

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
18 June 2009 (18.06.2009)

PCT

(10) International Publication Number
WO 2009/074160 A1

(51) International Patent Classification:
A62B 7/08 (2006.01) **A61M 16/06** (2006.01)

(21) International Application Number:
PCT/EP2007/010737

(22) International Filing Date:
10 December 2007 (10.12.2007)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant (for all designated States except US): **NOKIA CORPORATION** [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **RADIOJEVIC, Zoran** [RS/GB]; 98 Perne Road, Cambridge CB1 3RR (GB). **SAUNAMÄKI, Jarkko** [FI/FI]; Hevoshaantie 9 C 2, FIN-01200 Vantaa (FI).

(74) Agent: **VAN WALSTIJN, B., Gerard, G.**; Nordic Patent Service ApS, Pilestræde 58, DK-1112 Copenhagen K (DK).

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

Published:

— with international search report

(54) Title: PORTABLE OXYGEN DELIVERY DEVICE AND METHOD FOR DELIVERING OXYGEN TO A MOBILE USER

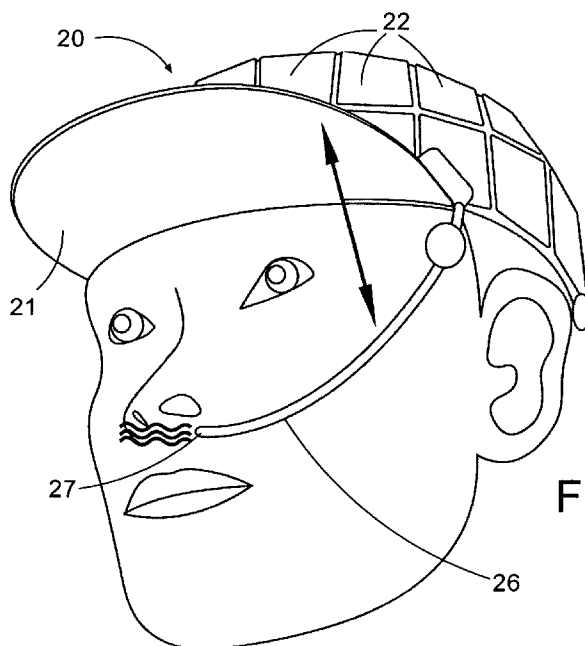


Fig. 2

(57) Abstract: A portable oxygen delivery device for increasing the oxygen content in the air inhaled by a user. The device includes solar cells that harvests energy over longer period of time and power instantaneously an electrolysis unit on user-demand for purpose of oxygen refreshment. The oxygen gas produced by the electrolysis unit is conveyed by tubing to an area in the vicinity of the users mouth and nose. The solar cells and the electrolysis unit are integrated in a garment worn by the user.

PORTABLE OXYGEN DELIVERY DEVICE AND METHOD FOR DELIVERING
OXYGEN TO A MOBILE USER.

5 FIELD OF THE INVENTION

The present invention relates to a portable device for increasing the oxygen content of the air inhaled by a user, in particular a user and a device that provides
10 high operational autonomy. Further, the invention relates to a method of increasing the oxygen content of the air inhaled by a user.

BACKGROUND OF THE INVENTION

15

Increased oxygen supply provides for improved well-being of persons in certain circumstances. Modern lifestyle keeps many people from sufficient access to fresh air. In particular in highly urbanized areas in which people
20 mainly stay inside may lead to oxygen deficiency for those concerned. The well-being of these people can be improved by increasing the amount of oxygen in the air that they inhale.

25 Portable oxygen dispensing systems are known, for example in the form of compressed enriched air bottles. However, these bottles are depleted relatively fast, which leads to a substantially reduced operational autonomy and leads to substantial operational costs.

30

DISCLOSURE OF THE INVENTION

On this background, it is an object of the present invention to provide portable oxygen delivery device that

overcomes or at least reduces the problems indicated above.

In this invention it is proposed to realize autonomous
5 portable oxygen delivery system by utilizing energy of
the sunlight illumination (via solar cells - SC) and
natural water to provide oxygen enrichment in the
breathing air.

10 This object is achieved by providing a portable oxygen
delivery device for increasing the oxygen content in the
air inhaled by a user, the device comprising an energy
source coupled to an electrolysis unit that is configured
to split water into oxygen gas and hydrogen gas, an
15 oxygen dispensing conduit coupled to the electrolysis
unit, the conduit being configured to transport the
oxygen produced to an area near the users nose and mouth
and the conduit being configured to release the oxygen
produced in the area near the users nose and mouth.

20

Thus, a portable oxygen delivery device is provided that
is substantially completely autonomous, since sunlight
and water are can be freely found almost everywhere.

25 The energy source may comprise at least one solar cell.

The solar cells may be integrated into a garment. Thus,
the oxygen delivery device is comfortable to carry.

30 Preferably, the solar cells are flexible solar cells.
Thus, the device is easily integrated in a garment.

The garment can be a jacket, a vest, a cap a belt or a
backpack.

The electrolysis unit may comprise a water container with two separate gas receiving chambers.

5 Preferably, each gas receiving chamber has at least one of at least two of the electrodes of the electrolysis unit.

The container can be an exchangeable cartridge. Thus, the
10 water container is easily exchanged by user when necessary.

The container or cartridge can be of a type that is refillable. Thus, the water container is easily refilled
15 by user when necessary.

Preferably, the electrolysis unit is integrated into a garment, so that it is easy to carry.

20 The solar cells and the electrolysis unit may further comprise a rechargeable battery or capacitor and the solar cells and the electrolysis unit can be connected to the battery or capacitor. Thus, the maximum oxygen production capacity is dependent on the maximum power
25 output of the rechargeable battery or capacitor and not limited to the instantaneous power output of the solar cells, given that the battery or capacitor is charged.

The solar cells may be substantially permanently
30 connected to the capacitor or battery for charging the battery or capacitor. Thus, the battery or capacitor is charged anytime light is available to the solar cells.

The electrolysis unit can be selectively connectable to the battery or capacitor. Thus, the user can activate and deactivate the oxygen production in accordance with his/her needs.

5

The device may further comprise an electrical connector for allowing the electrolysis unit and/or battery or capacitor to be connected to an external source of electrical power. Thus, the battery can be recharged quickly if necessary and/or the power for the electrolysis unit is supplied by an external power source.

The dispensing conduit may be connected to the outlet of the gas receiving chamber that contains one of the anodes of the electrodes.

A filter can be disposed at the outlet, preferably a filter capable of withholding water droplets. Thus, it is avoided that water is transported through the dispensing conduit.

The device may further comprise a gas flow regulator adapted to regulate the flow of oxygen towards the user. Thus, the user can control the amount of oxygen delivered in accordance with his/her needs.

The device may further comprise an oxygen dispensing arm in the upstream portion of the dispensing conduit. Thus the delivery to the correct area in the vicinity of the user's mouth and nose can be achieved.

The oxygen dispensing arm can be integrated into a body garment. Thus, the oxygen dispensing arm is easily carried.

