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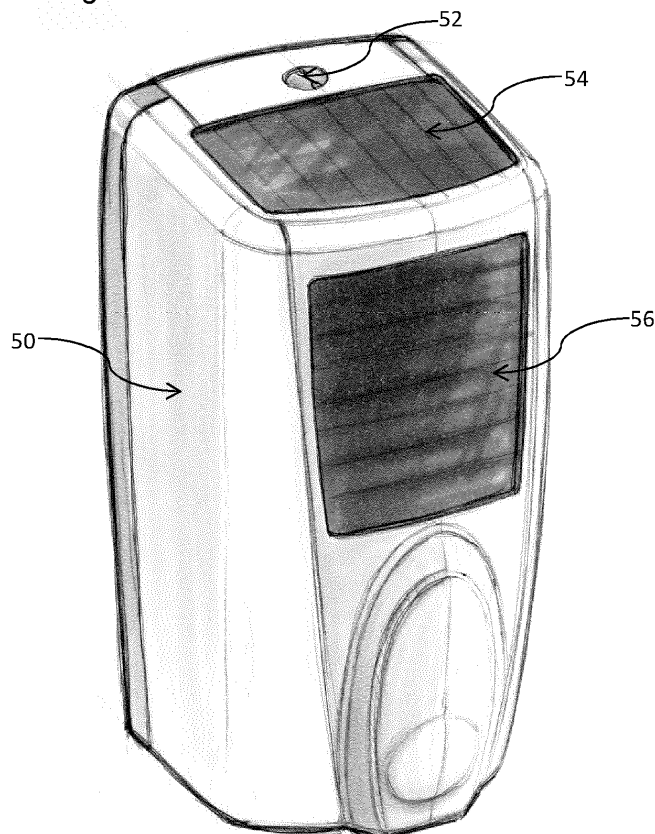
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(54) **Soap dispenser conversion kit**

(57) A battery powered soap dispenser 10 which includes a back section 12 and a removable front section 14 may be upgraded to a solar powered soap dispenser using the disclosed kit. The kit includes a replacement

front section 50, including solar panels 54, 56, and a battery pack 58 comprised of low-self-discharge (LSD) Nickel Metal-hydrate (NiMh) cells.

Fig 4



EP 3 061 373 A1

Description

[0001] The present invention relates to a kit for converting a battery-powered automatic soap dispenser into a solar powered automatic soap dispenser for use in an indoor lit area.

BACKGROUND TO THE INVENTION

[0002] Automatic soap dispensers are often provided in public washrooms. The dispensers typically include a proximity sensor, and automatic means for dispensing a measured volume of liquid or foam soap, when a user places his or her hands underneath the dispenser. Typically, a motor and gearbox arrangement is activated which in turn presses a fluid dispenser. US6557729 discloses a soap dispenser which uses a peristaltic pump. Other types of pump may be used to dispense the soap, but all rely on an electrically driven motor, solenoid valve, or similar device.

[0003] Compared with other solutions, for example bars of soap and manual liquid soap dispensers, automatic soap dispensers are hygienic, since they operate without contacting the hands. They also serve to reduce wastage and reduce mess, since they should only dispense soap when a person's hands are beneath the dispenser. Depending on the environment, different types of liquid soap can be used in the same dispenser - for example, antibacterial foam may be required in hospitals, and a barrier foam may be used in industrial areas. Other products such as moisturiser or shaving foam may also be dispensed where needed.

[0004] The disadvantage of these automatic soap dispensers is that they require electricity to work. The electricity may be supplied from the mains, but this increases the cost of installation significantly, since safety regulations generally require a qualified electrician to undertake this work in a washroom area. More commonly, battery-powered soap dispensers are provided. These are very easy to fit. Typically, these dispensers are provided in two parts-a back section which includes a battery holder and an automatic soap dispenser arrangement, and a front cover which clips and possibly locks over the back section, hiding the internal mechanism. To install the dispenser, the back section is first screwed to the wall, or attached using any other suitable fixings. Batteries and a soap bottle are installed, and then the front cover is clipped over to complete the installation.

[0005] Battery-powered soap dispensers are cheap and easy to install. However, the batteries require periodic replacement. Typically, four dry 'C' or 'D' sized cells are used to power the dispenser. The cells are replaced by removing the front cover, removing the old cells and replacing with new ones.

