



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
10.12.2014 Bulletin 2014/50

(51) Int Cl.:
A61H 7/00 (2006.01) A61H 15/00 (2006.01)

(21) Application number: **13170220.1**

(22) Date of filing: **03.06.2013**

(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

(72) Inventor: **Apolet, Josek Berek**
20146 Milano (IT)

(74) Representative: **Zaccaro, Elisabetta et al**
Notarbartolo & Gervasi S.p.A.
Corso di Porta Vittoria, 9
20122 Milano (IT)

(71) Applicant: **Apolet, Josek Berek**
20146 Milano (IT)

(54) **Sensory stimulation system for a patient with brain damage**

(57) The invention relates to a system for the release of sensory stimulations on the fingers and/or on the palm of one hand, adapted to rehabilitation in patients who

have sustained brain damage. A kit for neurological rehabilitation by means of the sensory stimulation of the fingers and/or the palm of one hand is also described.

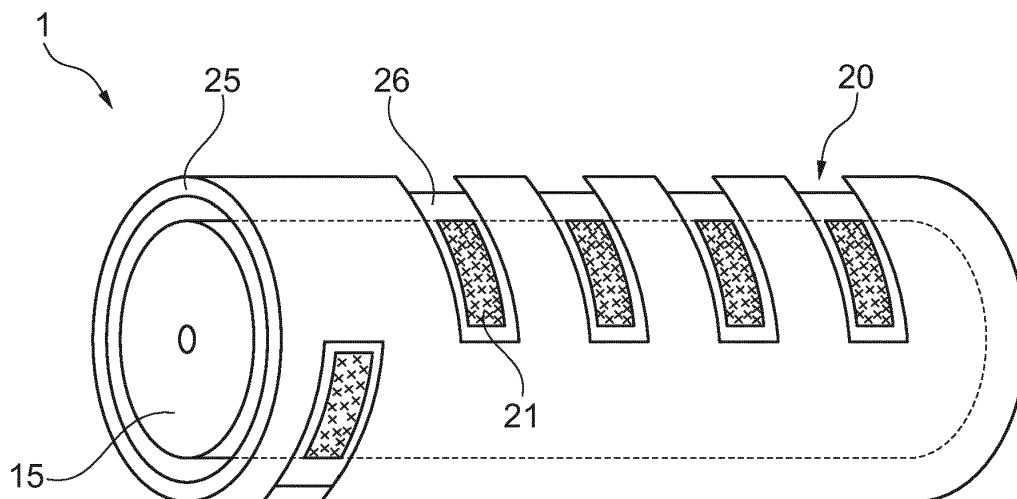


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The invention relates to a system for the release of sensory stimulations on the fingers and/or on the palm of one hand, adapted to rehabilitation in patients who have sustained brain damage. A kit for neurological rehabilitation by means of the sensory stimulation of the fingers and/or the palm of one hand is also described.

PRIOR ART

[0002] The brain is the most complex organ of the human body. It produces all of our thoughts, actions, memories and feelings. This gelatinous mass of tissue contains approximately 100 billion nerve cells, or neurones.

[0003] These cells have a complex systems of connections with one another. Every neurone has the capability of coming into contact with thousands or even tens of thousands of other neurones via small structures called synapses.

[0004] Signals are formed from electrochemical impulses within single neurones. This electrical activity can be detected using a variety of methods. One of the commonest methods in clinical practice is electroencephalography (EEG).

[0005] Brain damage or brain trauma consists of neuronal destruction or degeneration. Brain damage can occur because of various conditions, diseases or traumas. Possible causes of diffuse brain damage comprise haemorrhages, tumours, trauma, prolonged hypoxia, poisoning, infections, and degenerative neurological disorders.

[0006] Sometimes the damage to areas of the brain are associated with disturbances or lesions which co-involve locomotion, those that are particularly disabling being the lesions that induce partial or total paralysis and sensory disorders of the limbs and of the hand.

[0007] Methods of deep cerebral stimulation are known in patients with neurodegenerative diseases, patients suffering from dementia or disorders of locomotion, or to reduce the damage to the brain, for example following stroke. Cerebral stimulation is also used to facilitate or induce an improvement in patients with disturbances of consciousness.

[0008] Deep cerebral stimulation is performed by implanting small electrodes in specific regions of the central nervous system, acting on different areas relative to the pathologies to be treated. The electrodes transmit the stimuli released by small devices called stimulators within the areas of the brain that are of interest, causing an electrical current to flow.

[0009] This method has the disadvantage of being highly invasive and necessitating delicate surgical interventions.

[0010] Non-invasive methods of cerebral simulation are also known. Such methods allow activation of circuits in the brain at the surface of the cortex. Notwithstanding

that these methods do not necessitate invasive brain surgery, they have many side effects, including the possibility of transient memory loss; in any case there is the impossibility of reaching the deeper structures of the brain. Moreover, the effects generated by the magnetic field are very difficult to control. The aim of the present invention is therefore to provide a natural and non-invasive system to accelerate and facilitate the recovery of locomotive functionality and inter-neuronal communication in patients who have sustained damage to the brain, which does not have the above-mentioned? Disadvantages of the known methods for the same application.

