

CONTAINER FOR STORING AT LEAST ONE ELECTRICAL ENERGY STORAGE UNIT, PROVIDED WITH A VENT HATCH

FIELD OF THE INVENTION

5 The invention is directed towards the field of self-contained, stationary electrical installations i.e. fixed installations which couple energy production means, such as solar panels or wind turbines, with units to store the electrical energy thus produced.

10 The invention more particularly concerns a stationary container for storing at least one such electric energy storage unit, this container containing at least one element to receive said unit.

TECHNOLOGICAL BACKGROUND OF THE INVENTION

15 The aforementioned electrical installations are intended to be installed in remote regions having difficult access e.g. but not exclusively in Africa.

 Containers known as shelters allow the housing not only of a group of energy storage units but also of various devices ensuring the electronic management of their operation and safety.

20 For example, stationary shelters are known to store at least one electric energy storage unit, which comprise at least one emplacement to receive said unit, preferably several that are superimposed and/or juxtaposed.

 Although the operation of these units is regularly inspected, the risk cannot be excluded that at least one unit may have a fault and cause the onset of fire.

25 Even if the container is equipped with a smoke detector, action by personnel able to combat a fire is problematic insofar as this type of container, as indicated above, is intended to be installed in remote regions.

30 Over and above this risk, there is a second risk related to the fact that the container is evidently closed. In this case, the onset of fire will generate gas overpressure that needs to be evacuated.

 The object of the present invention is to provide a solution to this problem.

SUMMARY OF THE INVENTION

Therefore, the present invention relates to a container for storing at least one electrical energy storage unit, characterized by the fact that at least one of the walls thereof is provided with at least one vent hatch that is movable
 5 between a closed so-called normal position in which it closes said wall, and an open so-called safety position in which it places the inner space of said container in communication with the outside, and by the fact that it comprises:

- at least one smoke detector which, when actuated, is configured to trigger automatic movement of said hatch from said normal position to said
 10 safety position;

- and/or management means configured to measure an operating parameter of said storage unit and to trigger automatic movement of said hatch from said normal position to said safety position when the performed measurement reaches a predetermined set value.

15 Under these conditions, as soon as the detector is actuated, the vent hatches therefore open automatically and position themselves in the safety position so that smoke and gases are able to be evacuated towards the outside, thereby preventing any risk of overpressure.

20 In addition, when said management means are present, damage caused by an imminent fire can be prevented or limited.

According to other nonlimiting and advantageous characteristics of the invention, taken alone or in combination:

- the container is in the form of a rectangular or square parallelepiped and said hatch is arranged on a vertical peripheral side thereof;

- 25 - the container is in the form of a rectangular or square parallelepiped and said hatch is arranged on a roof thereof;

- said hatch is-mounted pivotably relative to said wall;

- said hatch is integrated in an access door to said inner space or is merged with this door;

- 30 - said hatch is provided with return means which tend to hold it in safety position when said return means are not restrained;

- said return means are selected from the group formed by: a hinge with reverse action springs, one or more actuators in particular pneumatic or electric, an elastomer material, at least one spring such as a torsion spring or compression
 35 spring, or a combination of at least two thereof;

- the container comprises means to retain said hatch in normal position, these means becoming inoperative as soon as they receive information relating to smoke detection, via said detector, or information relating to the operation of said at least one storage unit via said management means;

5 - said retaining means are selected from the group formed by at least one electromagnetic suction pad, at least one remote-controlled pneumatic kit, at least one electromagnetic or electropneumatic bolt, at least one electromagnetic or electropneumatic striker plate;

- the container comprises at least one position sensor of said hatch;

10 - the container comprises several hatches and several detectors, these detectors being configured to trigger said hatches selectively or simultaneously;

- the container comprises several hatches and said management means are configured to trigger the opening of said hatches selectively or simultaneously.

