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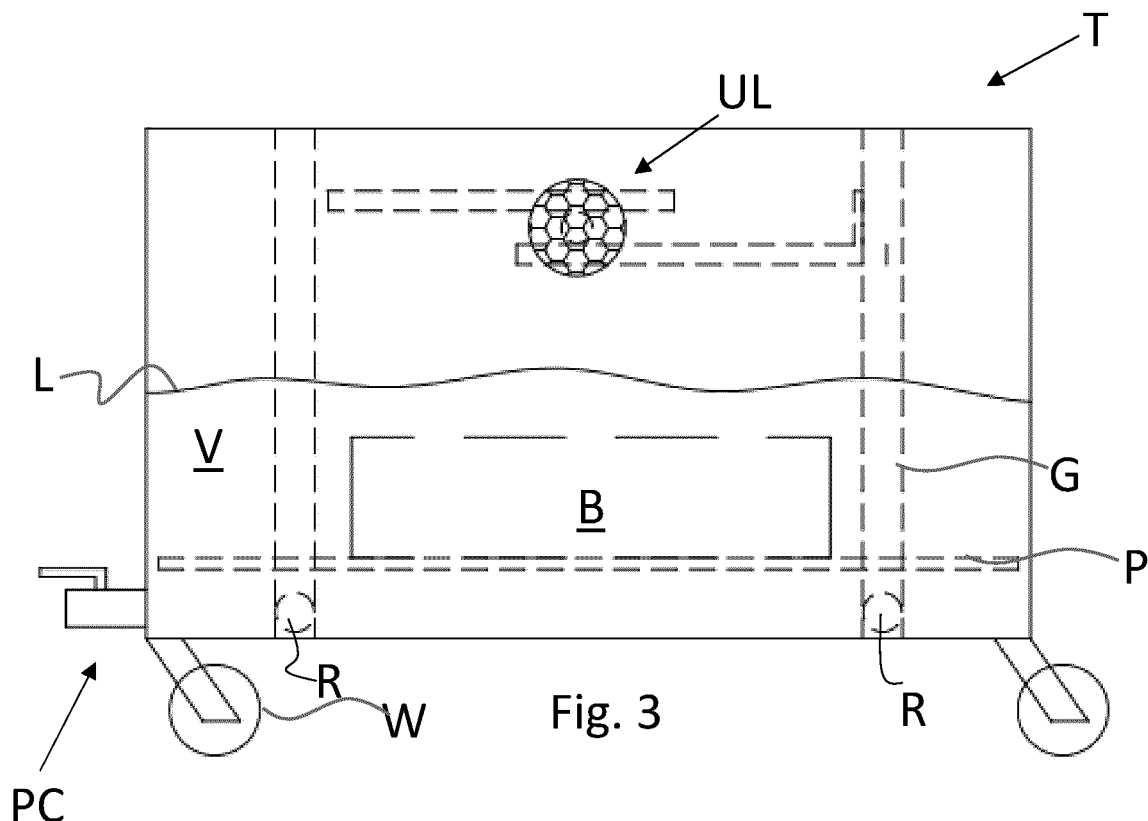
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(54) **SUPPORT WORKBENCH OR TROLLEY FOR THE MAINTENANCE OF A VEHICULAR PROPULSION BATTERY**

(57) Support bench or trolley (T) for the maintenance of a vehicle propulsion battery (B) comprising a work surface (P), a container volume (V) closed at the bottom arranged operationally underneath the work surface and capable of containing a refrigerant and/or extinguishing

liquid (L) and locking means (UL) arranged to unlock the work surface; the work surface being capable of releasing or accompanying the battery inside the container volume (V).



Description

Field of the invention

[0001] The present invention relates to the field of support benches or trolleys for the maintenance of a vehicle propulsion battery.

State of art

[0002] Battery packs used to propel electric vehicles store large amounts of energy in a small space, defining high energy densities.

[0003] Individual cells or groups of cells can be equipped with devices that try to limit or avoid the effects of anomalous situations that can compromise safety. A typical phenomenon considered anomalous is the so-called thermal runaway. Phenomenon in which a large amount of heat and gases are developed that can lead to the ignition of a fire.

[0004] Such conditions can be caused by the failure of a battery cell, thermal or mechanical abuse or the short circuit of at least one of the cells of the battery pack.

[0005] The heat released by the short circuit can be quite large, depending on many factors, including the amount of energy converted into heat and the location of the short circuit, can start a chain reaction.