[0006] Another problem with battery-powered soap dispensers is that the cells will often deteriorate and leak, particularly since the soap dispensers are often provided in moist environments. Leaking cells can damage the

soap dispenser. Having to remove the leaking cells and clean away the leaked electrolyte is an unpleasant and possibly time-consuming job, adding to the ongoing running cost of a battery-powered soap dispenser. This problem can be reduced by providing some sort of sealing arrangement to protect the cells from moisture. However, any effective sealing arrangement will either significantly increase the time required to replace the cells, or will increase the cost of replacement cells if they need to be provided in specialist sealed units. The fact that ordinary 'C' sized cells, available anywhere, may be used in existing soap dispensers is important to many customers, since they know that they can rely on a cheap future supply of replacement cells.

[0007] A soap dispenser which comprises a back section including a proximity sensor, means for receiving a soap bottle, electrically-operated dispensing means for dispensing soap from the soap bottle when the proximity sensor is activated, and a battery compartment for receiving and connecting at least one cell to power the dispensing means, and which further comprises a front section for substantially covering the back section, is henceforth referred to as "a soap dispenser of the type described". An example of this type of soap dispenser is shown in Figures 1 to 3.

[0008] It is an object of the invention to provide a soap dispenser which reduces or substantially obviates the above mentioned problems.

STATEMENT OF INVENTION

[0009] According to the present invention, there is provided a kit for converting a battery-powered automatic soap dispenser of the type described into a solar powered automatic soap dispenser for use in an indoor lit area, the kit comprising:

a battery pack for fitting into the battery compartment of the soap dispenser, the battery pack including a rechargeable nickel-metal hydride (Ni-Mh) low self-discharge (LSD) battery having positive and negative connection areas for connecting with positive and negative connectors in the battery compartment;

a replacement front section for the soap dispenser;

at least one tuned amorphous silicon solar panel or at least one dye sensitised solar cell disposed on an outer surface of the replacement front section; and

cable connection means electrically connecting the tuned amorphous silicon solar panel or the dye sensitised solar cell to the Ni-Mh LSD battery in the battery pack.

[0010] The kit allows existing battery-powered soap dispensers to be upgraded to solar-powered operation in a matter of seconds. The front section of the soap

dispenser is removed and the existing cells are taken out of the battery compartment. The battery pack of the kit is then inserted into the battery compartment, and the replacement front section is clipped on. From then on, the soap dispenser will operate for an extended period without battery maintenance, as long as there is some light in the surroundings. Energy is constantly harvested from both natural and artificial light, and the energy is stored in the battery pack. Energy is drawn directly from the NiMh LSD battery pack on demand when the user passes his hand close to the proximity sensor. Tuned amorphous silicon solar panels and/or dye sensitised solar cells are particularly suitable in this application, because they harvest a useful amount of energy from artificial light sources, and can be designed specifically to work with high efficiency in a particular spectrum, for example the spectrum emitted by typical fluorescent tubes. The energy density of the tuned amorphous solar panel or dye sensitised solar cell is great enough to allow the replacement front section, with the solar panel(s), to be substantially the same size as the existing front section of the soap dispenser which is being upgraded - bulky solar panel extensions are not required. The device can continue to run indefinitely, without battery replacement, even in low-light conditions or where there is little or no natural light. The low self-discharge battery retains charge, even when not used or charged for a period of time, for example if a washroom in a workplace is closed over a weekend. Also, the low self-discharge battery can be pre-charged at the time when the kit is manufactured, and will retain its charge over a long period so that the kits can be sold with the battery pack substantially charged.

[0011] The total surface area of the solar panel(s) may be around 80 square centimetres. This is found to provide sufficient power to keep the battery pack charged in most scenarios, and solar panel(s) of this area can be accommodated without making the replacement front section of the kit any larger than the front section of the original battery-powered soap dispenser being upgraded.

[0012] Preferably, at least one solar panel may be mounted substantially on a front wall of the replacement front section. The solar panel is therefore disposed substantially vertically when a rear wall of the soap dispenser is mounted to a vertical wall. A vertically mounted solar panel on the front surface maximises the degree to which the panel absorbs incident sunlight from any windows, whilst still absorbing an appreciable amount of ambient light from ceiling-mounted lights.

[0013] Preferably, at least one solar panel may be top-mounted on the replacement front section, and may be disposed substantially at an angle of between 0 degrees and 45 degrees from the horizontal when a rear wall of the soap dispenser is mounted to a vertical wall. The top-mounted solar panel is preferably mounted at substantially between 0 and 30 degrees from the horizontal, and most preferably at substantially 20 degrees from the horizontal.

[0014] A top-mounted solar panel is most advantageous for absorbing light from ceiling-mounted light fittings. Providing the panel at an angle of around 20 degrees is found to be particularly advantageous, bearing in mind that the soap dispenser is likely to be mounted to a wall which is at the edge of a room and which extends all the way up to the ceiling. The top-mounted panel is preferably mounted at an angle to face into the room, towards ceiling-mounted sources of artificial light.

