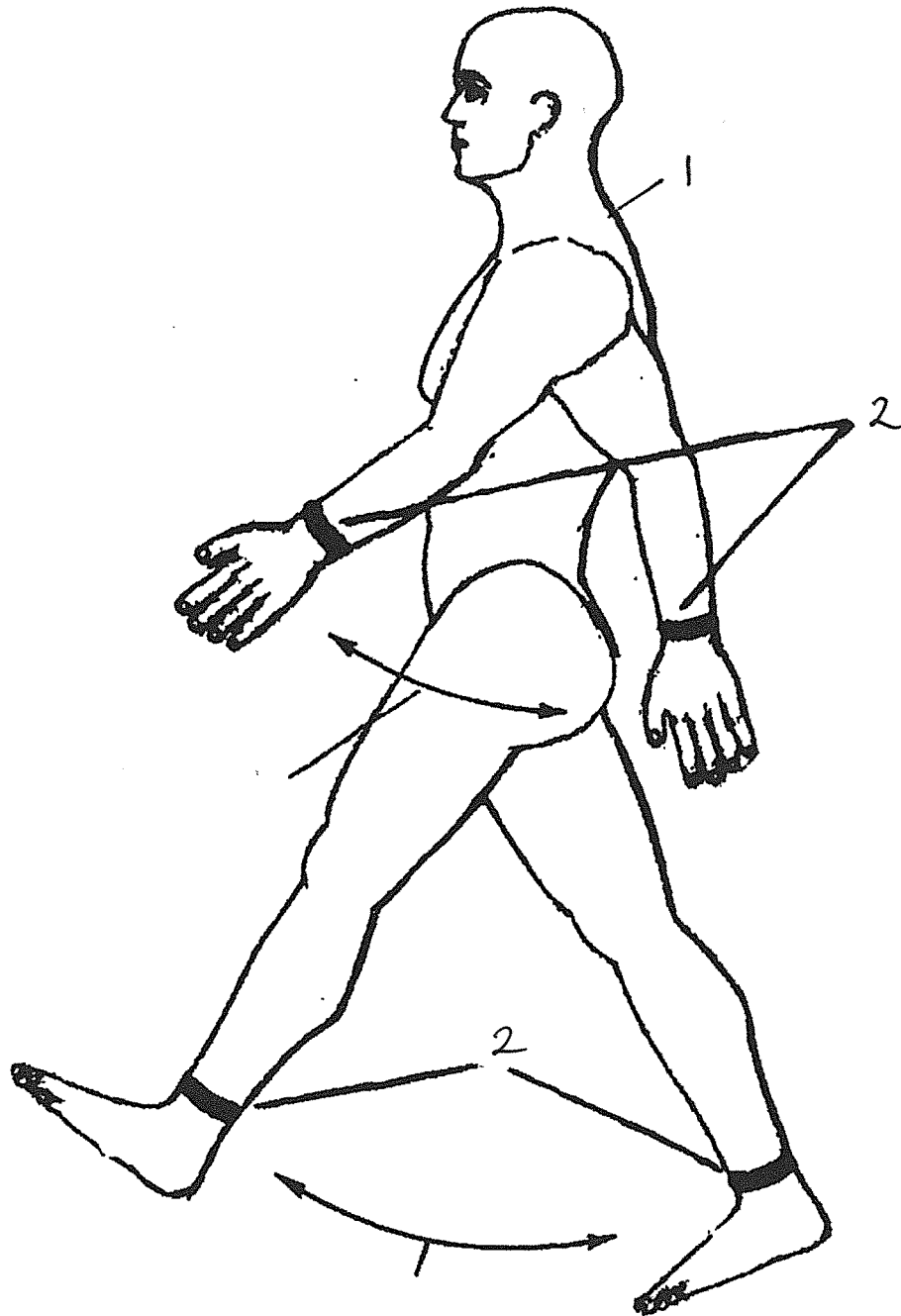


Figure 1

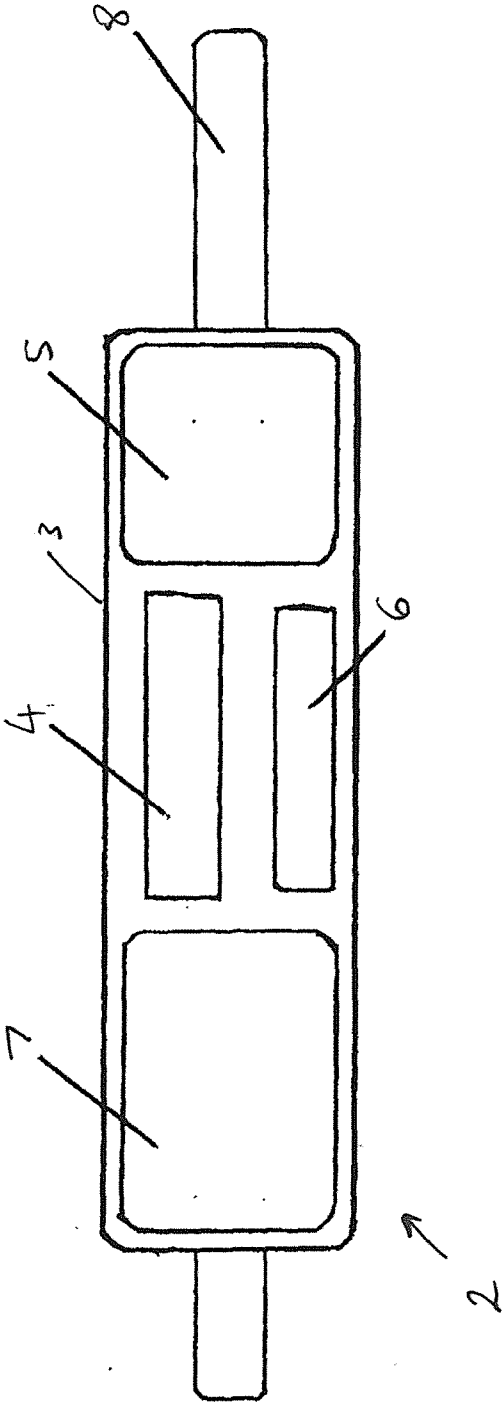


Figure 2

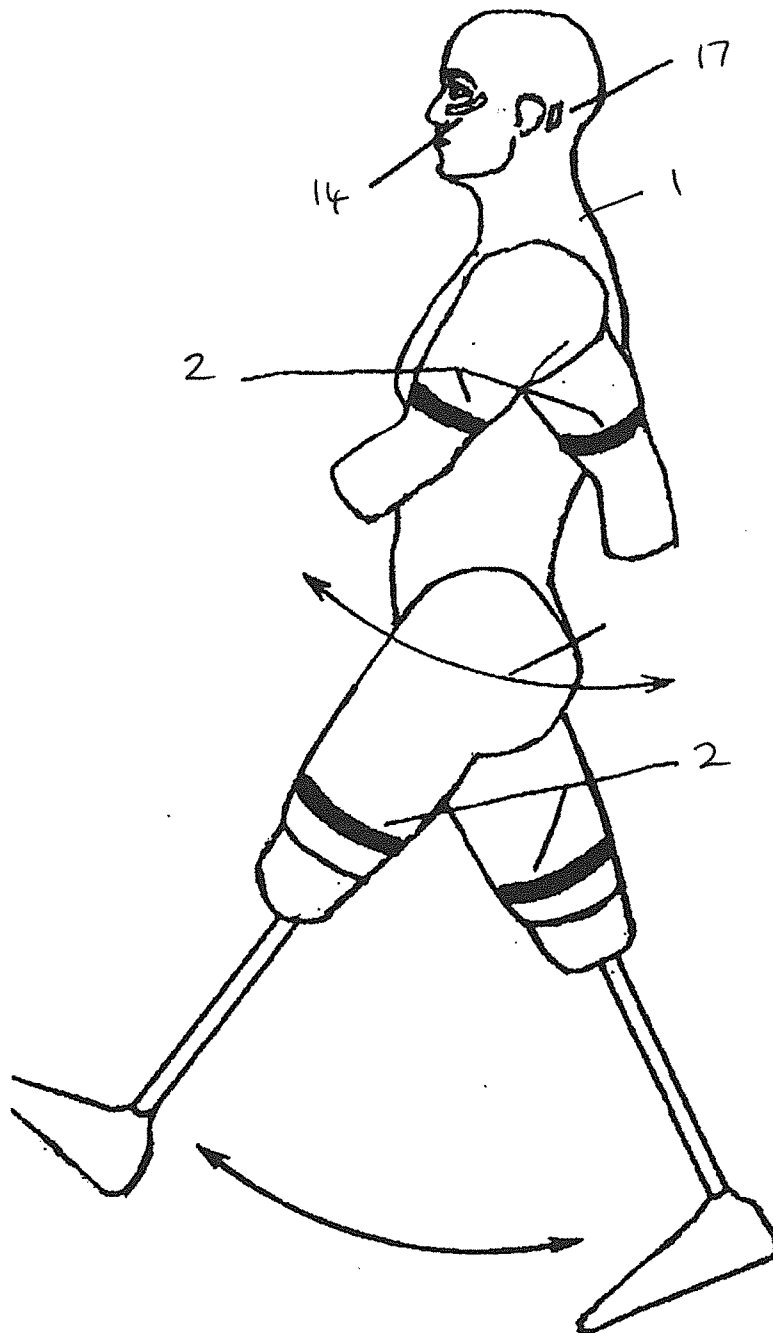


Figure 3

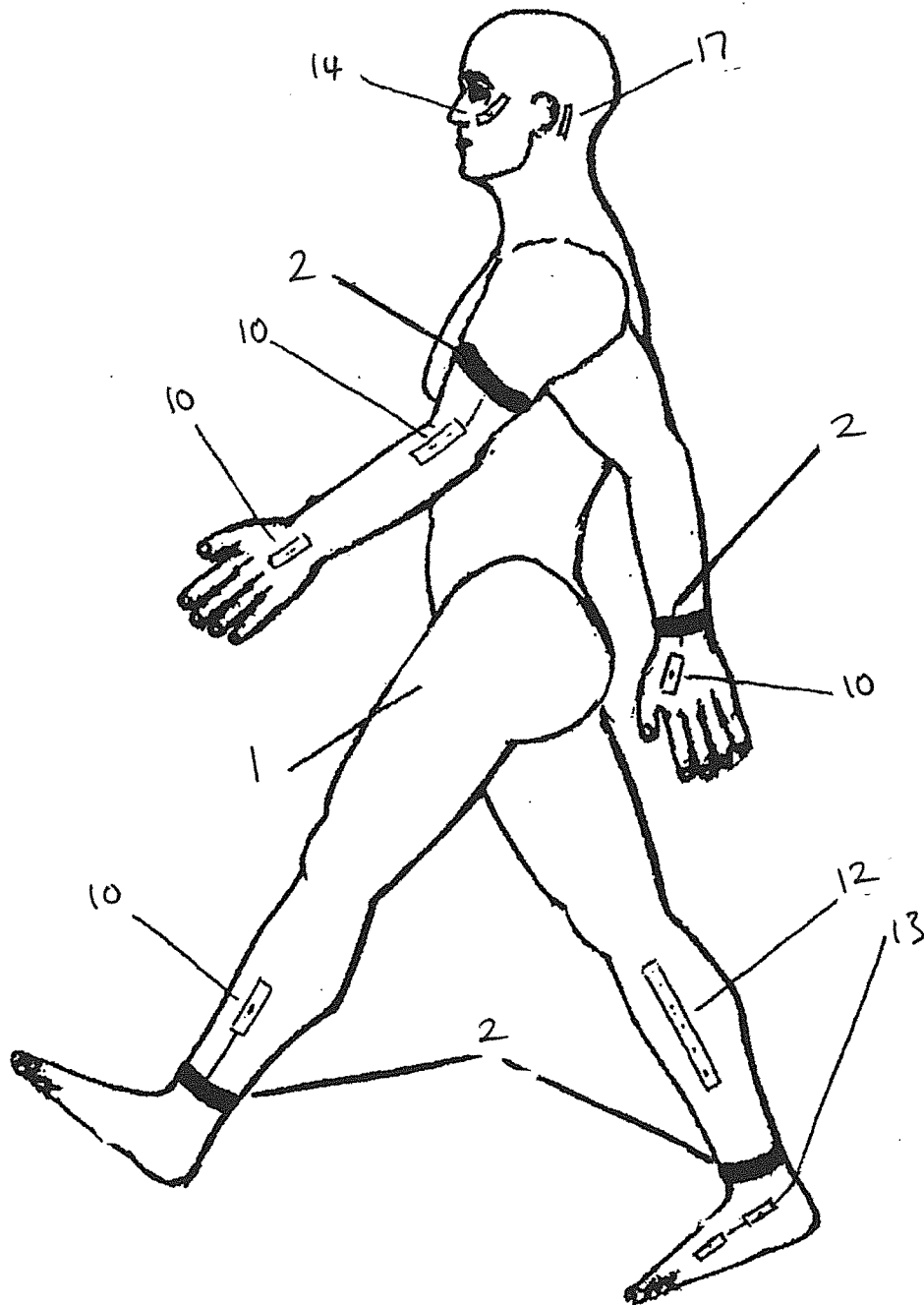


Figure 4

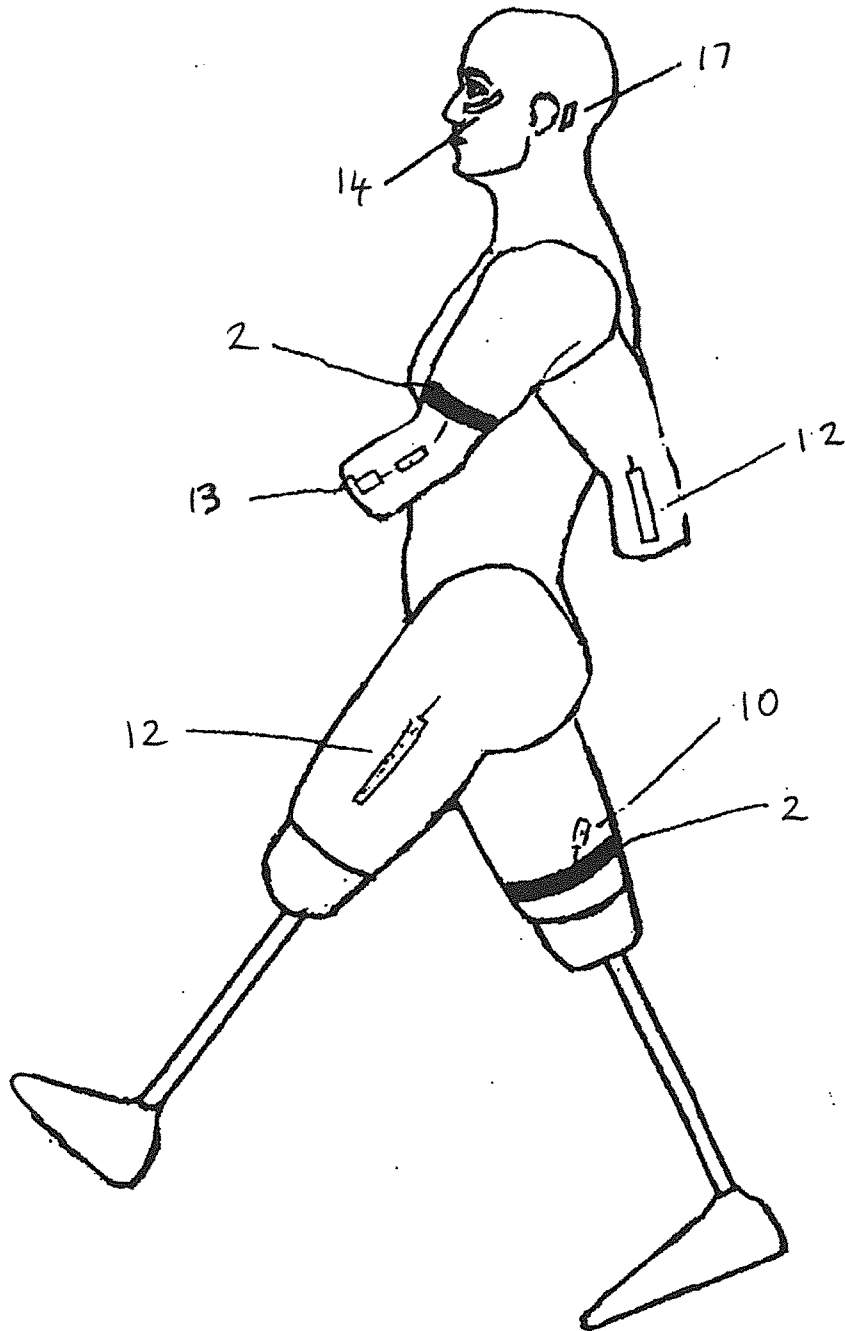
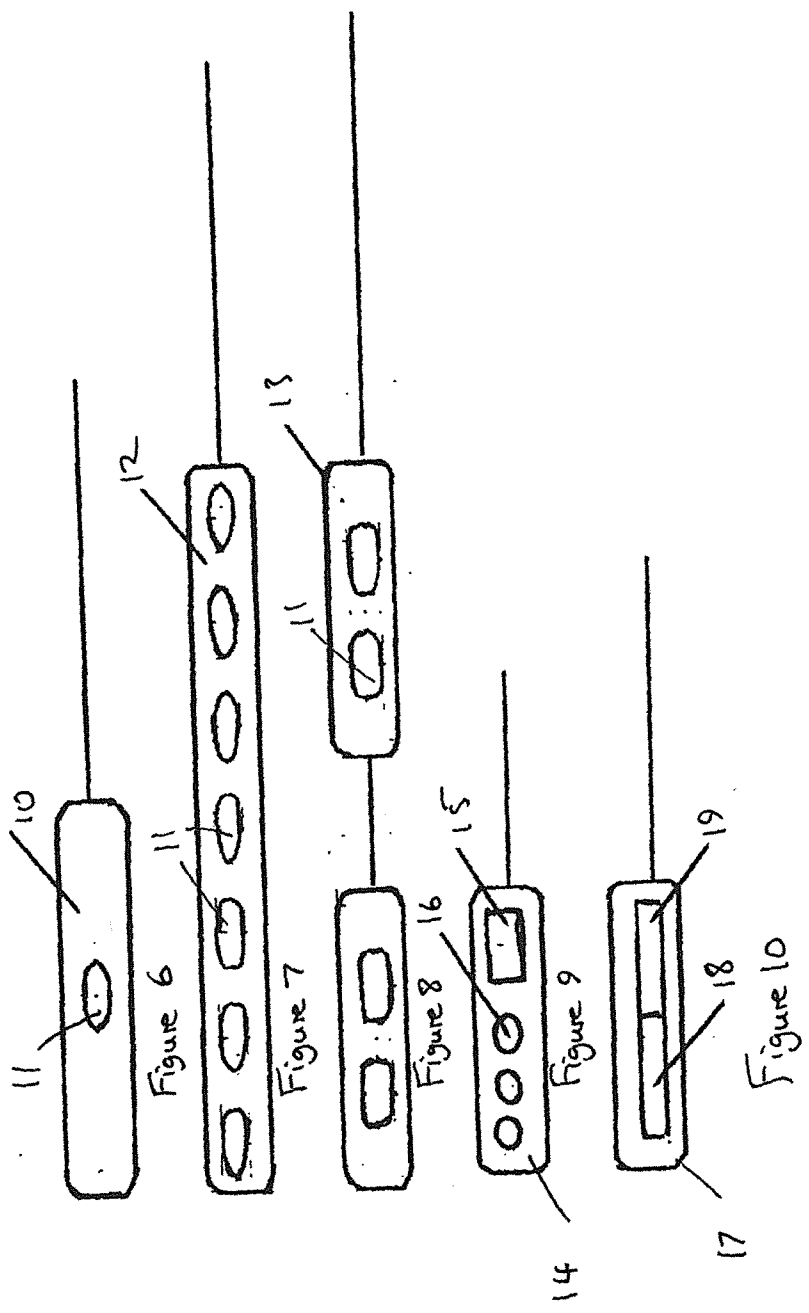


Figure 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2014/054169

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.: 16-18
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy
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:

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 fees, this Authority did not invite payment of 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.:

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/EP2014/054169

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61N1/36 A61B5/11
ADD.

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)

A61N A61B

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	paragraphs [0010] - [0013], [0016], [0017], [0062] - [0069], [0072], [0078], [0080]; claim 29; figures 16,18	8,10, 13-15
Y	US 2012/016431 A1 (PAUL ZACHARY D [US] ET AL) 19 January 2012 (2012-01-19)	8,10, 13-15
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	the whole document	
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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 another citation or other special reason (as specified)

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"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

20 May 2014

Date of mailing of the international search report

28/05/2014

Name and mailing address of the ISA/

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Authorized officer

Schöffmann

INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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