[0006] When the temperature that develops exceeds a predetermined threshold which is approximately 200°C in relation to the electro-chemical characteristics of the cell, an irreversible exothermic chain reaction is triggered which causes the overheating and failure of the cells adjacent to the one initially damaged, releasing heat which, in turn, spreads to the entire battery pack.

[0007] Depending on the characteristics of the individual cells and the configuration of the battery pack casing, a fire may start or, in extreme cases, the entire battery pack may explode.

[0008] When the battery pack is disconnected from a related vehicle, the related control and monitoring systems are not able to signal the triggering of a thermal drift with serious risk for maintenance workers who are preparing to disassemble the battery pack.

[0009] Unless specifically excluded in the detailed description that follows, what is described in this chapter is to be considered as an integral part of the detailed description.

Summary of the invention

[0010] The purpose of the present invention is to make maintenance operations conducted on a vehicle battery pack safer.

[0011] The basic idea of the present invention is to propose a support bench or trolley for the maintenance of a vehicle propulsion battery comprising a work surface and an underlying container volume capable of containing a coolant/extinguishing liquid, wherein the work surface is

capable of releasing or accompanying a battery supports into the container volume in response to a detection of a dangerous condition.

[0012] The dangerous situation can be determined by the operator and therefore the trolley comprises at least one human/machine interface device arranged to activate the immersion of the vehicle battery subject to maintenance. The dangerous situation can be determined by a special detection system configured to automatically activate the immersion of the vehicle battery being maintained.

[0013] It should be noted that the terms "battery pack" and "battery" have the same meaning, meaning a set of cells packed inside a casing which may include electrical and electronic circuitry known in itself.

[0014] According to a first preferred variant of the invention, the container volume of the trolley contains the coolant/extinguishing liquid before the vehicle battery is placed on the relative support surface for maintenance.

According to a second preferred variant of the invention, the container volume of the trolley is empty, the trolley includes hydraulic means for connection to a coolant/extinguishing liquid pipeline and means are present for activating the filling of the container volume of the trolley. More preferably, the trolley includes means for automatically activating the filling of the container volume in response to the introduction of the battery inside the container volume.

[0015] The dependent claims describe preferred variants of the invention, forming an integral part of this description.

Brief description of the figures

[0016] Further objects and advantages of the present invention will be clear from the following detailed description of an embodiment thereof (and variants thereof) and from the attached drawings given purely for explanatory and non-limiting purposes, in which:

- Fig. 1 discloses schematically a first variant of a support bench according to the present invention;
- Fig. 2 discloses schematically a second variant of a trolley according to the present invention;
- Fig. 3 discloses schematically a third variant of a support bench according to the present invention;
- Figs. 4a - 4b disclose two configurations assumed by the variant of the invention according to the previous figures;
- Fig. 5 discloses a safety system for the maintenance of vehicle propulsion batteries.

[0017] The same reference numbers and letters in the figures identify the same elements or components or functions.

[0018] It should also be noted that the terms "first", "second", "third", "upper", "lower" and the like may be used here to distinguish various elements. These terms

do not imply a spatial, sequential or hierarchical order for the modified elements unless specifically indicated or inferred from the text.

[0019] The elements and features illustrated in the various preferred embodiments, including the drawings, may be combined with each other without departing from the scope of protection of this application as described below.

Detailed description

[0020] With the help of Figs. 1 - 3, some variants of the present invention are shown.

[0021] Fig. 1 shows a support bench T comprising a work surface P and an operationally underlying, lower-closed container volume V, capable of containing a liquid, in particular an extinguishing and/or refrigerant liquid.

[0022] The lower-closed volume is defined by an operationally horizontal back wall BW and by perimeter and operationally vertical walls LW.

[0023] The support bench preferably has a parallelepiped shape, but could have different shapes depending on the circumstances.

[0024] Preferably, the work surface P is positioned at an ergonomic height between 90 and 110 cm as required by OHSAS 18001.

[0025] The work surface is arranged to release, for example by rotating with respect to an edge hinged to a wall of the container volume, or to accompany the battery, by means of a translation.

[0026] It is advantageous to exploit the weight force acting on the load itself to facilitate its introduction into the container volume.

[0027] According to the present invention, at least a portion of the work surface P is arranged to assume

- A first support position, capable of supporting a load, and in particular a battery, externally to the container volume V;
- A second collapsed position, capable of allowing the load to enter the container volume V.