SUMMARY OF THE INVENTION

[0011] The invention relates to a system [for] the release of sensory stimulations of at least the fingers of at least one hand 100a, 100b comprising:

- an internal member 15, preferably of a cylindrical or prismatic shape,
- sensory stimulation means 20 fixed onto said internal member 15 and having at least one stimulating zone 21,
- an external member 25 of tubular shape containing said internal member 15 and said sensory stimulation means 20,
- a motor (not shown in the drawing) connected to said internal member 15 and adapted to cause said sensory stimulation means 20 to rotate;

wherein said external member 25 has at least one aperture 26 on its cylindrical external surface adapted to expose at least part of said stimulating zone 21 in such a way that at least one finger 101a, 101b of the hand 100a, 100b can gradually come into contact with said stimulating zone 21 when said motor is in rotation.

[0012] From another point of view, the invention relates to a neurological rehabilitation kit, comprising the system according to the present invention and instructions for the use thereof.

LIST OF FIGURES

[0013] The technical features of the present invention, as well as its advantages, will become clear from the following description, which is provided purely by way of non-limiting example and is to be considered together with the attached drawings, wherein:

Fig. 1 is a prospective view of a sensory stimulation system according to the present invention.

Fig. 2 is a prospective view of a sensory stimulation system according to the present invention, adapted to induce a sensory stimulation [of] at least part of the right hand of an individual.

Fig. 3 is a prospective view of a sensory stimulation system according to the present invention, adapted

to produce a sensory stimulation of at least part of the left hand of an individual;

Fig. 4 is a prospective view of a second embodiment of a sensory stimulation system according to the present invention.

Fig. 5 is a prospective view of a third embodiment of a sensory stimulation system according to the present invention, for simultaneous stimulation of both hands.

Fig. 6 is a prospective view of a fourth embodiment of a sensory stimulation system according to the present invention.

Fig. 7 is a side sectional view of the system in Fig. 6.

DETAILED DESCRIPTION OF THE INVENTION

[0014] The present description is to be considered only as exemplifying and non-limiting in scope; the embodiments described can therefore be implemented in accordance with a variety of modalities, dimensions and shapes.

[0015] The invention therefore relates to a system for the release of sensory stimulations of at least the fingers of at least one hand, comprising:

- an internal member 15, preferably of a cylindrical or prismatic shape,
- sensory stimulation means 20 fixed onto said internal member 15 and having at least one stimulating zone 21,
- an external member 25 of tubular shape containing said internal member 15 and said sensory stimulation means 20,
- a motor (not shown in the drawing) connected to said internal member 15 and adapted to cause said sensory stimulation means 20 to rotate;

wherein said external member 25 has at least one aperture 26 on its cylindrical external surface adapted to expose at least part of said stimulating zone 21 in such a way that at least one finger of the hand can gradually come into contact with said stimulating zone 21 when said motor is in rotation.

[0016] In the present invention, use of the definition:

"sensory stimulation" is meant to comprise stimulating or subjecting to sensory stimulation, by means of stimulating the fingers and palm of the hand to activate different classes of sensory receptors.

[0017] The hand represents the most distal portion of the upper limb. Distinguished in said distal portion are the wrist, which mediates the continuity of the hand with the forearm, the metacarpus, which constitutes the broadest portion thereof, and the fingers, flexion and opposition of which on the metacarpus confers upon the hand the prehensile skill typical of primates, including hominids. The hand consists of five digits, commonly

called the:

- thumb (Latin: pollex),
- index finger,
- middle finger, or long finger, positioned centrally between the other fingers,
- ring finger, and
- little finger, the smallest finger, called in Latin digitus minimus.

[0018] The sense of touch is intimately associated with the hands, which are the principal means for manipulating and discovering the environment, by means of both "gross movements" (for example, taking hold of an object of large dimensions), and by "finer" movements. The tips of the fingers contain some of the most densely packed areas of nerve endings in the body, which are responsible for the tactile response.

[0019] Touch can be defined as the complex of sensations caused by direct contact between the surface of the body and external objects, or between two or more parts of the body itself.

[0020] In a preferred form, the motor of the system according to the present invention is an electric or hydraulic motor. The electric motor can be governed by a direct current, preferably of up to 24V and generated by a transformer connected to an optical isolator to avoid diffusions of current to the subject.

[0021] With reference to Figs. 6 and 7, a further embodiment of a system according to the present invention can be noted. The internal member 15 is generally in the form of a cam, fitted with two lobes 15a and 15b. According to this configuration, the hand portion is stimulated in accordance with various modalities during rotation of the member 15. During a first period of rotation of the member 15, corresponding to contact of the hand with the first lobe 15a, the hand portion is subjected to a substantially axial stimulus, in the direction of development of the first lobe 15a itself. During a second period of rotation of the member 15, corresponding to contact of the hand with the second lobe 15b, the hand is subjected to a stimulus substantially determined by brushing of the surface of the second lobe 15b with the hand portion. For this purpose, the second lobe 15b has a stimulating surface 21 of the type just described. Analogously, the first lobe 15a also may have a stimulating surface through combining different types of stimulus in single contact.