- 5 The oxygen dispensing arm can be integrated into a cap or spectacles.

The dispensing conduit may include flexible tubing between the electrolysis unit and the oxygen dispensing
10 arm.

The device may further comprise a hydrogen gas release vent coupled to the gas receiving chamber that contains one of the cathodes of the electrodes.

15

The object above is also achieved by providing a method for increasing the oxygen content in the air inhaled by a user, the method comprising providing a portable electrolysis device that is configured to split water
20 into oxygen gas and hydrogen gas, collecting the oxygen gas and transporting it towards an area in the vicinity of the users mouth and nose, and delivering the oxygen gas in the vicinity of the users mouth and nose.

- 25 The portable electrolysis device may be solar cell driven.

Preferably, electrolysis device includes a rechargeable battery or capacitor, and the method may further comprise
30 the step of charging the rechargeable battery or capacitor with the solar cells also when electrolysis and device is not active.

The electrolysis device may comprise a refillable water container, and the method may further comprise refilling the water container.

- 5 The electrolysis device may comprise a user exchangeable water cartridge, and the method may further comprise exchanging the user exchangeable water cartridge.

The object above can also be obtained by a providing
10 mobile device comprising a controller, the mobile device being provided with an interface for connecting to a portable oxygen delivery device and the mobile device being configured for controlling the operation of a portable oxygen delivery device.

15

The mobile device may be configured to start and stop the oxygen production process in the portable oxygen delivery device.

- 20 The mobile device may be configured to start and stop the stop the oxygen production process in accordance with the status of the mobile device.

The mobile device may be provided with sensors for
25 providing real time measurements, and configured to start and stop the oxygen production process in accordance with the result of the real time measurements.

The real time measurements may include one or more of
30 place, ambient air quality, ambient air pollution level, ambient air oxygen level, temperature, ambient air pressure, altitude, user heart rate and user breathing rate.

The status of the mobile device may change through the receipt of a message or command string from a remote service or device.

- 5 The message or command string may be received from a remote device or a remote service.

The mobile device may be a communication device.

- 10 The object above may also be achieved by providing a use of a mobile electronic device that comprises a rechargeable battery to power a portable oxygen delivery device.

- 15 The object above may also be achieved by providing a use of a mobile electronic device to control the operation of a portable oxygen delivery device.

- Further objects, features, advantages and properties of the mobile battery charging device and method of according to the invention will become apparent from the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

25

In the following detailed portion of the present description, the invention will be explained in more detail with reference to the exemplary embodiments shown in the drawings, in which:

30

Figure 1 is a block diagram illustrating the general architecture of a portable oxygen delivery device according to an embodiment of the invention,

figure 2 is perspective view of a portable oxygen delivery device according to an embodiment of the invention,

figure 3 is a cross-sectional view of the portable oxygen delivery device according to figure 2,

figure 4 is a perspective view of a portion of a portable oxygen delivery device according to an embodiment of the invention,

figure 5 is a perspective front view of another portion of the portable oxygen delivery device according to figure 4,

figure 6 is a perspective rear view of another portion of the portable oxygen delivery device according to figure 4,

figure 7 illustrates a detail of the oxygen delivery device according to figure 5 and 6,

figure 8 illustrates a flowchart of a method according to the invention,

figure 9 is a front view of a mobile device according to an embodiment of the invention, and

figure 10 is a diagrammatic block diagram of the mobile device according to figure 9.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

25

In the following detailed description, the autonomous portable oxygen delivery device according to the invention will be described by the preferred embodiments.

30 The basic design of the portable oxygen delivery device includes:

- Flexible (or rigid) solar cells integrated into portable forms such as cap, vest, jacket or a strip like garments,

- A water container or cartridge (exchangeable) with two separate chambers (for Oxygen/Hydrogen generation) and built-in electrodes (the electrode may be formed by interior coating of the chamber surface by carbon or metal),
5
- An oxygen dispersing arm for delivery of the produced under nose/mouth.

According to embodiments the portable oxygen delivery
10 device may also include an alternative electric connector to/from an external electronic device, such as to the battery of a mobile phone, and

- A gas flow regulator.

15 Electrolysis of water is an electrolytic process which decomposes water into oxygen (O_2) and hydrogen (H_2) gas with the aid of an electric current. The electrolysis cell consists of two electrodes (usually carbon conductive traces or an inert metal layer) connected to
20 opposite poles of a source of direct current. The energy efficiency of the electrolysis is relatively high (approximately 95%).

Figure 1 is a block diagram of the portable oxygen
25 delivery device according to an embodiment of the invention. The device includes a water container 10 but is at least partially filled with water and divided by a separation wall 11 into two chambers. An anode 12 is received in chamber 14 and at least partially immersed in
30 the water in chamber 14. The upper part of the chamber 14 receives that hydrogen gas that is produced during the electrolysis process. A cathode 13 is received in chamber 15 and at least partially immersed in the water in chamber 15. The upper part of chamber 15 receives the

oxygen gas that is produced during the electrolysis process.

The anode 12 and the cathode 13 are electrically
5 connected to one more solar cells 22 and a rechargeable
battery or capacitor 23 via a controller 16. The
controller 16 controls the flow of electricity (direct
current) from the solar cells 22 to the rechargeable
battery and from the battery 23 to the anode 12 and
10 cathode 13, respectively. The controller 16 is
configured to use the electricity produced by the solar
cells to charge the battery at any time, i.e. the solar
cells charged the rechargeable battery 23 per default.
The activation of the electrolysis process is controlled
15 by the controller 16 by selectively connecting and
disconnecting the electrodes 12,13 to the rechargeable
battery 23. The controller receives its instructions
from the user via a user interface 17. The user
interface 17 may consist of a keypad, switches, or any
20 other user input means.

The controller 16 is also connected to an external
electric connector 19 that is configured to connect to an
external source of electrical power, e.g. the battery of
25 a mobile phone (not shown). The external electric
connector 19 may in an embodiment also include an
interface for interfacing with a mobile device that takes
over the control of the oxygen delivery device. The
controller 16 is configured to use the external
30 electrical power for recharging and the rechargeable
battery 23 and/or for directly powering the electrolysis
process. Battery operation allows oxygen delivery when no
or little sunlight is available.

Different type of Solar Cells have been developed over past decades, like silicon or relatively new organic dye sensitized solar cells on flexible/transparent substrates. Inherent conversion efficiency of today's
5 ordinary solar cells is in range of 10-20%. The solar cell technology is rapidly developing. There are very strong indications that conversion efficiency will be further improved to higher levels as 35-50%. The power of sunlight at sea level is about 1200 W/m². Taking into
10 account ordinary solar cell conversion efficiency yields in a solar cell area of about S₁=10x10cm (100 cm²) capable to generate approximately 2 W of electric power.

A relatively small amount of oxygen is required to
15 provide noticeably better air quality by enhancing oxygen concentration in breathable air. Approximately 50 liters of oxygen gas per hour is consumed by an ordinary adult. An improvement in oxygen concentration by 10% can already make positive impact. This means that approximately 5
20 liter of pure oxygen per hour substantially improves a person's psychophysical condition.