[0028] More specifically, the work surface P is slidably associated with at least two perimeter and vertical walls LW by means of guides G, arranged to allow a transition between the first and second positions of the support surface, by translation. For this purpose, wheels R are rotatably fixed to the work surface P and are slidably associated with the vertical guides G, arranged on the internal faces of the perimeter and vertical walls LW to guide the support surface P during the stroke from the first to the second position and vice versa.

[0029] Locking means UL are arranged to lock the work surface P in the first position.

[0030] The locking devices can be manually and/or electrically released, for example, by means of an electric lock.

[0031] When the UL locking means are deactivated to

unlock the work surface, this is arranged to release the load which therefore falls inside the container volume.

[0032] According to the variant of figures 2 and 3, the container volume, closed at the bottom, includes hydraulic connection means PC which include for example a first manual valve V1, arranged externally to the container volume, and preferably quick coupling means for connection to a conduit connected to a source of refrigerant and/or extinguishing liquid L. So, when an operator detects a thermal drift, he/she can cause the work surface to be unlocked, by acting on the locking means, and subsequently open the valve V1 of the hydraulic connection so as to flood the container volume. The locking means can be made in any way, and act directly on the work surface P or indirectly on the wheels R.

[0033] With the help of Figs 4a and 4b, a further preferred variant of the invention is shown, according to which the filling of the container volume V is performed automatically in response to the introduction of the load, i.e. the battery B, inside the same container volume. According to this variant, the hydraulic connection means comprise a second normally open valve V2 and a normally closed valve V3 in cascade to the second valve; both arranged inside the container volume.

[0034] When the battery is introduced into the container volume V, directly or indirectly, it acts on a lever operationally connected to the third normally closed valve V3 causing the opening of the third valve and therefore the flooding of the container volume V. The normally open valve V2 is associated with a float arranged in the container volume. When the extinguishing and/or refrigerant liquid L reaches a predetermined level, then the float closes the second valve V2.

[0035] From the comparison of Figs. 4a and 4b, it can be seen that the lowering of the work surface causes the third valve V3 to open, while the raising of the liquid level L causes the corresponding lifting of the float associated with the second valve V2 which therefore closes.

[0036] Advantageously, the filling of the container volume V is completely automated.

[0037] According to a further preferred variant of the invention, the blocking means UL are electro-actuated and interlocked with a monitoring system.

[0038] A safety system SS according to the present invention comprises

- the detection system IRC of a thermal runaway of the battery, preferably comprising a thermal camera arranged to monitor the load supported by the work surface and
- the bench or trolley T described above,

in which the detection system is configured to deactivate the blocking means, in response to the detection of a possible thermal drift, so that the work surface releases or accompanies the battery into the volume below.

[0039] Advantageously, monitoring is performed 24 hours a day, without the presence of a human operator

and furthermore, the immersion of the battery in the liquid is performed completely automatically with greater safety not only for people but also for the working environment.

[0040] Preferably, the support bench is equipped with wheels W fixed under the back wall BW to allow easy movement of the same even in the presence of liquid inside, defining a trolley.

[0041] When the device T is equipped with wheels W, then it defines a trolley. This trolley can be equipped with handles (not shown) to facilitate its grip and movement. Implementation variants to the non-limiting example described are possible, without however departing from the scope of protection of the present invention, including all the equivalent embodiments for a technician in the field, to the content of the claims.

[0042] From the description reported above, the technician in the field is able to realize the object of the invention without introducing further construction details.

Claims

1. Support bench or trolley (T) for the maintenance of a vehicle propulsion battery (B) comprising

- a work surface (P),
- a container volume (V), closed at the bottom, operatively arranged under the work surface and capable of containing a refrigerant and/or extinguishing liquid (L) and
- locking means (UL) arranged to unlock the work surface, the work surface being capable of releasing or accompanying the battery inside the container volume (V) in response to a deactivation of the lock means.

2. Bench or trolley according to claim 1, wherein said container volume comprises hydraulic connection means (PC) for connection to a duct (PP) connected to a source (LS) of refrigerant and/or extinguishing liquid (L).

3. Bench or trolley according to claim 2, wherein said hydraulic connection means comprise means for quick coupling to the duct (PP) connected to the source (LS).

4. A bench or trolley according to claim 2 or 3, comprising second control means (C) for causing a flooding of the container volume in response to the release or accompaniment of the battery (B) into the container volume.