[0022] It should be stated that the shape of the member 15 of the embodiment in Figs. 6 and 7 is non-limiting.

[0023] The sensory stimulation in this embodiment has an on/off modality.

[0024] Advantageously, the system according to the present invention is also capable of producing sensory stimulation of the palm of at least one hand, wherein said external element has an aperture on its cylindrical surface adapted to expose at least part of a stimulating zone of said sensory stimulation means in such a way that a palm of the hand can gradually come into contact with

said stimulating zone when said motor is in rotation. It should be stated that the shape of the member 15 in Figs. 2 and 3 is non-limiting, indeed the opening 27 on the cylindrical surface adapted to expose at least part of a stimulating zone may have a plurality of sizes and shapes so as to enable stimulation of a part or of the whole of the palm of the hand.

[0025] Like the fingers, the palm of the hand too is enriched with nerve endings and with connections which allow sensitivity of the skin in response to contact and pressure. All the sensory stimuli are conducted from the fibres of the peripheral nervous system to the spinal medulla, and from there to specific structures of the brain. Two fundamental sensory stimuli-elaborating regions are the ventrobasal thalamus and the somatosensory cerebral cortex. The signals arrive at the thalamus from the spinal medulla and from the thalamus are then released to the cerebral cortex. A continuous conversation exists between these two zones, consisting of a flow of signals from the thalamus to the cortex and from the cortex to the thalamus. Within this "conversation" an image is constructed which then, with the aid of other regions of the brain, becomes our sensation.

[0026] In an embodiment of the system according to the invention, said sensory stimulation means 20 have at least four stimulating zones, and said external member has at least four openings 26 adapted to expose respectively at least part of said at least four stimulating zones 21 in such a way that four fingers of the hand can gradually come into contact with said stimulating zones when said motor is in rotation.

[0027] In a preferred embodiment, within the system according to the invention said sensory stimulation means 20 have at least five stimulating zones, and said external member has at least five openings 26 adapted to expose respectively at least part of said at least five stimulating zones 21 in such a way that five fingers of the hand can gradually come into contact with said stimulating zones when said motor is in rotation.

[0028] Advantageously, within the system according to the invention one of or each of said openings 26 on the cylindrical surface of said external member 25 has an elongate shape corresponding to a finger of the hand or portion of a finger of the hand, and wherein said external member is adapted to be used by one hand 100a, 100b or positioned in the hollow and below the fingers 101a, 101b of one hand, in patients in whom voluntary movements are not possible owing to motor and sensory problems.

[0029] Naturally, the sensory stimulation must extensively co-involve the damaged part in that on the one hand the signal detection activity by the thalamus and the cortex occurs with meticulous segregation of the stimuli so that each is referenced with the maximum detail to the zone of the hand or finger affected by the actual stimulus, and on the other this detailed sensation is correlated in functional concert to which all the adjacent and less adjacent areas of the hand are able to co-operate cor-

rectly both in the perception and in the construction of the potential movement (on the part of the areas of the brain which control movements and which are strictly connected to the sensory areas described).

[0030] The system according to the invention preferably comprises means 20 adapted to release a sensory stimulation simultaneously or separately on the fingers 101a of a right hand 100a and the fingers 101b of a left hand 100b.

[0031] Moreover, it is also important to take into consideration that between the cerebral cortexes (both the sensory and the motor cortexes) which represent the hand 100a, 100b, there are many connections linking the two parts functionally, and that they assist one another in the complex elaboration of stimuli or of movements.

[0032] In one embodiment within the system according to the invention, said sensory stimulation means consist of a plurality of radially arranged rod-shaped members 22 and a corresponding plurality of stimulating devices 22a, wherein one of said stimulating devices 22a is positioned at one end of each of said rod-shaped members 22, which sensory stimulation stimulating devices 22a constitute stimulating zones 21 emerging from the openings 26.

[0033] The stimulating devices may be of various types, and are selected on the basis of the type of treatment selected for the patient.

[0034] The choice of stimulating device to be used for a particular patient depends not only on the severity of the brain damage: it is also very dependent on the frequencies that will be used for the stimuli. The stimuli may be generic in patients with more severe damage, whereas the sensory stimulation programme is richer in less severely affected patients.

[0035] In a preferred embodiment, within the system according to the invention said sensory stimulation means 20 consist of a plurality of stimulating devices 21, wherein each of said stimulating devices is positioned directly on said element within a stimulating zone.

[0036] Within the system according to the invention said stimulating devices 21 are preferably wrinkled and/or smooth and/or hairy.

[0037] The stimulating devices may be covered with various types of fibres, with various structural characteristics which allow a sensory stimulation to be released in a different way on to the skin of the hand.