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BRIEF DESCRIPTION OF THE DRAWINGS

Other characteristics and advantages of the invention will become apparent on reading the following description of one preferred embodiment of the invention. This description is given with reference to the appended drawings in which:

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- Figure 1 is a perspective view of one example of embodiment of a storage container according to the invention;

- Figure 2 is a detailed view of the front wall of the container in Figure 1, one of the hatches being open providing a view of the electrical energy storage units stored therein;

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- Figure 3 is a detailed view of one of the doors of the container in Figure 1 in which a vent hatch can be seen that is illustrated in closed position, called normal position;

- Figure 4 is a similar view to Figure 3 showing the hatch in open position called safety position;

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- Figure 5 is a perspective view of a hatch and of the frame on which it is-mounted pivotably;

- Figures 6 and 7 are partial, perspective cross-sectional views of a hatch and of the door on which it is mounted, these views showing means allowing retaining of the hatch in closed position and means providing the user with information on the position of the hatch;

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- Figure 8 is a detailed view of the inner side of the hatch and associated door, intended more particularly to show the aforementioned means;
- Figure 9 is a detailed view showing the arrangement of Figure 8, the hatch being illustrated this time in open so-called safety position.

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DETAILED DESCRIPTION OF THE INVENTION

As indicated above, a storage container according to the invention can be seen in Figure 1, configured to house therein at least one electrical energy storage unit.

10 Solely by way of indication, the electrical energy storage unit under consideration can be an electrical energy storage battery of LMP® type (Lithium Metal Polymer) or of Lithium Ion type.

This container has a general configuration known *per se*. Here it is a metal container in the form of a rectangular or square parallelepiped. This
15 container 1 comprises an upper wall 10 forming a roof and ceiling, a lower wall 11 forming a floor, and four vertical peripheral walls referenced 12 to 15.

The lower wall 11, as is known *per se*, is provided with means allowing the insertion of the forks of a forklift truck, so that the container 1 can be moved at will. Also, this lower wall 11, and also preferably the upper wall 10, comprises
20 means at its four corners allowing the positioning and fixing of several containers of this type stacked one on the other.

The aforementioned four peripheral walls are more specifically a front wall 12, a rear wall 13 and two right and left side walls 14, 15.

In the example illustrated here, the front wall 12 is provided with two
25 swing doors 2 namely a right swing door 2a and a left swing door 2b. Together they occupy substantially the entire surface of the front wall 12.

These doors evidently comprise a vertical hinge axis 21 positioned as close as possible to the vertical edges of the front wall 12. They are also provided with a locking device to hold them in closed position. This locking device 20 of known
30 type will not be further detailed.

According to the invention, this container 1 comprises a wall that is provided with at least one vent hatch 3.

More specifically, in the precise case illustrated here, the hatches 3 that can be seen in Figure 1 are three in number. One hatch 3a equips the
35 aforementioned door 2a, while one hatch 3b equips door 2b. In addition, the wall forming the right sidewall 14 of the container 1 is also provided with a hatch 3c.

Evidently, this example of embodiment is in no way limiting. In other words, it can be envisaged to have at least one hatch, of same type as those illustrated here, on the rear wall 13 and on the second peripheral wall 15. It can even be envisaged that the upper wall 10 i.e. the roof could also be equipped therewith.

Additionally, in other non-illustrated embodiments, there could be no hatches on the front wall and only on the other peripheral walls and/or on the upper wall.

One other alternative could be to have a hatch 3 merged with one and/or the other of the doors 2a and 2b.

The hatch 3a illustrated in open position in Figure 2 provides a view of the electrical energy storage units 4 such as mentioned above, which are stored inside the inner space E of the container 1, this storage made possible via supporting racks for example that are not described in further detail in the remainder of the description.

Not illustrated in the Figures is a smoke detector referenced D contained in the container inside its inner space E e.g. close to the upper wall 10. More particularly, the smoke detector D is arranged against the upper wall 10 and directly above the assembly of superimposed storage units.