5. A bench or trolley according to claim 4, comprising a second valve (V2), normally open, and a third valve (V3) normally closed in cascade to the second valve, wherein the second and third valves are arranged internally to the container volume, wherein the sec-

ond valve comprises first control means (F) for causing a closure of the second valve in response to the reaching of a predetermined level of liquid inside the container volume, and wherein said third valve comprises said second control means (C) for causing an opening of the third valve in response to a contact with the battery (B) released or accompaniment into the container volume.

6. A bench or trolley according to any of the preceding claims 1 - 5, wherein said work surface is hinged to a wall of the container volume.

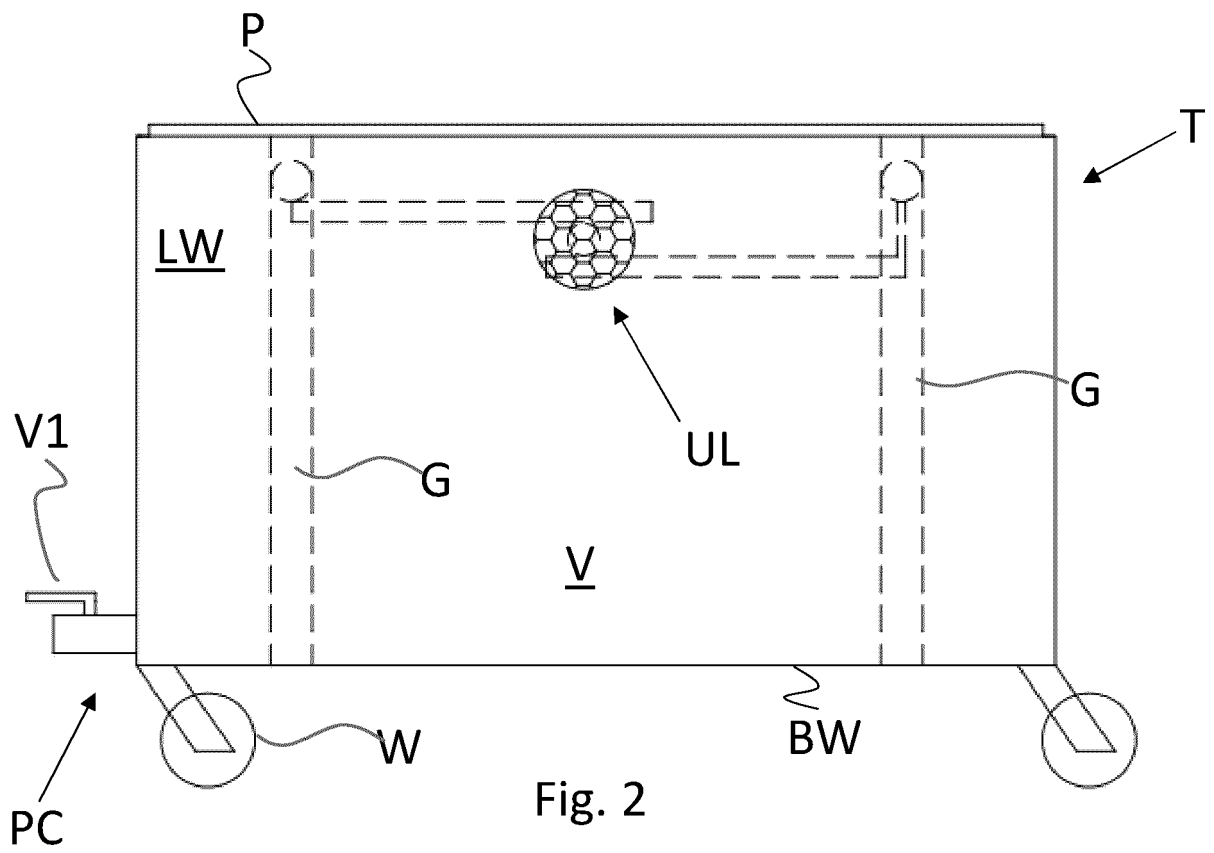
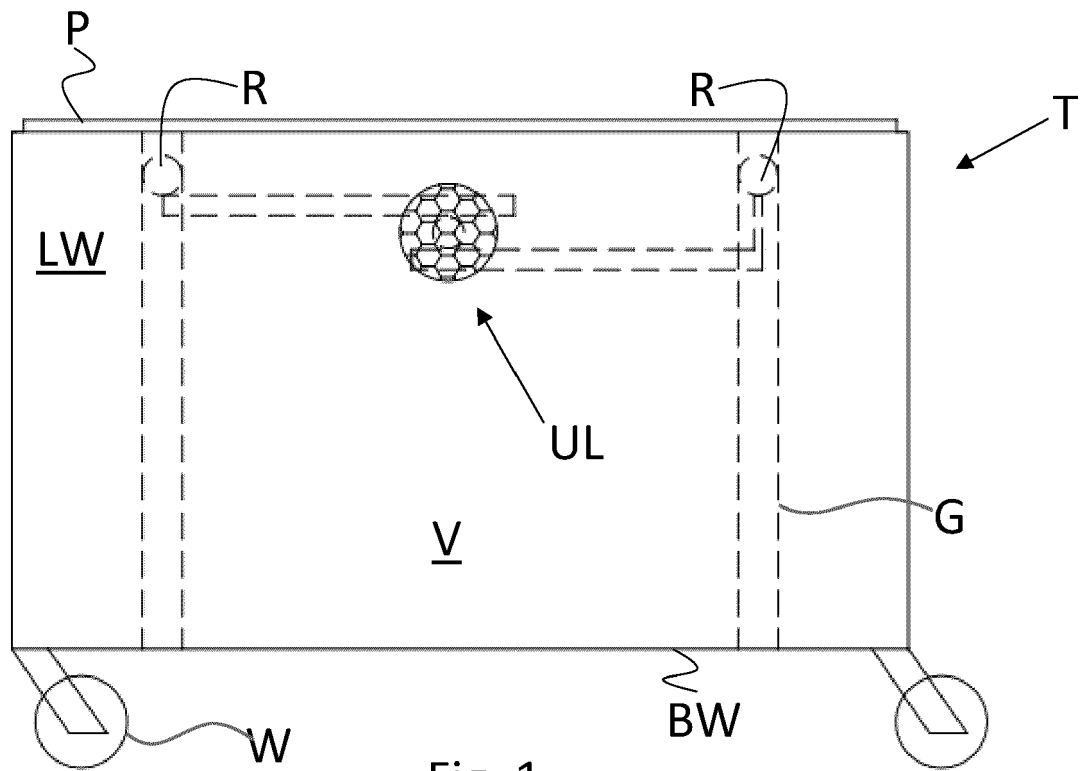
7. A bench or trolley according to any of the preceding claims 1 - 5, wherein said work surface is slidably associated with two opposing walls of the container volume to translate inside the container volume.