[0038] The fibres may be of various origin and can be grouped into:

- natural fibres (vegetable and animal)
- man-made artificial and synthetic fibres.

[0039] The natural fibres are treated as materials existing in nature and utilised with the use of mechanical washing, without ever modifying their structure.

[0040] The artificial fibres (for example acetate and viscose (Rayon) are obtained on the basis of natural products such as cellulose and proteins, while synthetic fibres

(for example acrylic, elastane, polyester, Alcantara and Lurex) are obtained from synthesised chemical compounds derived from petroleum and reduced into filaments of varying lengths.

[0041] Some examples of animal fibres are: Alpaca, angora, camel hair, cashmere, wool, lambs wool, mohair and silk. Examples of vegetable fibres are: Cotton, hemp, jute, flax and ramie.

[0042] Within the system according to the invention, said stimulating devices 21 have surfaces of various materials, in particular of various metals.

[0043] As an alternative to fibres, the stimulating members or devices 21 may be covered with a metal or with wood. The different metals stimulate the skin in different ways depending on their structure and temperature. The apparent temperature of an object depends on the thermal conductivity of the material from which it is made. Identification of the temperature is performed by action of the thermoreceptors of the skin, not of the touch receptors.

[0044] In one embodiment, within the system according to the invention said stimulating devices 21 are heated and/or cooled (in particular electrically).

[0045] Within the system according to the invention, said stimulating devices 21 are arranged in such a way that a finger comes into contact with more than one thereof.

[0046] Within the system according to the invention, said stimulating devices 21 are preferably arranged in such a way that a finger comes into contact with one thereof at a time.

[0047] This strategy is elaborated to attempt to utilise the peripheral receptors homogeneously and to avoid inducing disequilibria in the space and time dimension assumed by the stimuli at the level of the cerebral elaboration circuits. In a preferred form of the system according to the invention, said stimulating devices 21 are arranged in such a way that there is a pause between two successive stimuli.

[0048] In a preferred form of the system according to the invention, at least one of said stimulating devices 21 is shaped, dimensioned and arranged in such a way as to come into contact with a finger by gradually moving along the finger 101a, 101b and potentially along the palm 102a, 102b.

[0049] Within the system according to the invention said stimulation devices 21 are arranged in such a way that a plurality of fingers 101a, 101b are simultaneously subjected to a sensory stimulation of the same kind.

[0050] The homogenous and consensual stimulation of the fingers 101a, 101b and of the palm is capable of producing activation of the thalamus and cortex that is highly coherent in time and space, to reconstruct a "sensory image" or "sensorimotor image" that is as accurate as possible. A different strategy with non-homogeneous stimuli would not allow gradual reconstruction of the possibility of reconstruction [sic] of the sensory image arriving from the periphery (from the body). This possibility

appreciably improves the possibility of success of the early rehabilitative intervention that is possible with the system [sic].

[0051] In one embodiment, the system according to the invention comprises means of controlling said motor that are capable of changing the speed of rotation of said motor with irregular or random timings.

[0052] The adaptability of the features such as those indicated has the advantage of eliminating the risk of signal saturation (with a loss of efficacy) at the sensory receptors by maintaining as far as possible an elevated responsiveness, and thus the quality of the sensory signals released towards the brain. This enables a more rapid and effective therapeutic rehabilitation strategy.

[0053] In a preferred embodiment, the system according to the invention comprises means of controlling said motor, which means are adapted to reverse the direction of rotation of said motor, preferably with irregular or random timings.

[0054] In a further embodiment, the system according to the invention advantageously comprises means of keeping one hand (in particular via the wrist) or two hands in a predetermined position at least when said motor is in rotation.

[0055] From another point of view, the invention relates to a neurological rehabilitation kit, comprising the system according to the present invention and instructions for the use thereof.

[0056] Said neurological rehabilitation kit according to the invention preferably has stimulation means and optionally also an interchangeable internal member.

[0057] Said internal members and said stimulation means may be interchangeable because of wear or for reasons linked to the fact that they are selected on the basis of the severity and the condition of the patient.

[0058] The neurological rehabilitation kit according to the invention may, in another embodiment, be combined with or comprise a datalogger. The datalogger is an automatic data acquisition device consisting of one or more electronic probes connected to an electronic elaboration unit which stores the measurements of one or more parameters made at appropriately established time intervals. The datalogger enables the changing condition of the patient to be stored in the form of a diary, as well as allowing storage of the rehabilitation protocol. In particular, the datalogger could be integrated in the internal member; in this way, for example, each patient could have one or more rehabilitation accessories of his or her own with the respective treatment data.

[0059] From the detailed description given above, the advantages obtained by means of the system of the present invention are obvious. In particular, this system has proved to be surprisingly and advantageously suitable for the rehabilitation of patients who have sustained brain damage. At the same time, since it is extremely easy to use, this system can also be conveniently employed outside the hospital environment.