Figures 2 and 3 illustrate an embodiment of the portable auction delivery device that is integral with a cap
25 that can be worn by a user. The power generating solar cells 22 (in flexible form or as a set of rigid cells) are placed on top of the cap 20 and sunshade 21 (total surface covered by solar cells is approximately 1000 cm²). Such cap concept is capable to generate 10-20%
30 oxygen enrichment in the breathable air in front of the user nose/mouth.

In the overall structure of the cap 20; there are two basic parts: the cover made of the solar cells 20 and the

internal layer that forms a water containing cartridge. Below the solar cell layer there is exchangeable (and refillable) cartridge 24 at least partially filled with water. The cartridge 24 is realized by using soft
5 rubber/polymer like materials which at the same time provide a soft coupling to the user head. The cartridge 24 is physically divided into two separated chambers (oxygen gas chamber 15 and hydrogen gas chamber 14) by a separation wall 11 for oxygen and hydrogen generation,
10 respectively. At the bottom of the cap a ring shaped channel 18 connects the chambers 12 and 13. At the inner side of the cartridge there is a conductive surface coating (e.g. carbon or metallic coating) which serves as electrode surface 12,13. The conductive surface can cover
15 the complete interior surface of the cartridge (to maximize efficiency) but it is physically separated providing two separated electrodes (anode 12/cathode 13).

When the cartridge 24 (and thus both chambers 14,15) is
20 filled with water, the electrodes 12, 13 powered by electric current from illuminated solar cells (or from a not shown battery), the electrolysis process is started. Above the anode (+) oxygen 12 is generated which is collected and exhausted at an outlet nozzle on top of the
25 oxygen receiving chamber 15.

At the chamber outlet there is a GoreTex® layer/filter 29 which prevents water from spilling into a flexible tubing
25 that leads the oxygen gas towards the user. The GoreTex® filter 29 stops water but allows the oxygen gas
30 to flow outside. Instead of Gore-Tex® another type of a gas permeable filter capable of withholding water droplets can be used.

The oxygen gas is further transported by the flexible tubing 25 towards a dispersing arm 26 where there is a gas flow regulator (not shown) allowing in the user to adjust the flow rate. The dispersing arm 26 is integrated
5 into the cap also and can be clipped up/down (depending on usage). The oxygen dispensing arm 26 ends in vicinity of the user's nose and mouth thereby enriching the breathing air just in front of the user's nose and mouth. The dispensing arm 26 is designed to fit firmly on the
10 head's cap to allow for physical activities (moving, walking, running, etc). In parallel with oxygen gas certain amount of hydrogen gas is generated in the key hydrogen receiving chamber 14 that receives the cathode. The hydrogen gas is released into the atmosphere through
15 a vent 28 that is also provided with a Gore-Tex® filter 29 or other a gas permeable filter material capable of withholding water droplets.

Both the H₂ vent 28 and the O₂ outlet connections can be
20 detached/attached providing possibility to access both electrolysis chambers for water refill.

Figures 4 to 7 illustrate another embodiment of the oxygen delivery device according to the invention. In
25 this embodiment the oxygen delivery device is realized in the form of a vest 30 which takes advantage of a larger available surface on the vest. A solar cell covered vest can provide a sufficient amount of electrical power for a higher level of oxygen generation. The available service
30 on the vest can be large, approximately 5000 cm² (or even larger like solar cell coat). The exchangeable water cartridge 10 is realized in the form of a vest pocket 32. The cartridge 10 has a lid 34 that allows the user to refill the cartridge 10 with water. Alternatively, user

can exchange the cartridge 10 after use. The cartridge 10 is kept into the vest pocket and can be exchanged or filled (depending on user situation and conditions).

5 The produced oxygen gas is transported via flexible tubing 25 to the oxygen dispensing arm 26. In this embodiment the oxygen dispensing arm 26 is an integral part of a pair of glasses or spectacles 37. The pair of glasses or spectacles 37 could be a pair of sunglasses or
10 other glasses that do not have any optical lens effect.

Figure 7 illustrates a flow chart of the method according to an embodiment of the invention. In the first step 50 a portable solar driven electrolysis device is provided.
15 The electrodes device is configured to split water into oxygen gas and hydrogen gas. In the next step 52 the oxygen gas is collected and transported towards an area in the vicinity of the user's mouth and nose. The following step 54 includes delivering the oxygen gas in
20 the vicinity of the user's mouth and nose.

Usage scenario

The portable oxygen delivery device can be carried by a
25 user outside on highly urbanized/busy streets, on the way and in the office; even with user being in athletic activities; by a mobile user; used at home; used for stressful times, and of course to help user to alleviate a headache. The portable oxygen delivery device is
30 designed to fit firmly high operational autonomy and mobility (water and sunlight can be freely found almost everywhere).

The portable oxygen delivery device is great for anyone who participates in mountain activities including; skiing, mountain climbing, off road or distance biking, rock climbing, trail running, and hiking. Travelers can
5 also greatly benefit by using the portable auction delivery device. A possible application includes usage before and after air travel. Another application is stress removal. The portable oxygen delivery device 1
10 can be used at work to get the competitive edge and keep better focus. Further, no bacteria or virus can survive in an oxygen enriched environment which means that the portable oxygen delivery device can be used to minimize infection probability while commuting in densely populated areas (bus, tram, metro or other crowded
15 areas).

Figures 9 and 10 illustrate a mobile device according to an embodiment of the invention. The mobile device 200, in this embodiment a mobile phone, has a housing, a display
20 203, speaker 204 and a keypad 205. The operation of the mobile phone 200 is controlled by a controller 218. The controller is connected to the display 203, to the speaker 204, to the keypad 205, to the microphone 206, to a transmitter, to a receiver unit 220 and to a
25 rechargeable battery 224. The mobile phone 200 further includes sensors 210 and an external device interface 230 that are both connected to the controller 218.

The external device interface 230 is suitable for
30 interfacing with an external device like the portable oxygen delivery device 20. The external device interface 230 is suitable for controlling the operation of the external device that is connected to the mobile phone 200. The controller 218 is configured to control the

operation on the external device when such an external device is connected to the mobile phone 200. In particular, controller 218 can be configured to control the operation of the portable oxygen delivery device, 5 i.e. starting and stopping the electrolysis process in accordance with circumstances. The controller will take into account status of the mobile phone 200 and control the portable oxygen delivery device accordingly. In particular, the control can control the operation of the 10 portable oxygen delivery device in accordance with receipt of a messages or a command string from a remote device or service. Such a service maybe located at a hospital, or maybe a server that monitors the data on air quality at the actual location of the mobile phone 200.

15

In an embodiment the mobile phone 200 is provided with sensors 210 that are connected to the controller 18. The sensors 210 deliver real-time signal to the controller 218. The real time measurements delivered by the sensors 20 include one or more of: place (actual position), ambient air quality, ambient air pollution level, ambient air oxygen level, temperature, ambient air pressure, altitude, user heart rate and user breathing rate. In response to this signal or these signals the 25 controller 218 determines to start or stop the oxygen production process.