[0015] Most preferably, both top-mounted and front-mounted solar panels are provided on the replacement front section. This maximises the amount of energy which can be harvested from the ambient light, reducing the likelihood that the battery pack will become depleted, especially where there is heavy use of the soap dispenser. Also, two solar panels can provide some redundancy - the unit will not stop functioning if one of the solar panels develops a defect.

[0016] A water-resistant barrier may be provided for protecting the battery pack from moisture. In one embodiment, a shrink wrap cover is provided to protect the cells of the battery pack. Other types of water-resistant or water-tight barrier may be provided, either as an integral part of the battery pack, or as an additional component which is fitted over the battery compartment once the battery pack has been installed. It is noted that, since the battery pack is constantly recharged and has a long service life, for example around 10 years, the ease of changing the battery is less important than with the disposable dry cells which were used in the original battery-powered soap dispenser. The batteries can therefore be better sealed, to prevent moisture from affecting their operation. This protects the battery pack from short-circuits, corrosion and leakage which can all be problems with conventional battery-powered soap dispensers.

[0017] In particular, the battery pack may comprise at least one set of two NiMh cells, connected in series. Preferably, two sets of two cells are provided. In one embodiment, a shrink-wrap cover is provided over each set of two cells. The positive cable from the solar panel may be connected to one of the sets of cells and the negative cable from the solar panel may be connected to the other set of cells, so that the cells do not form a circuit with the solar panel when the sets of cells are disconnected from each other, awaiting installation. However, when the cells are inserted into a battery enclosure usually designed for 4 cells, the existing connections are used to form a charging circuit between the solar panels and the cells, and to connect the cells to the soap dispenser to power the soap dispenser.

[0018] One or more Shottky blocking diodes may be provided between the solar panel and the cells. This prevents discharge of the cells through the solar panels in low-light conditions. Shottky blocking diodes are found to be preferable to providing an electronic charge controller in this application, since they are simple, cheap and small. Also, the Shottky blocking diode uses very little energy, enabling nearly 100% efficiency in this part

of the energy transfer. A conventional charge controller would typically be 80% efficient or less. This is significant, since the amount of energy generated by the solar panel(s) is small and space is at a premium on the replacement front section. Using blocking diodes instead of an electronic charge controller allows a soap dispenser to be modified without adding bulky extensions.

[0019] The replacement front section may include a nozzle access through which soap may be dispensed. An aperture or window may be provided to allow the proximity sensor to work, and an aperture or window may be provided for viewing the amount of soap remaining. The replacement front section may be clipped, locked or latched onto the back section. These features will preferably be identical or substantially similar to the corresponding features on the front section which is being replaced, so that the operation and maintenance (i.e. refilling with soap) of the soap dispenser is substantially unaffected by conversion to solar operation. Preferably, at least one solar panel on the replacement front section is disposed above the nozzle access, so that soap will not drip onto the panel and reduce its effectiveness. In most designs of soap dispenser of the type described, the soap is dispensed in any case from the underside of the dispenser.

DESCRIPTION OF THE DRAWINGS

[0020] For a better understanding of the present invention, and to show more clearly how it may be carried into effect, an embodiment will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a soap dispenser of the type described, which is fully assembled with the front section clipped over the back section, ready for use;

Figure 2 is a perspective view of the soap dispenser of Figure 1, with the front section open;

Figure 3 is a perspective view of the soap dispenser of Figure 2, with the front section open and a bottle holder removed to reveal the battery compartment;

Figure 4 is a perspective view of a soap dispenser which has been upgraded with the kit of the invention;

Figure 5 is a perspective view of a different soap dispenser which has been upgraded with an alternative embodiment of the kit of the invention;

Figure 6 is a perspective view of a rechargeable battery pack, part of the kit of the invention, which is installed in a battery compartment.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0021] Referring firstly to Figures 1 to 3, a prior art soap dispenser of the type described is indicated generally at 10. The soap dispenser 10 comprises a front section 12 and a rear section 14. The front section 12 is simply a cover, which clips over the back section 14 and locks in place when the soap dispenser is loaded with soap and ready for use, as shown in Figure 1. The front section 12 can be unclipped by releasing a catch at the top of the dispenser, and pivots downwardly on a hinge 16 to allow access to the inside of the soap dispenser, as shown in Figure 2.

[0022] Figure 3 shows the battery compartment 18. The battery compartment 18 receives four 'C' sized dry cells, which power the soap dispenser. The soap dispenser further includes a proximity sensor, a controller, and a motor and gearing arrangement powered by the cells.