Claims

1. System (1) for the release of sensory stimulations of at least the fingers of at least one hand (100a, 100b), comprising:
 - an internal member (15),
 - sensory stimulation means (20) fixed onto said internal member and having at least one stimulating zone (21),
 - an external member (25) of tubular shape containing said internal member and said sensory stimulation means,
 - a motor connected to said internal member and adapted to cause said sensory stimulation means to rotate;

wherein said external member (25) has at least one opening (26) on its external surface adapted to expose at least part of said stimulating zone (21) in such a way that at least one finger (101a, 101b) of the hand (100a, 100b) can gradually come into contact with said stimulating zone (21) when said motor is in rotation.
2. System according to claim 1, adapted to also release a sensory stimulation to the palm of at least one hand, wherein said external member has an opening (27) on its cylindrical surface adapted to expose at least part of a stimulating zone (21) of said sensory stimulation means (20) in such a way that a palm of the hand (102a, 102b) can gradually come into contact with said stimulating zone (21) when said motor is in rotation.
3. System according to claim 1 or 2, wherein said sensory stimulation means (20) have at least four stimulating zones (21), wherein said external member (25) has at least four openings (26) adapted to respectively expose at least part of said at least four stimulating zones in such a way that four fingers of the hand can gradually come into contact with said stimulating zones (21) when said motor is in rotation.
4. System according to claim 3, wherein said sensory stimulation means (20) have at least five stimulating zones (21), wherein said external member (25) has at least five openings (26) adapted to respectively expose at least part of said at least five stimulating zones (21) in such a way that five fingers (101a, 101b) of the hand (100a, 100b) can gradually come into contact with said stimulating zones (21) when said motor is in rotation.
5. System according to one or more of the preceding claims, wherein one or each of said openings (26) on the cylindrical surface of said external member has an elongated shape corresponding to a finger of the hand (101a, 101b) or portion of a finger of the hand, and wherein said external member (25) is adapted to be grasped by one hand (100a, 100b).
6. System according to any one of the preceding claims 1 to 5, comprising means adapted to sensory stimulation of the fingers of a right hand (100a) and the fingers of a left hand (100b), contemporaneously or separately.
7. System according to any one of claims 1 to 6, wherein said sensory stimulation means (20) consist of a plurality of radially arranged rod-like members (22) and a corresponding plurality of stimulating devices (22a), and wherein one of said stimulating devices (22a) is positioned at one end of each of said rod-like members (22) in a stimulating zone (21).
8. System according to any one of claims 1 to 7, wherein said sensory stimulation means (20) consist of a plurality of stimulating devices (22a), and wherein each of said stimulating devices (22a) is positioned directly on said member (15) in a stimulating zone (21), and wherein said devices (22a) have surfaces of various materials.
9. System according to any one of the preceding claims 7 to 8, wherein said stimulating devices (22a) are heated and/or cooled (electrically in particular).
10. System according to any one of the preceding claims 7 to 9, wherein said stimulating devices (22a) are arranged in such a way that a finger (101a, 101b) comes into contact with more than one thereof.
11. System according to claim 10, wherein said stimulating devices (22a) are arranged in such a way that a finger (101a, 101b) comes into contact with one thereof at a time and in such a way that there is a pause between two successive stimulations.
12. System according to any one of the preceding claims 7 to 11, wherein at least one of said stimulating devices (22a) is shaped, dimensioned and arranged in such a way as to come into contact with a finger (101a, 101b) by gradually moving along the finger.
13. System according to any one of the preceding claims 7 to 11, wherein said stimulating devices (22a) are arranged in such a way that a plurality of fingers (101a, 101b) are simultaneously subjected to a sensory stimulation of the same kind.
14. System according to any one of claims 1 to 13, comprising control means of said motor adapted to change the speed of rotation or to reverse the direc-

tion of rotation of said motor with irregular or random timings.

15. Neurological rehabilitation kit, comprising the system according to any one of claims 1 to 14 and instructions for the use thereof. 5