The external device interface 230 may in an embodiment also include a connection for establishing a circuit that 30 directs current from the battery to a 24 in the mobile phone 200 to the external device. Thus, the mobile electric device 200 can be used to power the portable oxygen delivery device 20, and to recharge the

rechargeable battery 23 in the portable oxygen delivery device.

Invention has been disclosed as integrated in a cap or vest, but it is understood that it could be integrated in
5 any other garment that can be worn or carried by user.

The invention has numerous advantages. Different embodiments or implementations may yield one or more of
10 the following advantages. It should be noted that this is not an exhaustive list and there may be other advantages which are not described herein. One advantage of the invention is that it allows for autonomous oxygen delivery. It is another advantage of the invention that
15 it allows for an oxygen delivery system that is mobile and lightweight. It is also an advantage of the invention that it allows a for an oxygen delivery system that can be integrated into a garment. It is a further advantage of the invention that it allows for an oxygen
20 delivery system that has low operational costs. It is further advantage of the invention that it allows for an environmental friendly oxygen delivery system. It is another advantage of the invention that it allows for achieve more satisfying health and wellbeing level of a
25 user. It is a further advantage of the invention than it can support extensive activities including skiing, backpacking, and camping, hiking, mountain biking, cycling and climbing. Another advantage is provided by miniaturization possibility offered by the present
30 invention since liquid is the source of the oxygen (18 grams of water contains 25 liters of gaseous oxygen at atmospheric pressure) which offers huge potential for miniaturized portable application concepts and improved

safety regulations (oxygen generated/consumed on user demand not stored in heavy bottles in gaseous phase).

The term "comprising" as used in the claims does not
5 exclude other elements or steps. The term "a" or "an" as
used in the claims does not exclude a plurality.

Whilst endeavoring in the foregoing specification to draw
attention to those features of the invention believed to
10 be of particular importance it should be understood that
the Applicant claims protection in respect of any
patentable feature or combination of features
hereinbefore referred to and/or shown in the drawings
whether or not particular emphasis has been placed
15 thereon. Moreover, it should be appreciated that those
skilled in the art, upon consideration of the present
disclosure, may make modifications and/or improvements on
the apparatus hereof and yet remain within the scope and
spirit hereof as set forth in the following claims.

20

CLAIMS:

1. A portable oxygen delivery device for increasing the oxygen content in the air inhaled by a user, said device
5 comprising:
- an energy source coupled to an electrolysis unit that is configured to split water into oxygen gas and hydrogen gas,
- 10
- an oxygen dispensing conduit coupled to said electrolysis unit, said conduit being configured to transport the oxygen produced to an area near the users nose and mouth and said conduit being
15 configured to release the oxygen produced in said area near the users nose and mouth.
2. A device according to claim 1, wherein said energy source comprises at least one solar cell.
- 20
3. A device according to claim 2, wherein said solar cells are integrated into a garment.
4. A device according to claim 2 or 3, wherein said solar
25 cells are flexible solar cells.
5. A device according to any of claims 2 to 4, further comprising a rechargeable battery or capacitor, wherein said solar cells are configured for permanently
30 harvesting solar energy which is stored in a capacitor or battery and shortly released on user demand for purpose of generating oxygen.

6. A device according to any of claims 3 to 5, wherein said garment is one of a jacket, a vest, a cap a belt or a backpack.
- 5 7. A device according to any of the preceding claims, wherein electrolysis unit comprises a water container with two separate gas receiving chambers.
8. A device according to claim 7, wherein each gas
10 receiving chamber has at least one of at least two of the electrodes of the electrolysis unit.
9. A device according to claim 7 or 8, wherein said container is an exchangeable cartridge.
- 15 10. A device according to any of claims 7 to 8, wherein said container or cartridge is refillable.
11. A device according to any of the preceding claims,
20 wherein said electrolysis unit is integrated into a garment.
12. A device according to claim 5, wherein said solar cells are substantially permanently connected to said
25 capacitor or battery for charging said battery or capacitor.
13. A device according to any of claims 5 to 12, wherein said electrolysis unit is selectively connectable to said
30 battery or capacitor.
14. A device according to any of claims 5 to 13, further comprising an electrical connector for allowing said

electrolysis unit and/or battery or capacitor to be connected to an external source of electrical power.

15. A device according to any of claims 7 to 14, wherein
5 said dispensing conduit is connected to the outlet of the gas receiving chamber that contains one of the anodes of said electrodes.

16. A device according to claim 15, wherein a filter is
10 disposed at said outlet, preferably a gas permeable filter capable of withholding liquid droplets.

17. A device according to any of the preceding claims,
further comprising a gas flow regulator adapted to
15 regulate the flow of oxygen towards the user.

18. A device according to any of the preceding claims,
further comprising an oxygen dispensing arm in the
upstream portion of said dispensing conduit.

20
19. A device according to claim 18, wherein said oxygen dispensing arm is integrated into a body garment.

20. A device according to claim 19, wherein said
25 dispensing arm is integrated into a cap or spectacles.

21. A device according to any of claims 18 to 20, wherein
said dispensing conduit includes flexible tubing between
said electrolysis unit and said oxygen dispensing arm.

30
22. A device according to any of claims 7 to 21, further comprising a hydrogen gas release vent coupled to the gas receiving chamber that contains one of the cathodes of said electrodes.

23. A method for increasing the oxygen content in the air inhaled by a user, said method comprising:

5 providing a portable electrolysis device that is configured to split water into oxygen gas and hydrogen gas,

collecting said oxygen gas and transporting it
10 towards an area in the vicinity of the users mouth and nose, and

delivering the oxygen gas in the vicinity of the users mouth and nose.

15

24. A method according to claim 23, wherein said portable electrolysis device is solar cell driven and said solar cells collect energy over longer period of time and releases it for oxygen production on user demand to the
20 system.

25. A method according to claim 23 or 24, wherein said electrolysis device includes a rechargeable battery or capacitor, further comprising the step of charging said
25 rechargeable battery or capacitor with said solar cells also when electrolysis and device is not active.

26. A method according to claim 23 to 25, wherein said electrolysis device comprises a refillable water
30 container, further comprising refilling said water container.

27. A method according to claim 23 to 26 wherein said electrolysis device comprises a user exchangeable

water cartridge, further comprising exchanging said user exchangeable water cartridge.

28. A mobile device comprising a controller, said mobile
5 device being provided with an interface for connecting to a portable oxygen delivery device and said mobile device being configured for controlling the operation of a portable oxygen delivery device.

10 29. A mobile device according to claim 28, wherein said mobile device is configured to start and stop the oxygen production process in the portable oxygen delivery device.

15 30. A mobile device according to claim 29, wherein said mobile device is configured to start and stop the stop the oxygen production process in accordance with the status of the mobile device.

20 31. A mobile device according to claim 29, wherein said mobile device is provided with sensors for providing real time measurements, whereby said mobile device is configured to start and stop the oxygen production process in accordance with the result of the real time
25 measurements.

