pull converter takes place from the battery. Such a push-pull converter is a circuit which converts an electric d.c. voltage into a different electric d.c. voltage.

Summary of invention

According to an aspect, there is provided a cycle test method for at least one rechargeable battery having a single-battery emergency lamp as a load, wherein the battery is connected to a supply device for charging/discharging at the location of use, characterized by the following steps: i) determining that a first value of a battery parameter of the rechargeable battery that is measured by the supply device is outside a predetermined battery parameter range, wherein the battery parameter is an emergency power supply time to the single-battery emergency lamp and the predetermined battery parameter range comprises a predetermined emergency power supply minimum time; ii) responsive to a positive determination that the first value of the battery parameter is outside the predetermined battery parameter range, iii) charging the rechargeable battery by means of the supply device to a full capacity; iv) interrupting the charging for a specified time in order to lower the temperature of the rechargeable battery; v) discharging the rechargeable battery to a deep discharge; and vi) performing steps iii) to v) n-times; vii) measuring a second value of the battery parameter after repeating steps iii) to v) n-times; viii) determining whether the second value of the battery parameter is outside the predetermined battery parameter range; ix) responsive to a negative determination that the second value of the battery parameter is outside the predetermined battery parameter range, reusing the rechargeable battery for supplying the load; and x) responsive to a positive determination that the second value of the battery parameter is outside the predetermined battery parameter range, generating and displaying an error message via a display of the supply unit to notify a user regarding a malfunction of the rechargeable battery with respect to the battery parameter.

An advantageous embodiment of the invention is explained in greater detail below with reference to the appended drawings.

In the drawings:

Figure 1 shows a simplified basic representation of a circuit for carrying out the cycle test method and

Figure 2 shows graphs of current, voltage and temperature, in particular during the cycle test method.

Figure 1 shows a highly simplified sketch of a corresponding circuit arrangement for carrying out the cycle test method according to the invention. The circuit comprises at least one rechargeable battery 1 or also a plurality of rechargeable batteries. The battery or batteries 1 are arranged in a housing 4, in which a display device 15 is optionally also integrated. This can be connected to a supply unit 3 in a lamp by means of corresponding explosion-proof contacts, for example according to explosion protection type Ex-d. The corresponding connection makes it possible that even in areas at risk of explosion, for example, the housing 4 with the batteries can be replaced, in particular, without switching off of the mains voltage 16. The battery or batteries 1 are connected to a supply device 3. The battery can be charged and monitored thereby. In particular, such charging, discharging and monitoring takes place during the cycle test method according to the invention.

In the illustrated exemplary embodiment the supply device 3 has various components. A component is, for example, a charging device 12, which carries out the charging of the respective battery 1 from the mains voltage 16. Furthermore, the supply device 3 has a battery monitor 19, a constant current source 14 and a processor 13. The charging of the respective battery 1 by means of the charging device 12 from the constant current source 14 can be monitored by the processor 13. Moreover, the processor 13 can likewise control and monitor the discharging of the respective battery 1, in particular by means of the load 2 and, optionally the electronic ballast 17. The charging of the respective battery takes place depending upon the capacity. The load 2 may be an emergency lamp which has, for example, a phosphor lamp, a LED module or the like as the light fixture. In this connection the electronic ballast 17 optionally serves for activation of the light fixture.

CLAIMS

1. A cycle test method for at least one rechargeable battery (1) having a single-battery emergency lamp (2) as a load, wherein the battery (1) is connected to a supply device (3) for charging/discharging at the location of use, characterized by the following steps:

i) determining that a first value of a battery parameter of the rechargeable battery (1) that is measured by the supply device (3) is outside a predetermined battery parameter range,

wherein the battery parameter is an emergency power supply time to the single-battery emergency lamp (2) and the predetermined battery parameter range comprises a predetermined emergency power supply minimum time;

ii) responsive to a positive determination that the first value of the battery parameter is outside the predetermined battery parameter range,

iii) charging the rechargeable battery (1) by means of the supply device (3) to a full capacity;

iv) interrupting the charging for a specified time in order to lower the temperature of the rechargeable battery (1);

v) discharging the rechargeable battery (1) to a deep discharge; and

vi) performing steps iii) to v) n-times;

vii) measuring a second value of the battery parameter after repeating steps iii) to v) n-times;

viii) determining whether the second value of the battery parameter is outside the predetermined battery parameter range;

ix) responsive to a negative determination that the second value of the battery parameter is outside the predetermined battery parameter range, reusing the rechargeable battery (1) for supplying the load (2); and

x) responsive to a positive determination that the second value of the battery parameter is outside the predetermined battery parameter range, generating and displaying an error message via a display (15) of the supply unit (3) to notify a user regarding a malfunction of the rechargeable battery (1) with respect to the battery parameter.

2. The cycle test method according to claim 1, characterized by arrangement of the rechargeable battery (1) in a separate housing (4) and connection of the housing (4) to the load

(2) by means of explosion-proof contacts and/or design of the supply device (3) with the necessary type of explosion protection.

3. The cycle test method according to claim 1 or 2, characterized by detection of the number of rechargeable batteries (1) and/or battery types by the supply device (3).

4. The cycle test method according to one of the preceding claims, characterized by recording and/or monitoring of battery parameters before, during and after the steps iii) to v).

5. The cycle test method according to one of the preceding claims, wherein determining that the first value of the battery parameter of the rechargeable battery (1) as measured by the supply device (3) is outside the predetermined battery parameter range comprises determining that the emergency power supply time of the load (2) by the rechargeable battery (1) is less than the predetermined emergency power supply minimum time.

6. The cycle test method according to one of the preceding claims, characterized by charging/discharging in steps iii) to v) by means of charging current monitoring and/or charging voltage monitoring and/or by temperature monitoring of the rechargeable battery (1).

7. The cycle test method according to one of the preceding claims, characterized by carrying out of the steps iii) to v) only after supply of the rechargeable battery (1) with mains voltage (16) for a predetermined time.

8. The cycle test method according to one of the preceding claims, characterized by design of the supply device (3) with a charging device (12) for the battery (1) and/or a processor (13) and/or a constant current source (14) and/or the display (15) and/or a battery monitoring device (19).

9. The cycle test method according to one of the preceding claims, characterized by discharging of the rechargeable battery (1) in step v) by means of the load (2).

10. The cycle test method according to one of the preceding claims, characterized by capacity-dependent charging of the rechargeable battery (1) in step iii).

11. The cycle test method according to one of the preceding claims, characterized by disconnection in the step v), of a mains voltage (16) from an electronic ballast (17) (EB) for supplying a phosphor lamp or a LED module as load (2) and supplying the EB (17) from the rechargeable battery (1) by means of a push-pull converter (18).