10

15

20

25

30

35

40

45

50

55

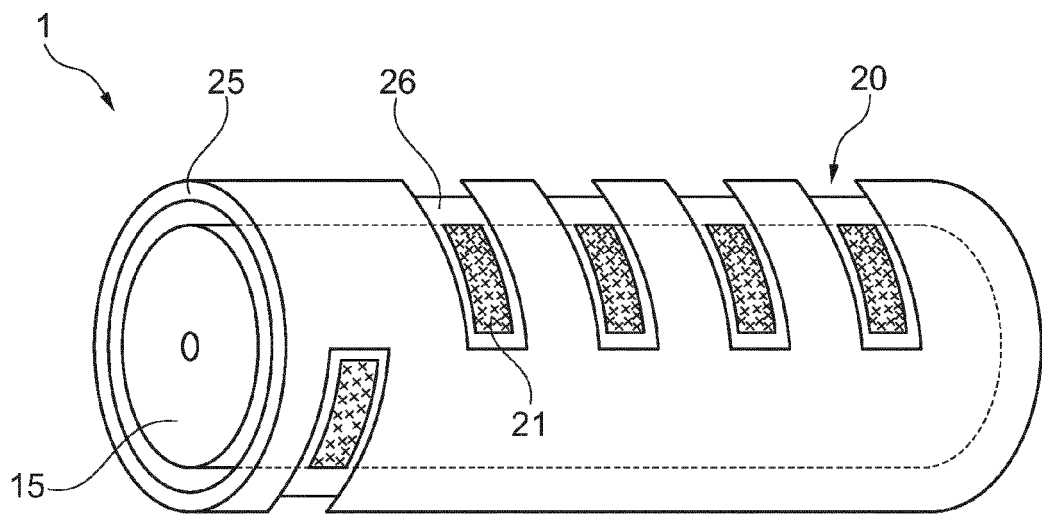


Fig. 1

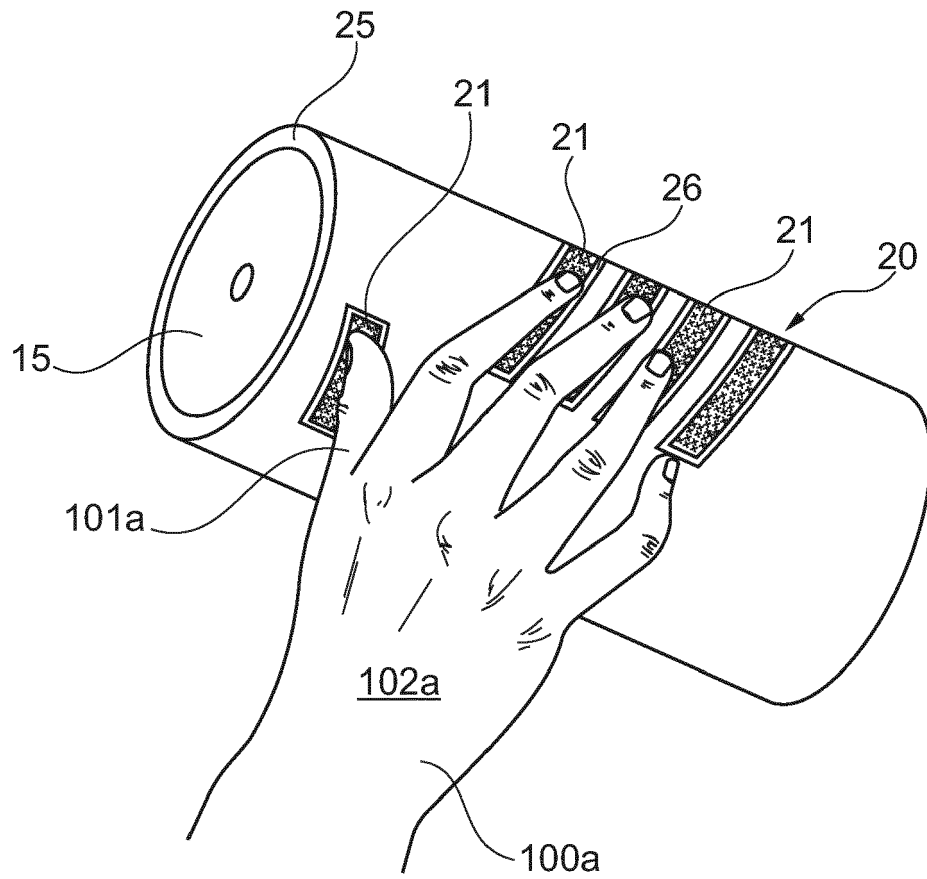


Fig. 2

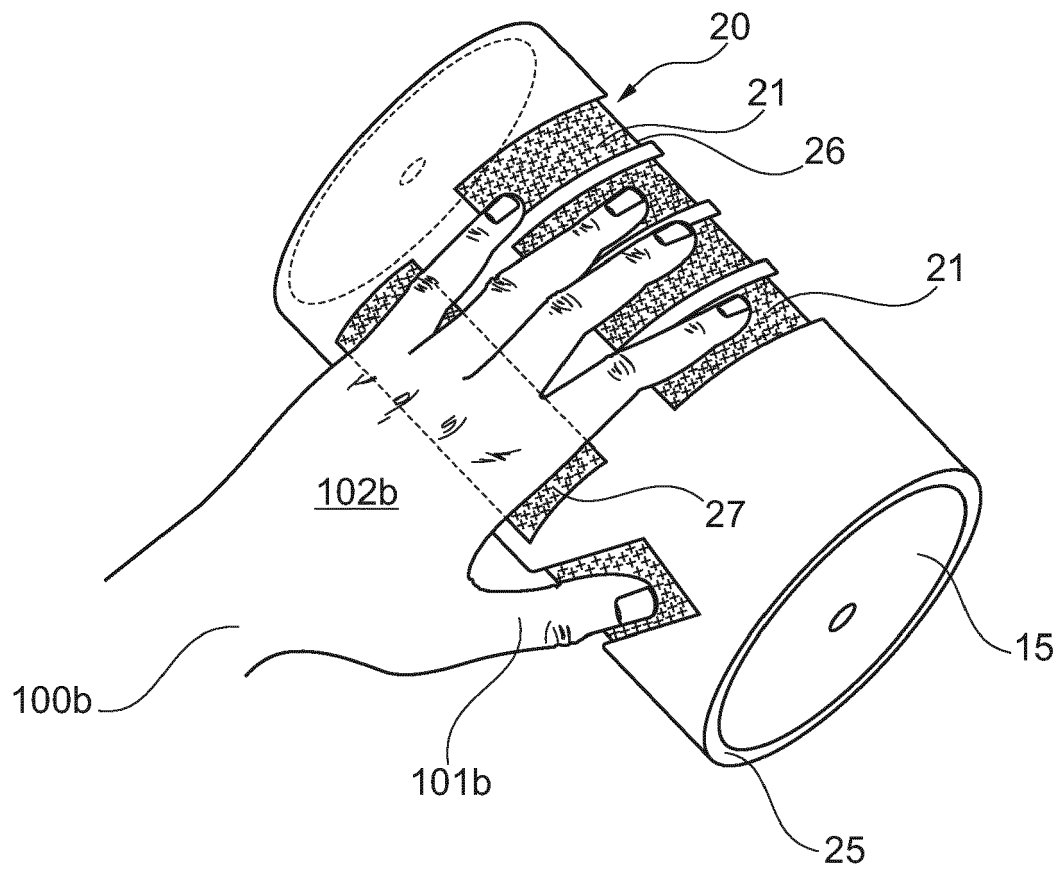


Fig. 3

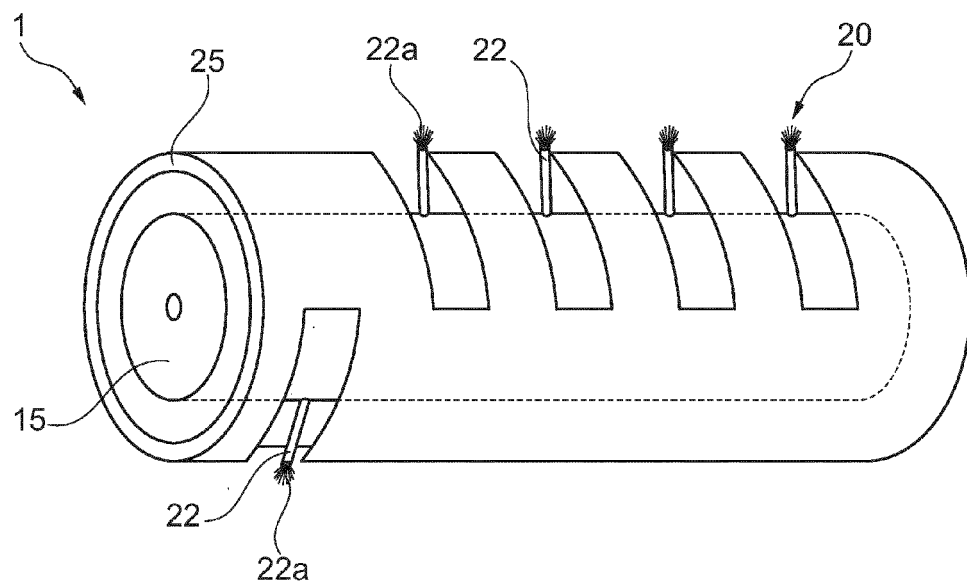


Fig. 4

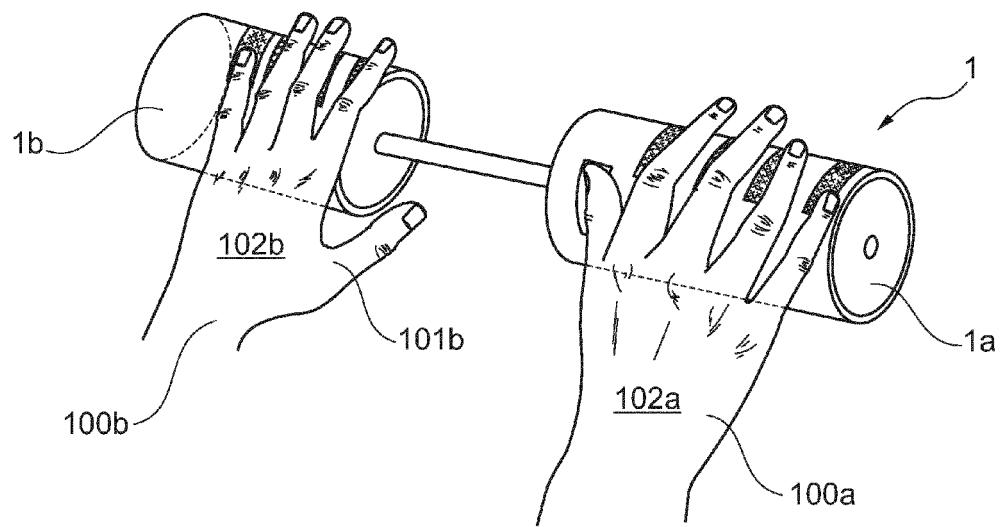


Fig. 5

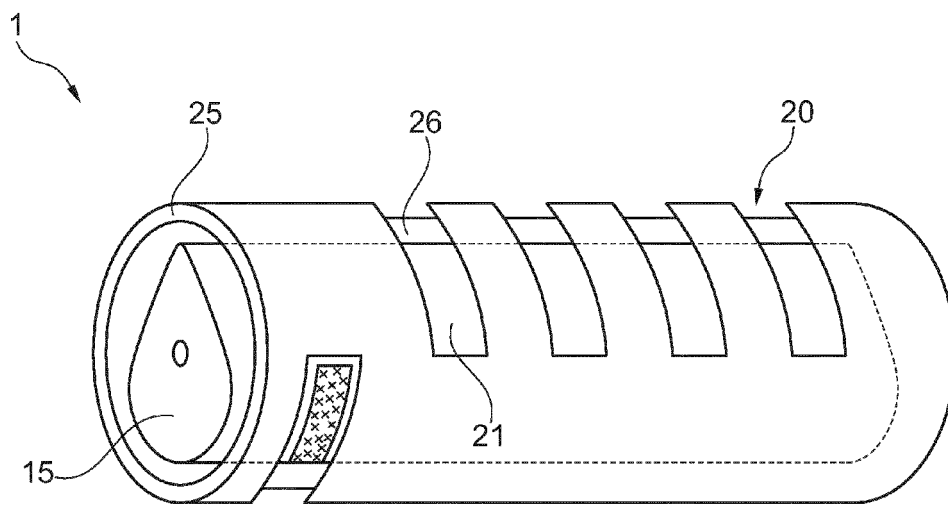


Fig. 6

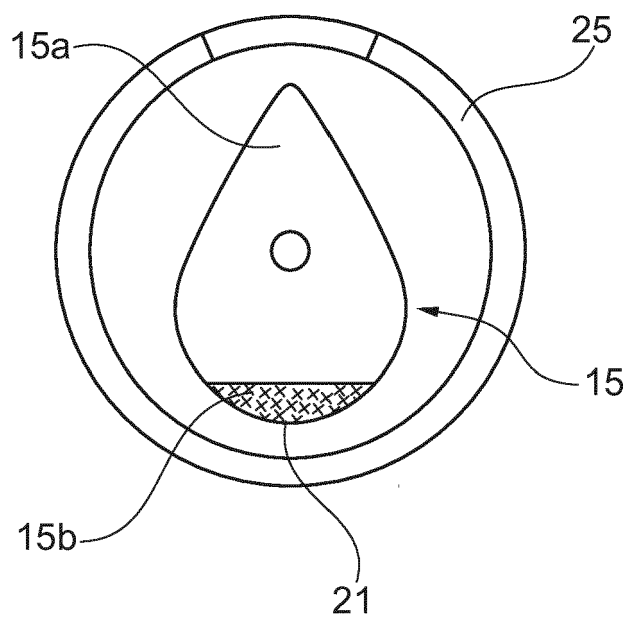


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 13 17 0220

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	DE 85 27 068 U1 (STELDERMANN, F.) 31 October 1985 (1985-10-31) * the whole document *	1-15	INV. A61H7/00 A61H15/00