32. A mobile device according to claim 31, wherein said real time measurements include one or more of place, ambient air quality, ambient air pollution level, ambient
30 air oxygen level, temperature, ambient air pressure, altitude, user heart rate and user breathing rate.

33. A mobile device according to any of claims 30 to 33, wherein the status of said mobile device changes through

the receipt of a message or command string from a remote service or device.

34. A mobile device according to claim 33, wherein said
5 message or command string is received from a remote device or a remote service.

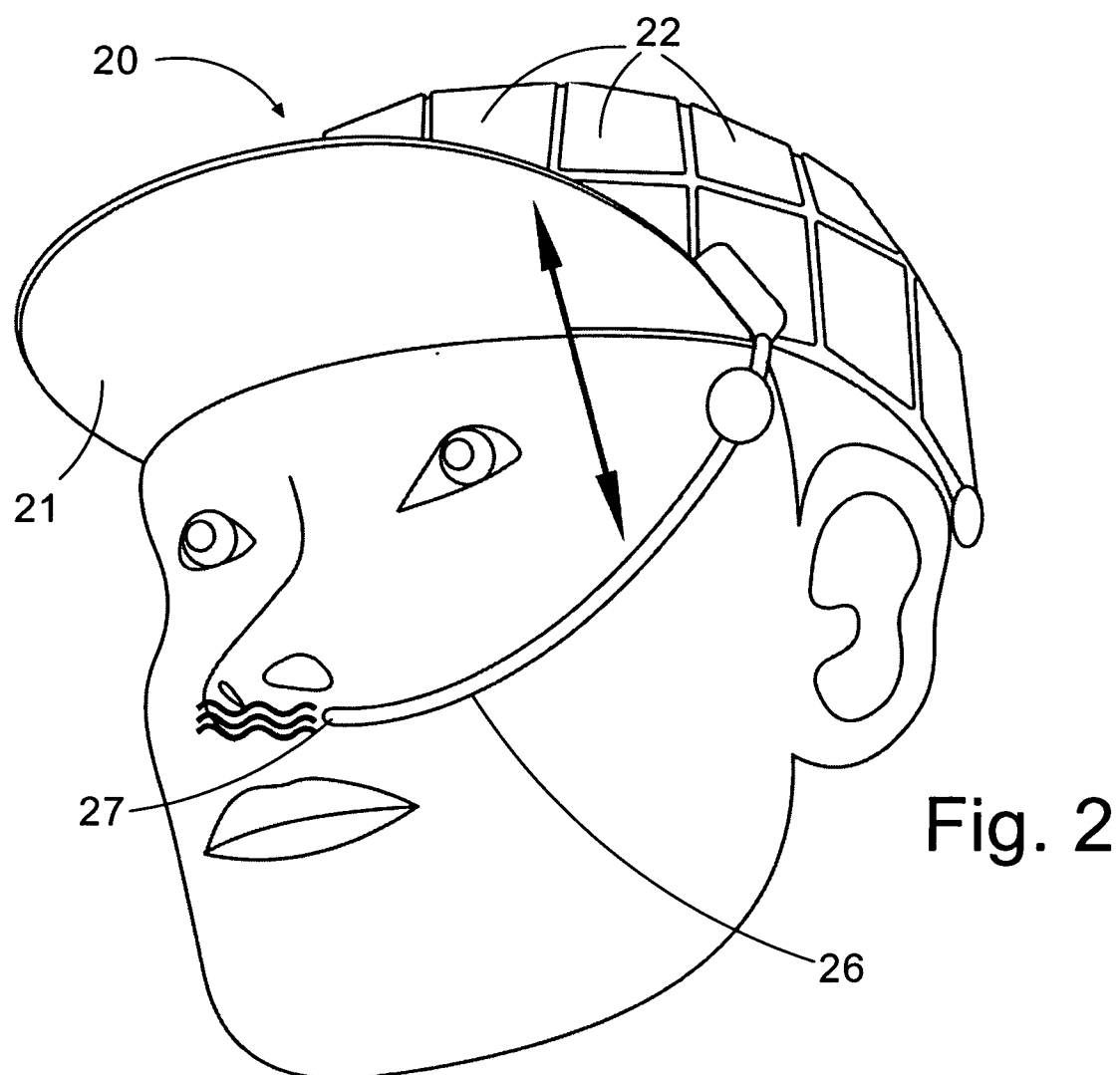
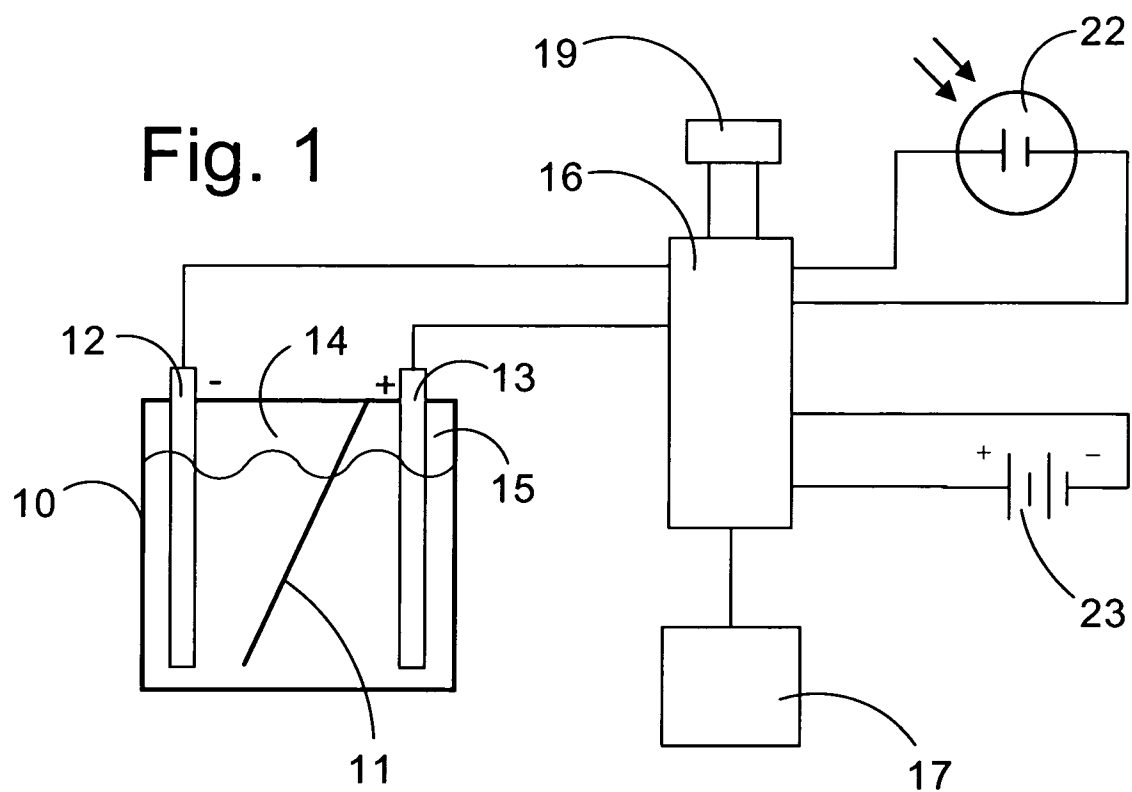
35. A mobile device according to any of claims 28 to 34,
wherein said mobile device is a communication device.
10

35. Use of a mobile electronic device that comprises a rechargeable battery to power a portable oxygen delivery device.

15 36. A use according to claim 35, wherein said mobile electronic device is a mobile communication device.