[0023] As shown in Figure 2, a bottle holder 20 is provided which can be clipped over the battery compartment 18, once the batteries are installed. A soap bottle which includes a push-operated pump outlet can then be placed within the bottle holder, with the pump and outlet extending below the bottle holder, into a pump region 22. The pump region includes a pair of jaws 24 which grip the neck of the soap bottle when installed, and a sliding actuator 26. When the soap dispenser is activated by the proximity sensor, the motor and gearing arrangement drive the sliding actuator 26 upwards, to operate the pump on the soap bottle and dispense a portion of soap.

[0024] It will be appreciated that kits according to the invention can be made which are suitable for other soap dispensers. The type of pumping and actuator arrangement, and the arrangement for holding the bottle, may be different in different devices. However, a wide range of soap dispensers are available which comprise a back section including a proximity sensor, means for receiving a soap bottle, electrically-operated dispensing means for dispensing soap from the soap bottle when the proximity sensor is activated, and a battery compartment for receiving and connecting at least one cell to power the dispensing means, and which further comprise a front section for substantially covering the back section. Many different soap dispensers of this type may be upgraded with a suitable kit according to the invention.

[0025] Figure 4 shows a first embodiment of a kit according to the invention, installed on a soap dispenser similar to that shown in Figures 1 to 3. The kit includes a replacement front section 50, which is substantially the same size and shape as the front section 12 of the soap dispenser 10 which is being upgraded. In particular, note the lock 52 on the top face of the front section 50, which is identical to a lock which is not seen in Figures 1 to 3 but which is nevertheless provided on the top face of front section 12. The lock co-operates with a catch 28, seen in Figure 3, to keep the soap dispenser 10 closed when installed and ready for use. The soap dispenser may be

opened with a suitable key in order to refill with liquid soap.

[0026] Figure 5 shows an alternative embodiment of a kit according to the invention, fitted over a different soap dispenser. Note that the front section 50' is a slightly different shape to the front section 50 in Figure 4.

[0027] Solar panels 54, 54', 56 are provided on outer surfaces of the replacement front sections 50, 50' which form part of embodiments of the inventive kit. The solar panels 54, 54', 56 are either tuned amorphous silicon solar panels, or dye-sensitised solar cells. The embodiment of Figure 4 includes two solar panels 54, 56, one on the front face of the front section 50 and one on the top face. Note that the space available on the top face of the Figure 4 embodiment is limited due to the location of the lock 52. The solar panel 56 on the front face provides extra area for energy harvesting, to compensate for the necessarily fairly small solar panel 54 on the top face. In the embodiment of Figure 5, the soap dispenser being converted has a different locking arrangement, which does not take up space on the top face of the front section 50'. As a result, a larger solar panel can be provided on the top face, and it is found that a second, front solar panel is not required in this embodiment.

[0028] Figure 6 shows a battery pack 58 which forms part of the kit. The battery pack includes two sets of two 'C' sized rechargeable cells 60, 62. Each set of cells is shrink-wrapped to protect the cells from moisture, and to hold the two cells of the set together to form one 'long cell'. The cells in the set are attached to each other in series, i.e. the negative terminal of one cell is connected to the positive terminal of the other cell.

[0029] A first cable 64 is attached to the negative end of the first cell set 60, and another cable 66 is attached to the positive end of the second cell set 62. These cables then connect to the solar panels which are provided on the replacement front section (not visible in Figure 6). Upgrading the soap dispenser 10 for solar-powered operation is very simple. The front section 12 is first removed. With the specific soap dispenser 10 illustrated, the front section 12 can be unlocked and pivoted down, as shown in Figure 2, and then detached at the hinge 16 simply by urging the side walls, which are slightly resilient, sideways away from the back section 14. The replacement front section 50 is then attached at the hinge by the reverse operation.

[0030] If a soap bottle is currently installed, it is temporarily removed to allow removal of the bottle holder 20 and access to the battery compartment 18, as shown in Figure 3. Then, the battery pack 58 is installed in the battery compartment 18 by installing each 'long cell' 60, 62 into a respective side of the battery compartment 18. The internal connections in the battery compartment join the two 'long cells' together in series, and connect the positive and negative terminals of the four-cell battery to the soap dispenser, for powering the proximity sensor, actuator, and any other electrically-powered features. The bottle holder 20 can then be clipped back on, and

the soap bottle re-installed. The replacement front cover is then closed by pivoting upwards. The converted soap dispenser, ready for use, is shown in Figure 4.