According to the invention, the vent hatches 3 are movable between a closed so-called normal position in which they close the wall equipped therewith and an open so-called safety position in which they place the inner space E of the container 1 in communication with the outside.

Reference will now be more specifically made to Figures 3 *et seq.* to explain the structure and operation of these vent hatches, and the type and function of the means to cause these to move automatically from one position to the other.

Therefore, with reference to Figure 5, the illustrated hatch 3 can be hatch 3a in Figure 1. The description that will be given thereof also applies to the other hatches equipping the container unless otherwise indicated.

This hatch 3, here formed of a planar insulating panel, is associated with a rectangular metal frame 30 forming the hatch frame provided with a peripheral seal 300 more particularly illustrated in Figures 6 and 7. The hatch 3 is hinged on this frame via hinges 31 so that pivoting thereof from a closed position to an open position takes place about a vertical axis passing through the longitudinal axis of these hinges.

These hinges 31 integrate means to return the hatch 3 to open so-called safety position.

Here they are preferably hinges with reverse action springs. This means that by default the hatch 3 is in open position, or in other words that the rest
5 position of the hinge springs corresponds to an open position of the hatch 3.

Other return means which also tend to hold the hatch 3 in safety position can be envisaged instead of the above-mentioned reverse action springs.

Therefore, these return means can be selected from the following list: one or more actuators particularly pneumatic or electric, a pre-stressed
10 elastomer material, at least one spring such as a torsion spring or compression spring, or combination of at least two of these return means.

According to one advantageous embodiment, the container also comprises retaining means for the hatch 3 that are conformed to hold it in normal position i.e. closed position, which become inoperative when they receive information
15 related to smoke detection via the detector D or information relating to the operation of the storage units via management means as described below.

In the case presented here, these retaining means 5 are formed of an electromagnetic suction cup 51 secured to a plate 50 itself attached to a corresponding part of the inner wall of the door 2, so that the suction cup is
20 arranged such that it enters at least partly into a hollow 32 provided in the thickness of the hatch 3 (see in particular Figure 6).

In the case where the hatch 3 is not mounted on a door but directly on a wall of the container 1, it is then this wall that is mounted on the plate 50.

These retaining means 5, formed here of an electromagnetic suction cup,
25 may be replaced by any type of means to retain the hatch in closed position. For example, they can be one or more remote-controlled pneumatic kits usually used to trigger fire emergency hatches. They may also be an electromagnetic or electropneumatic bolt, or an electromagnetic or electropneumatic striker plate.

In addition, the hatch 3 is also provided with a position sensor 6 allowing
30 automatic checking of whether the hatch is in closed position.

For example, this sensor 6 is consisting of a roller (or skid-shoe) mounted in rotation, and of a compression spring which causes the roller/skid-shoe to move from a compressed position against the hatch 3 to a released position when the hatch 3 is open.

35 When the smoke detector is actuated, it sends corresponding information to a central processing unit piloted by computer which *inter alia* triggers opening

of all the hatches 3, namely it cuts off powering of the electromagnetic suction cups described above. By so doing, the hatches all change over to the open so-called safety position due to the presence of the return means 31.

Independently of or combined with the foregoing, the container 1 may
5 contain management means such as a programmable logic controller which *inter alia* perform one or more measurements of at least one operating parameter of the storage units 4, these means being configured to trigger selective or simultaneous automatic movement of said hatches from said normal position to said safety position as soon as the performed measurement reaches a
10 predetermined set value.

The parameter under consideration can be temperature, intensity, voltage etc., the set value then corresponding to an abnormal value of this parameter, said value can also be parameterized according to applications.

In this manner damage caused by an imminent fire can be prevented or
15 limited.

In variants of embodiment, the container could comprise several detectors linked together and/or to the aforementioned central processing unit to trigger opening of several hatches simultaneously or independently.