37. Use of a mobile electronic device to control the operation of a portable oxygen delivery device.
20

38. A use according to claim 37, wherein said mobile electronic device is a mobile phone.



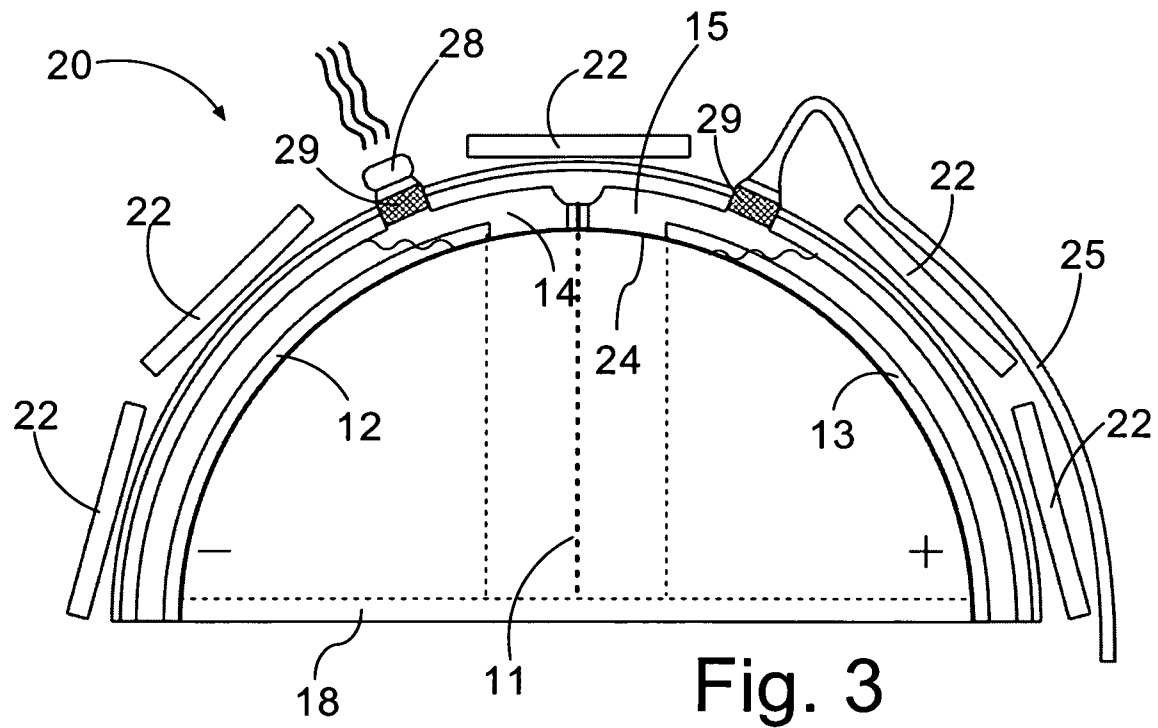


Fig. 3

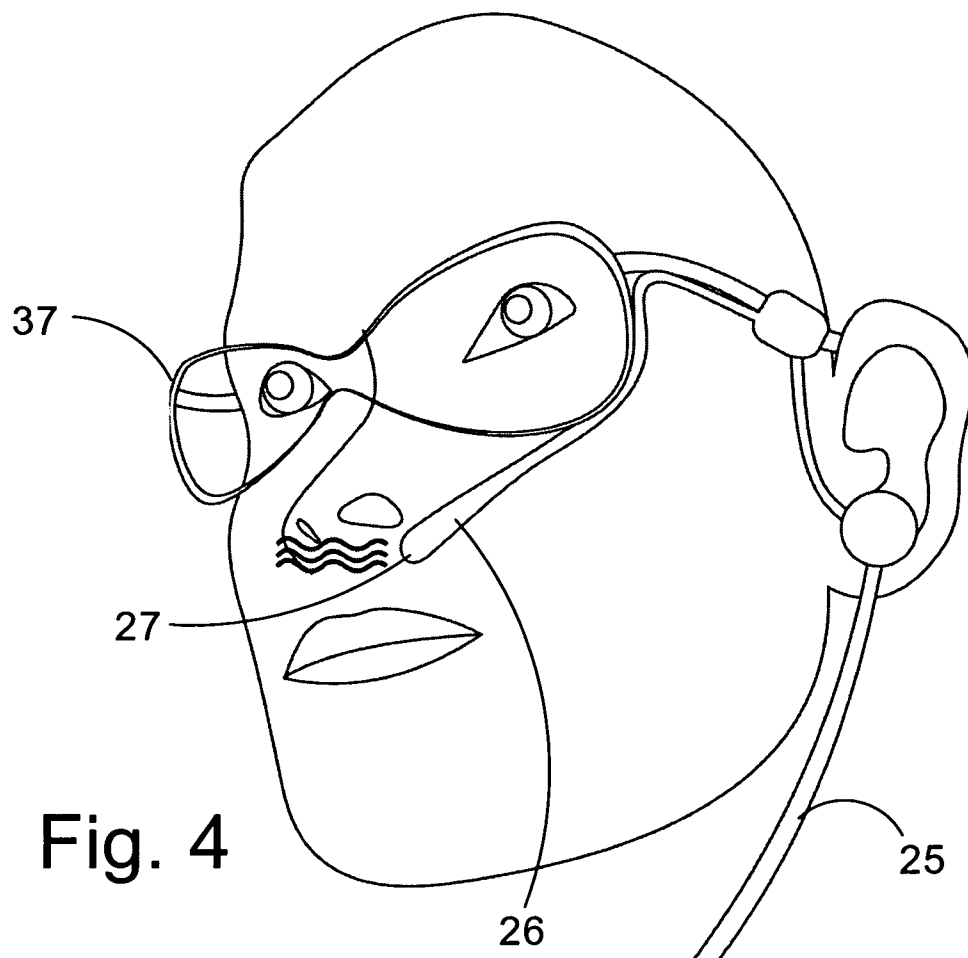


Fig. 4

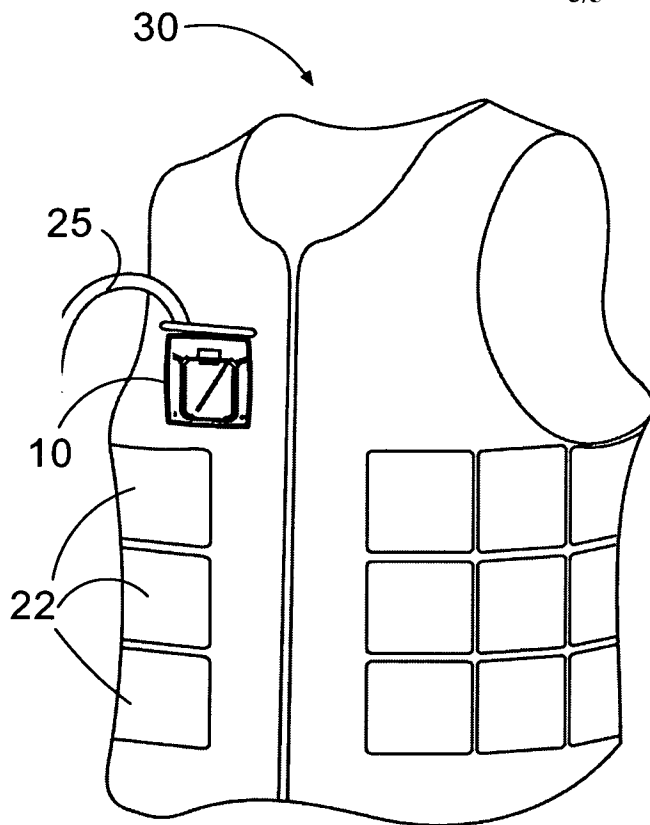


Fig. 5

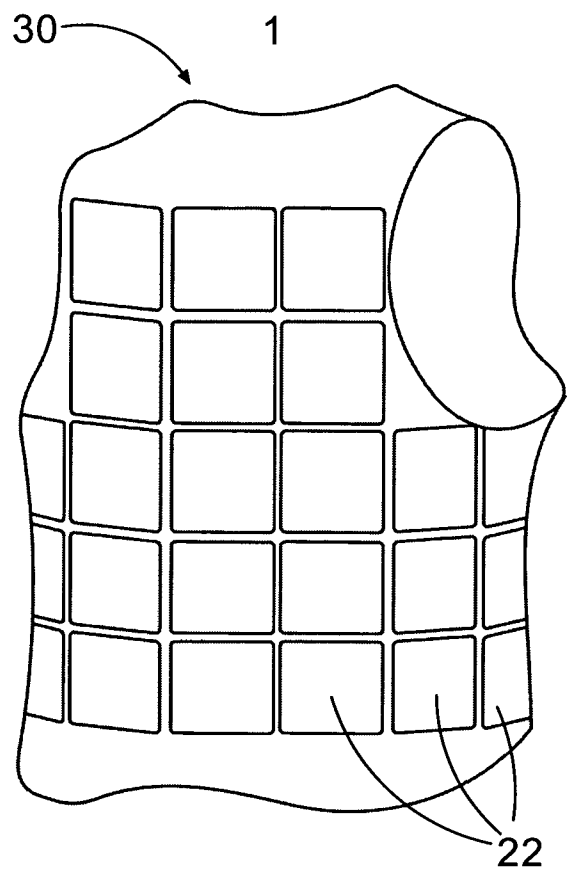


Fig. 6

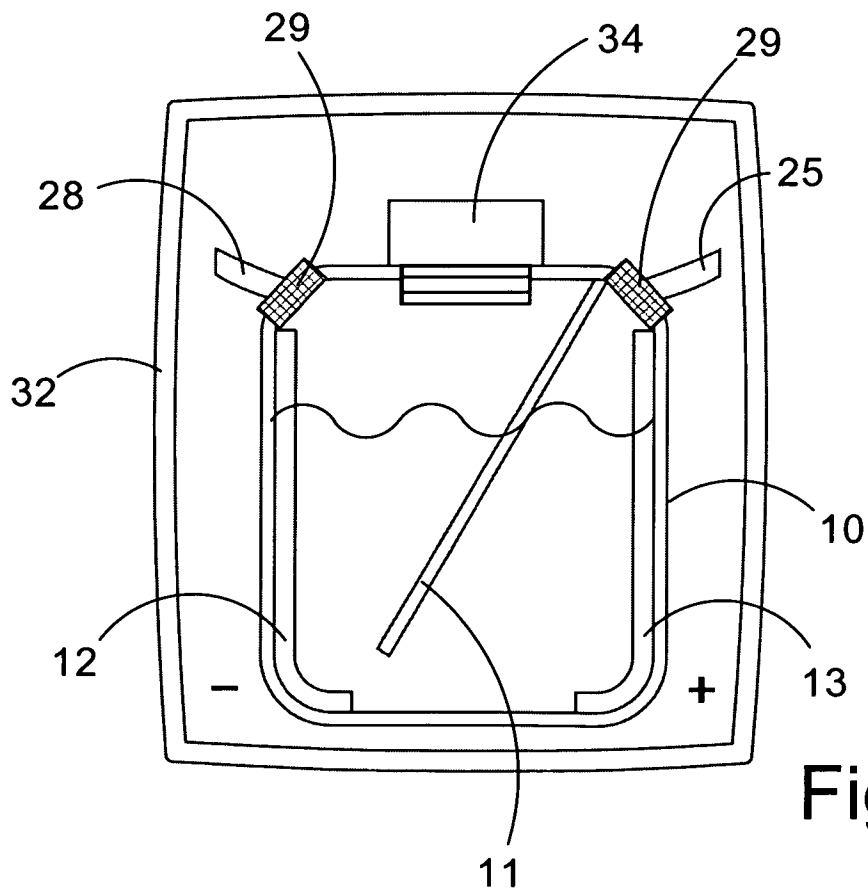


Fig. 7

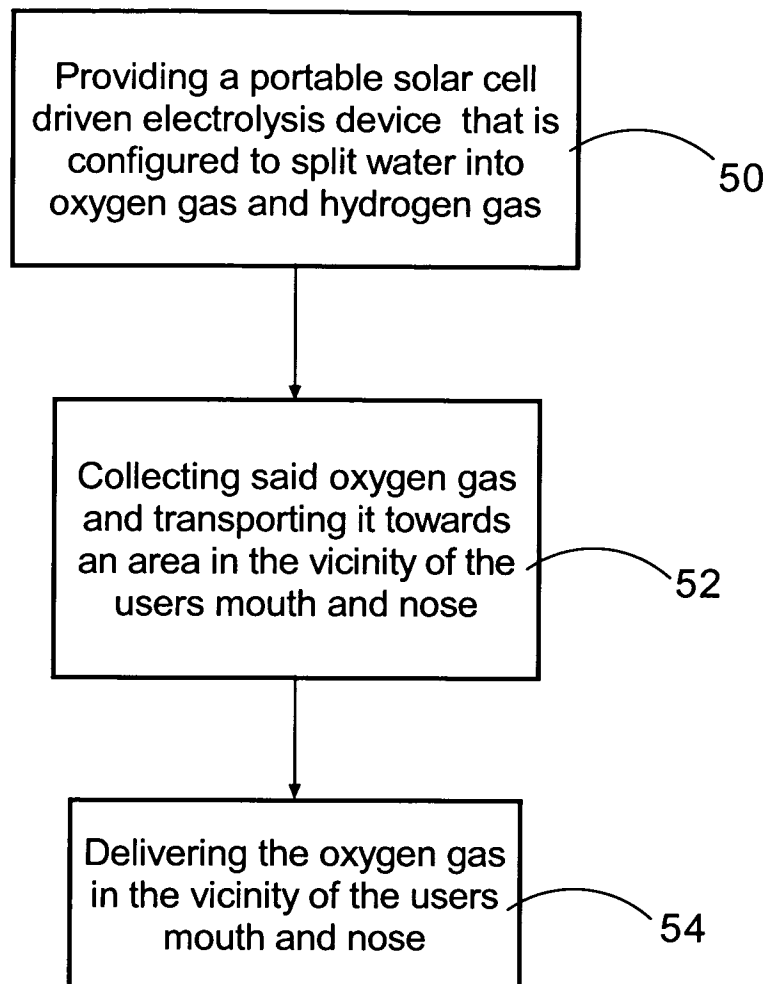


Fig. 8

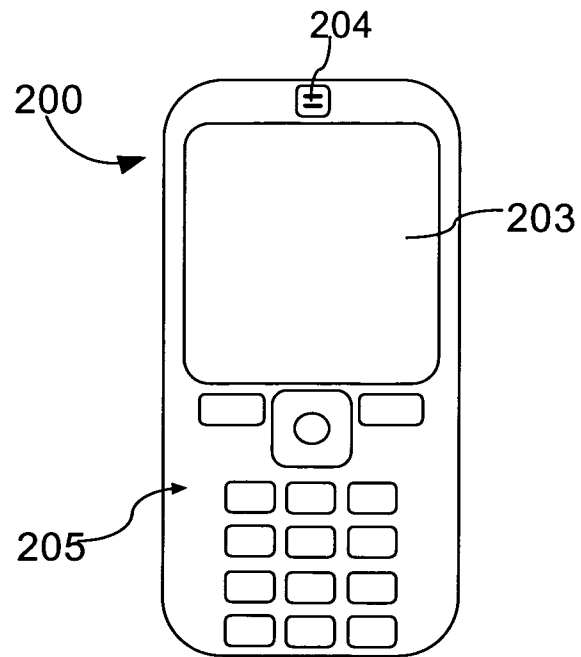


Fig. 9

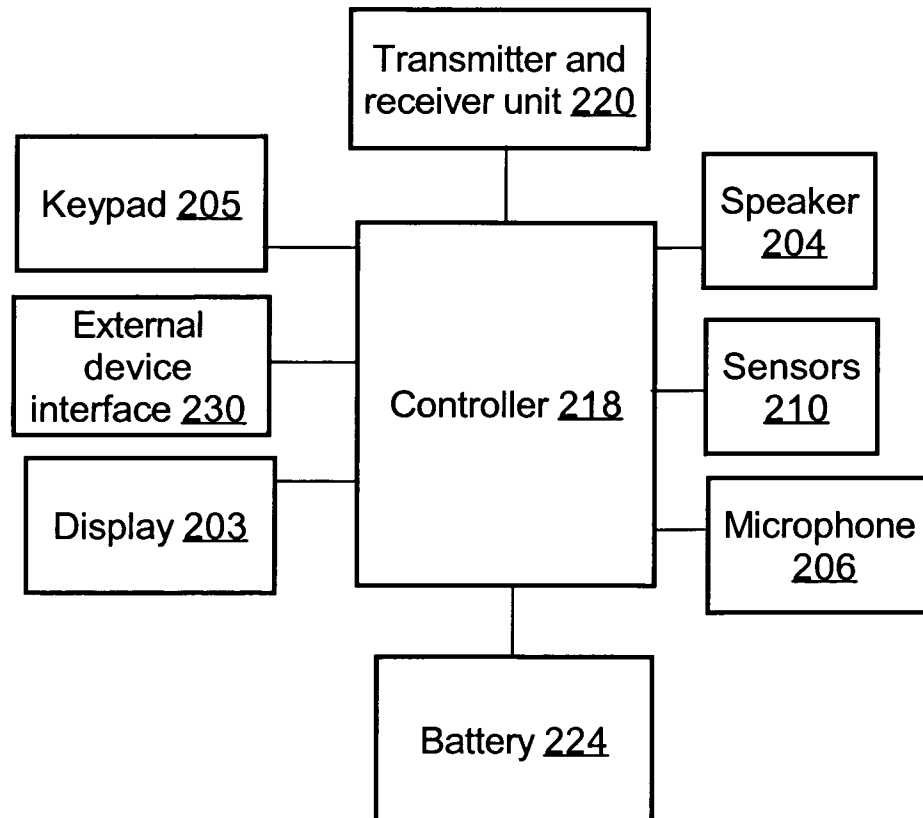


Fig. 10

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2007/010737

A. CLASSIFICATION OF SUBJECT MATTER

INV. A62B7/08 A61M16/06

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)

A62B A61M

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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 3 504 669 A (ALBERT DAVID) 7 April 1970 (1970-04-07) column 1, line 12 - line 57 figures 1,2 ----- -/--	1, 11, 22, 28-30 2-10, 12-21, 31-35



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 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