[0031] In typical light conditions found in washrooms, the soap dispenser may be expected to operate for around 10 years without requiring any battery maintenance. Conversion of an existing battery-operated soap dispenser may be carried out in-situ, with minimal effort. The converted soap dispenser is more reliable, because the batteries are unlikely to fail. The risk of battery leakage is also significantly reduced, since each 'long cell' 60, 62 is substantially sealed in shrink wrap. Because access to the battery compartment is generally not required once the soap dispenser has been converted, extra seals may be included over the battery compartment as part of the conversion process, further reducing the possibility that moisture will damage the batteries.

[0032] The embodiments described above are provided by way of example only, and various changes and modifications will be apparent to persons skilled in the art without departing from the scope of the present invention as defined by the appended claims.

Claims

1. A kit for converting a battery-powered automatic soap dispenser of the type described (10) into a solar powered automatic soap dispenser for use in an indoor lit area, the kit comprising:
 - a battery pack (58) for fitting into the battery compartment of the soap dispenser, the battery pack including a rechargeable nickel-metal-hydride (Ni-Mh) low self-discharge (LSD) battery having positive and negative connection areas for connecting with positive and negative connectors in the battery compartment;
 - a replacement front section (50) for the soap dispenser;
 - at least one tuned amorphous silicon solar panel (54, 56) and/or at least one dye sensitised solar cell disposed on an outer surface of the replacement front section (50); and
 - cable connection means (64, 66) electrically connecting the at least one tuned amorphous silicon solar panel and/or the at least one dye sensitised solar cell to the Ni-Mh LSD battery in the battery pack (58).
2. A kit as claimed in claim 1, in which at least one solar panel (56) is mounted substantially on a front wall of the replacement front section (50).
3. A kit as claimed in claim 1 or claim 2, in which at least one solar panel (54) is mounted substantially on a top wall of the replacement front section (50).

4. A kit as claimed in claim 3, in which the solar panel (54) mounted on the top wall is disposed substantially at an angle of between 0 and 45 degrees from the horizontal. 5
5. A kit as claimed in claim 4, in which the top-mounted solar panel (54) is disposed substantially at an angle of between 0 and 30 degrees from the horizontal.
6. A kit as claimed in claim 5, in which the top-mounted solar panel (54) is disposed substantially at an angle of 20 degrees from the horizontal. 10
7. A kit as claimed in any preceding claim, in which a water-resistant barrier is provided for protecting the battery pack (58) from moisture. 15
8. A kit as claimed in claim 7, in which the water-resistant barrier is provided in the form of a shrink-wrap cover. 20
9. A kit as claimed in any of the preceding claims, in which the battery pack (58) comprises one or more sets (60, 62) of two cells. 25
10. A kit as claimed in claim 9, when dependent on claim 8, in which each set of two cells (60, 62) is joined together and substantially covered by a shrink-wrap cover. 30
11. A kit as claimed in any of the preceding claims, in which at least one Schottky blocking diode is provided between the solar panel (54, 56) and the cells.
12. The kit as claimed in any of the preceding claims, fitted to a soap dispenser (10) of the type described. 35