As illustrated in the appended Figures, the hatches can be integrated in a
20 wall of the container or in a door. Each hatch 3 can be thermally insulated as needed and can carry members of air vent grille type, or fans, air-conditioning equipment, air-flow registers, etc.

In the particular case where the container 1 is equipped with several hatches 3, a combination of the opening of these hatches can be envisaged based
25 on the direction of the wind to allow better smoke evacuation.

In this case, suitable sensors are to be provided connected to the central processing unit of the container to optimize the opening of these hatches.

In addition, the container can be provided with a blower device for faster evacuation of smoke.

30 The presence of a system to protect the inside of the container against bad weather can also be envisaged, when the hatches unduly move over to the open safety position e.g. further to electric or magnetic perturbations. In such case, it is effectively important to protect the elements contained inside the container, elements which *a priori* are in perfect state of operation.

Finally, a sound alarm system can be connected to the smoke detector and to the central processing unit to warn close neighbourhood in the event of fire.

- 5 In all the foregoing description, the hatches have been considered to be formed of a planar light-blocking material. However, it could be envisaged that these hatches are of slightly convex shape of so-called skydome type. Also, these hatches could be made of a translucent or transparent material.

CLAIMS

1. Container (1) for storing at least one electrical energy storage unit (4), characterized by the fact that at least one of the walls thereof is provided with at least one vent hatch (3) that is movable between a closed so-called normal position in which it closes said wall, and an open so-called safety position in which it places the inner space (E) of said container in communication with the outside, and by the fact that it comprises:

- at least one smoke detector (D) which, when actuated, is configured to trigger automatic movement of said hatch (3) from said normal position to said safety position;
- and/or management means configured to measure at least one operating parameter of said at least one storage unit (4) and to trigger automatic movement of said hatch from said normal position to said safety position when said performed measurement reaches a predetermined set value.

2. The container (1) according to claim 1, characterized by the fact that it is in the form of a rectangular or square parallelepiped and in that said hatch (3) is arranged on a vertical peripheral side (12, 13, 14, 15) thereof.

3. The container according to one of claims 1 and 2, characterized by the fact that it is in the form of a rectangular or square parallelepiped and in that said hatch (3) is arranged on a roof (10) thereof.

4. The container (1) according to one of claims 1 to 3, characterized by the fact that said hatch (3) is-mounted pivotably relative to said wall.

5. The container (1) according to one of the preceding claims, characterized by the fact that said hatch (3) is integrated in an access door (2) to said inner space (E) or is merged with this door (2).

6. The container (1) according to one of the preceding claims, characterized by the fact that said hatch (3) is provided with return means (31) which tend to hold it in safety position when these return means are not restrained.

7. The container (1) according to claim 6, characterized by the fact that said return means (31) are selected from the group formed by: a hinge with reverse action springs, one or more actuators in particular pneumatic or electric, an elastomer material, at least one spring such as a torsion spring or compression spring, or a combination of at least two thereof.

8. The container (1) according to one of the preceding claims, characterized by the fact that it comprises means (5) to retain said hatch (3) in normal position which become inoperative as soon as they receive information relating to smoke detection, via said detector (D), or information relating to the operation of said at least one storage unit (4), via said management means.

9. The container (1) according to claim 8, characterized by the fact that said retaining means are selected from the group formed by at least one electromagnetic suction cup (5), at least one remote-controlled pneumatic kit, at least one electromagnetic or electropneumatic bolt, at least one electromagnetic or electropneumatic striker plate.

10. The container (1) according to one of the preceding claims, characterized by the fact that it comprises at least one position sensor (6) of said hatch (3).

11. The container (1) according to one of the preceding claims, characterized by the fact that it comprises several hatches (3) and several detectors (D), these detectors (D) being configured to trigger the opening of said hatches (3) selectively or simultaneously.

12. The container (1) according to one of the preceding claims, characterized by the fact that it comprises several hatches (3) and in that said management means are configured to trigger the opening of said hatches (3) selectively or simultaneously.