- *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.
- *G* document member of the same patent family

Date of the actual completion of the international search

2 September 2008

Date of mailing of the international search report

09/09/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Nehrdich, Martin

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2007/010737

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 2006 068305 A (FUJI ELECTRIC HOLDINGS) 16 March 2006 (2006-03-16) abstract; figures -----	1,7-10, 13-16, 28,29, 36,38 17 2-6,11, 12, 18-22, 30-35, 37,39
X Y A	JP 2005 035848 A (MATSUSHITA ELECTRIC IND CO LTD) 10 February 2005 (2005-02-10) abstract figure 1 paragraph [0019]; claim 3 -----	1,7,8, 10,18, 21,22 17 2-6,9, 11-16, 19,20
X Y A	WO 02/072919 A (HECKER KARL-HEINZ [DE]; FIEDLER STEFAN [DE]; SCHINAGL RUDOLF [DE]) 19 September 2002 (2002-09-19) page 2, line 29 - line 31 page 6, line 20 - line 26 page 7, line 16 - line 23 page 10, line 15 - line 17 figure 1 -----	28-32 17 1,33-35

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2007/010737

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.: 23-27
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 (see also description, page 1, lines 16-23)
2. ☒ Claims Nos.: 23-27
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:
see FURTHER INFORMATION sheet PCT/ISA/210
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 allsearchable 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 reportcovers 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 23-27

Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy (see also description, page 1, lines 16-23)

Continuation of Box II.2

Claims Nos.: 23-27

Rule 39.1 (iv) PCT - Method of treatment of the human or animal body by therapy

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2007/010737

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3504669	A	07-04-1970	NONE	
JP 2006068305	A	16-03-2006	NONE	
JP 2005035848	A	10-02-2005	NONE	
WO 02072919	A	19-09-2002	CA 2440736 A1 EP 1368511 A2 JP 2004534907 T MX PA03007968 A US 2004146759 A1	19-09-2002 10-12-2003 18-11-2004 15-10-2004 29-07-2004