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Fig 1

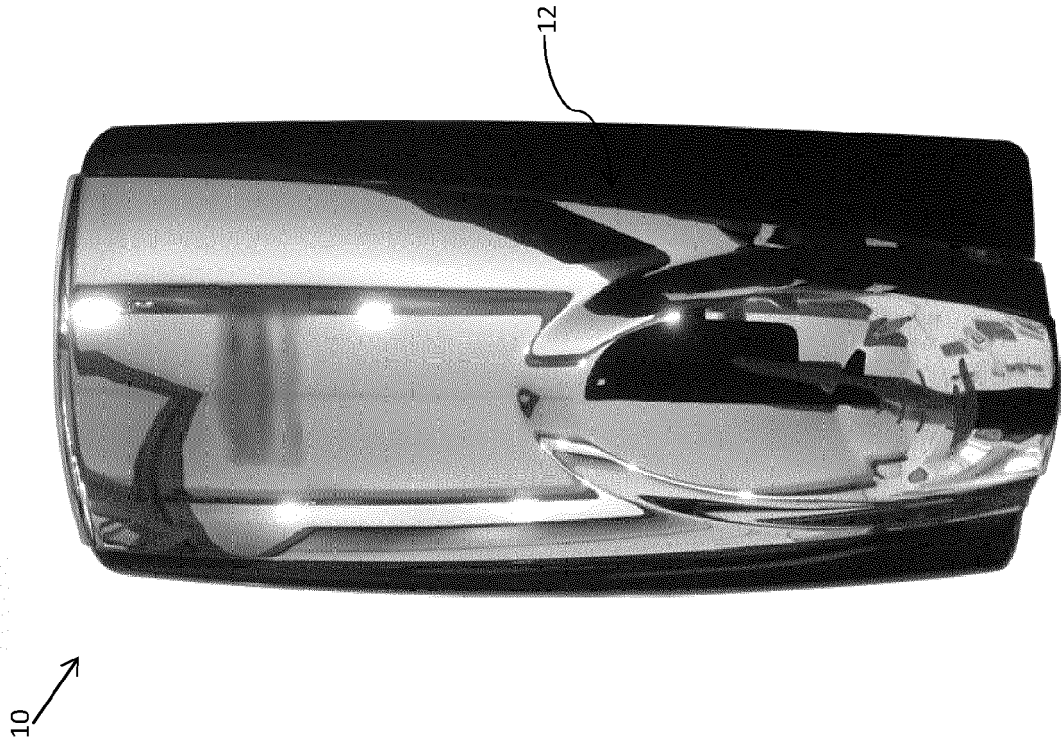


Fig 2

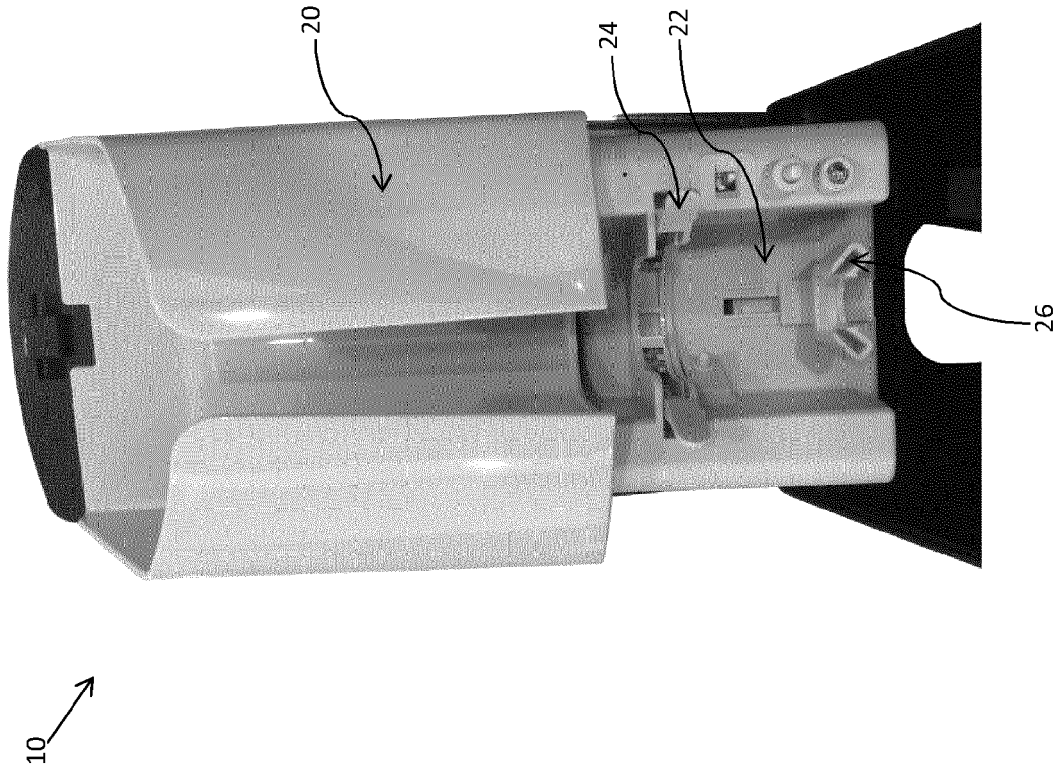


Fig 4

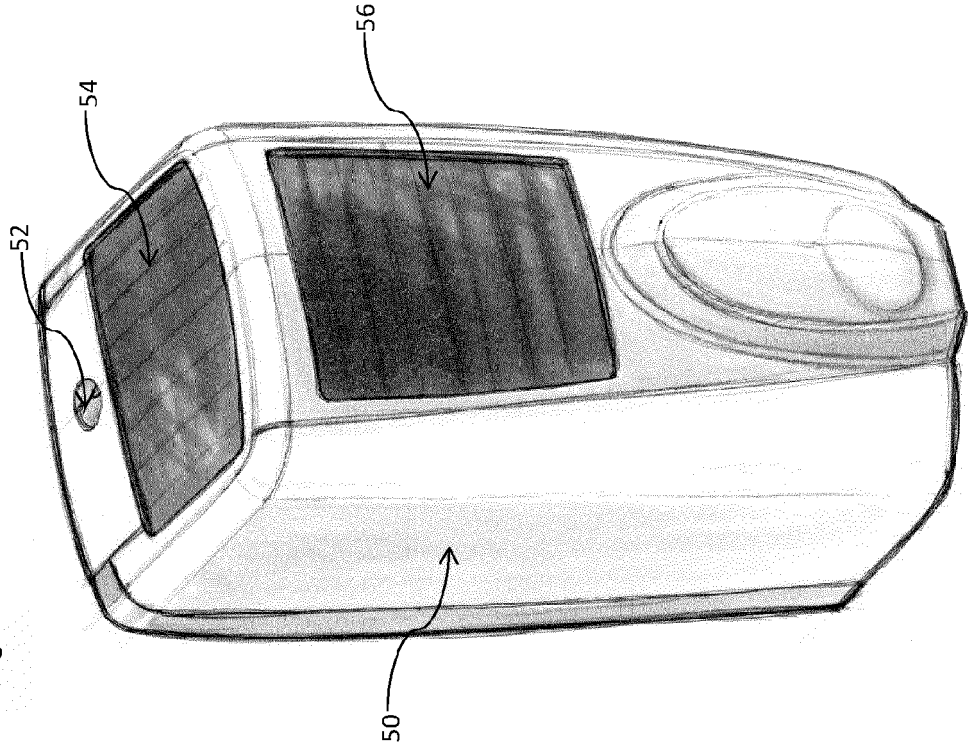
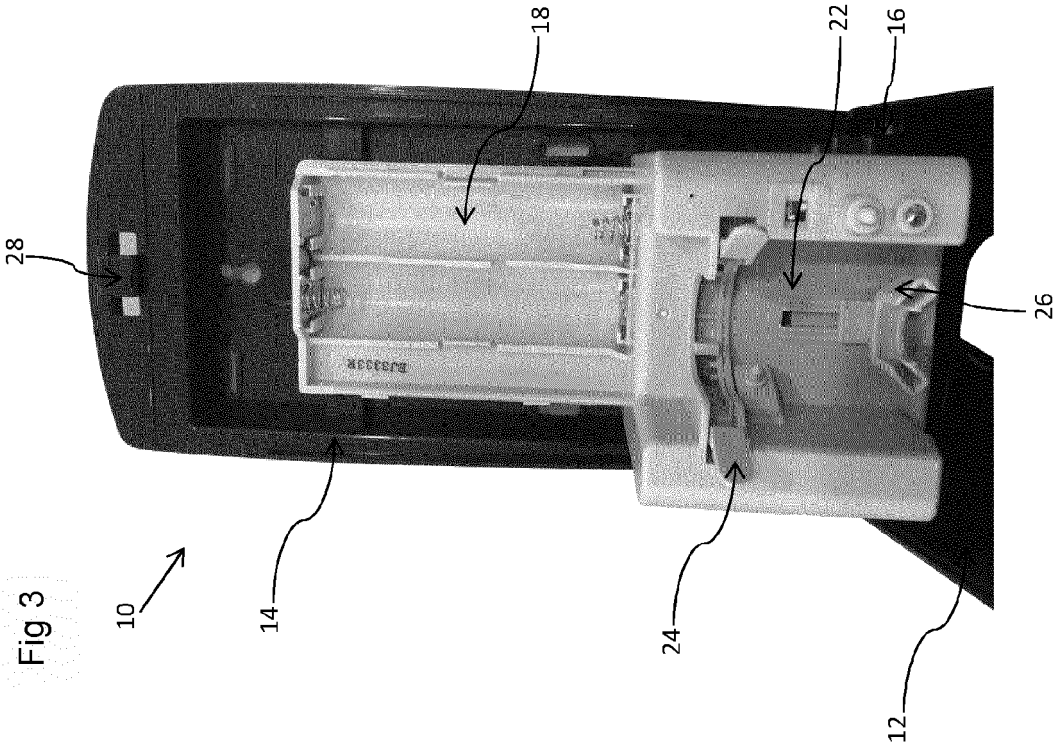
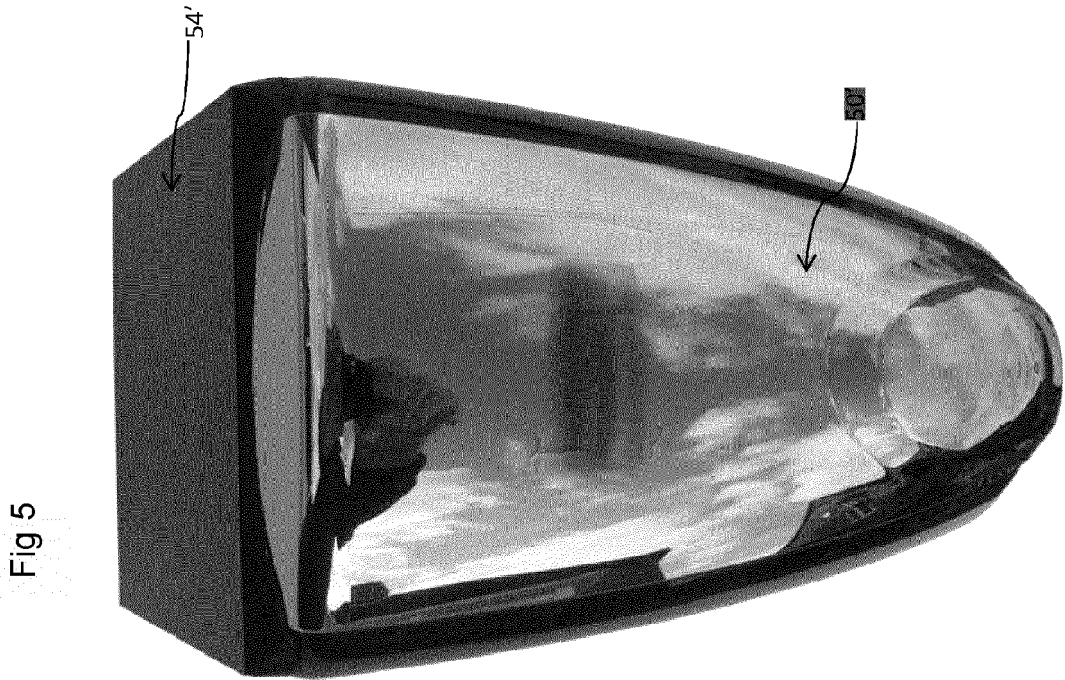
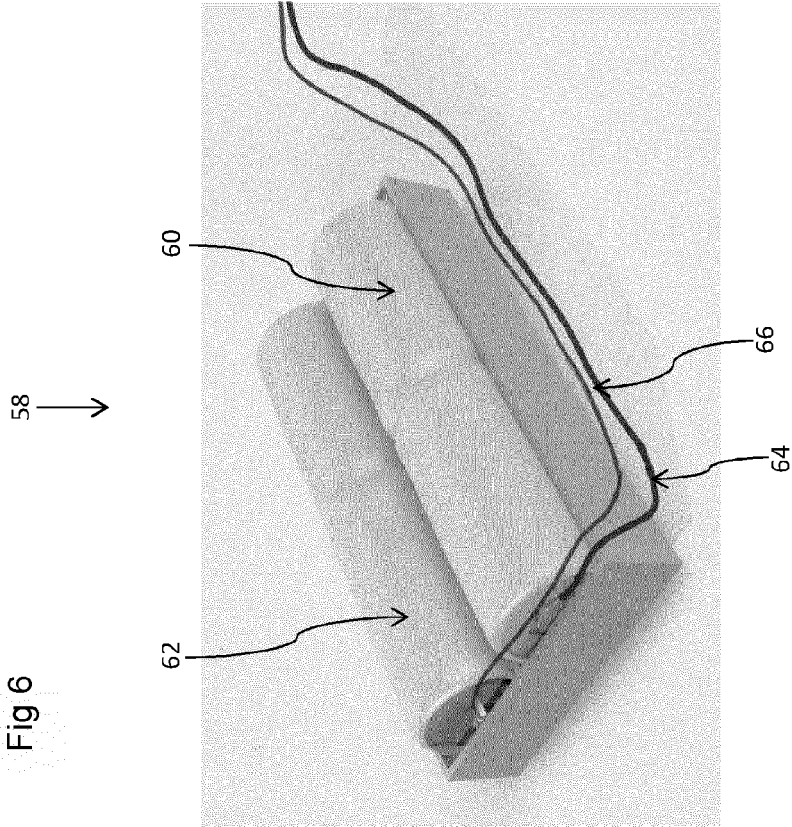


Fig 3







EUROPEAN SEARCH REPORT

Application Number
EP 15 15 6912

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	CN 201 675 835 U (YOU ZHAN ENTPR CO LTD) 22 December 2010 (2010-12-22) * paragraph [[0041]] - paragraph [[0071]]; figures *	1-12	INV. A47K5/12
E	WO 2015/028816 A1 (BLICK VIVIAN [GB]) 5 March 2015 (2015-03-05) * page 2, line 17 - page 12, line 4; figures *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47K
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 August 2015	Examiner van de Beek-Duijker
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EPO FORM 1503 03/82 (P04C01)

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

EP 15 15 6912

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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
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21-08-2015

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

REFERENCES CITED IN THE DESCRIPTION

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