X	WO 2007/122656 A1 (FENIX S N C DI G CAVALLETTI & [IT]; CAVALLETTI ROMEO [IT]; CAVALLETTI) 1 November 2007 (2007-11-01) * figures 2,3,8-10 *	1-15	
X	GB 2 492 533 A (HUMPHREYS ALUN GARETH [GB]) 9 January 2013 (2013-01-09) * page 3, paragraph 2 - page 4, paragraph 3; figures 1-4 *	1,2,6, 14,15	
X	EP 2 201 923 A1 (MURPHY TREVOR [IE]) 30 June 2010 (2010-06-30) * figures 1-5 *	1,2,5-15	
A	US 4 187 837 A (BRAUN JOSEPH M [US]) 12 February 1980 (1980-02-12) * the whole document *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			A61H A61B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 September 2013	Examiner Fischer, Elmar
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	

1
EPO FORM 1503 03.82 (P04C01)

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

EP 13 17 0220

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.

25-09-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 8527068	U1	31-10-1985	NONE
WO 2007122656	A1	01-11-2007	AT 479415 T 15-09-2010 EP 2010123 A1 07-01-2009 ES 2351946 T3 14-02-2011 WO 2007122656 A1 01-11-2007
GB 2492533	A	09-01-2013	NONE
EP 2201923	A1	30-06-2010	EP 2201923 A1 30-06-2010 US 2010160840 A1 24-06-2010
US 4187837	A	12-02-1980	NONE

EPO FORM P0459

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