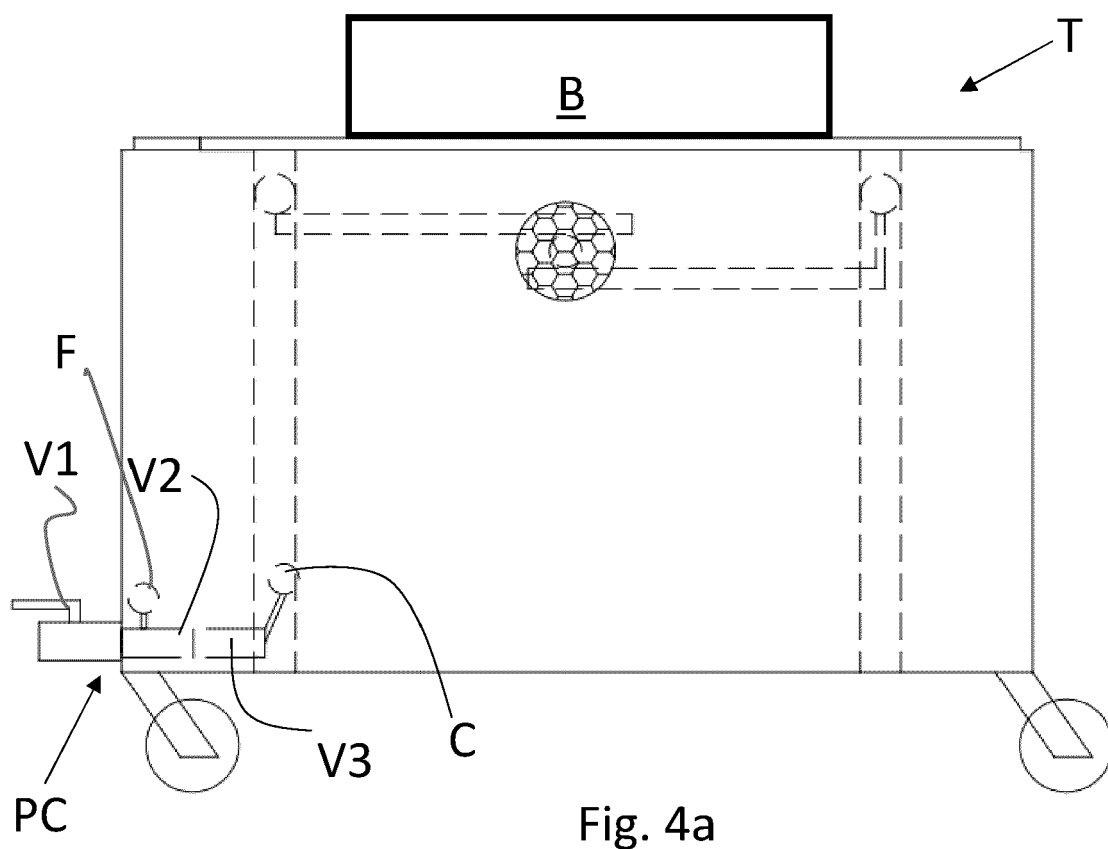
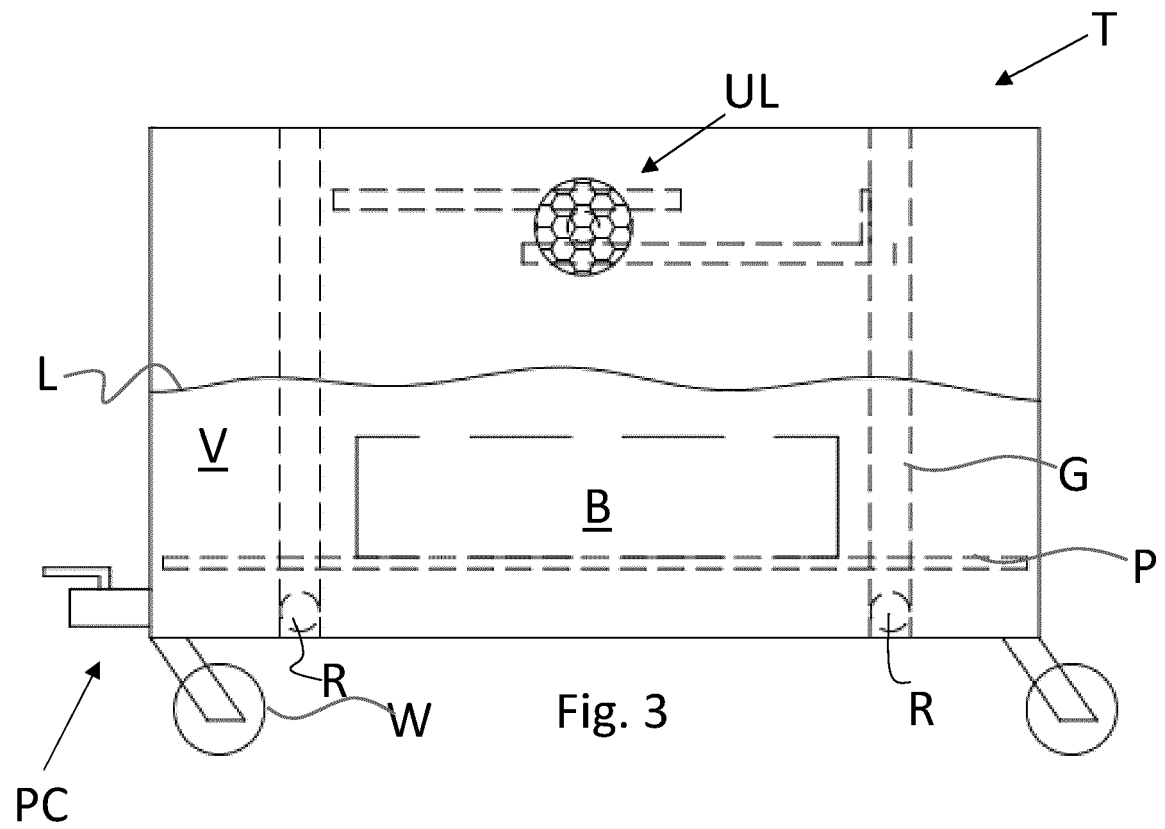
8. A bench or trolley according to any of the preceding claims 1 - 7, wherein said locking means are manually operable and/or by means of an electro-actuator.

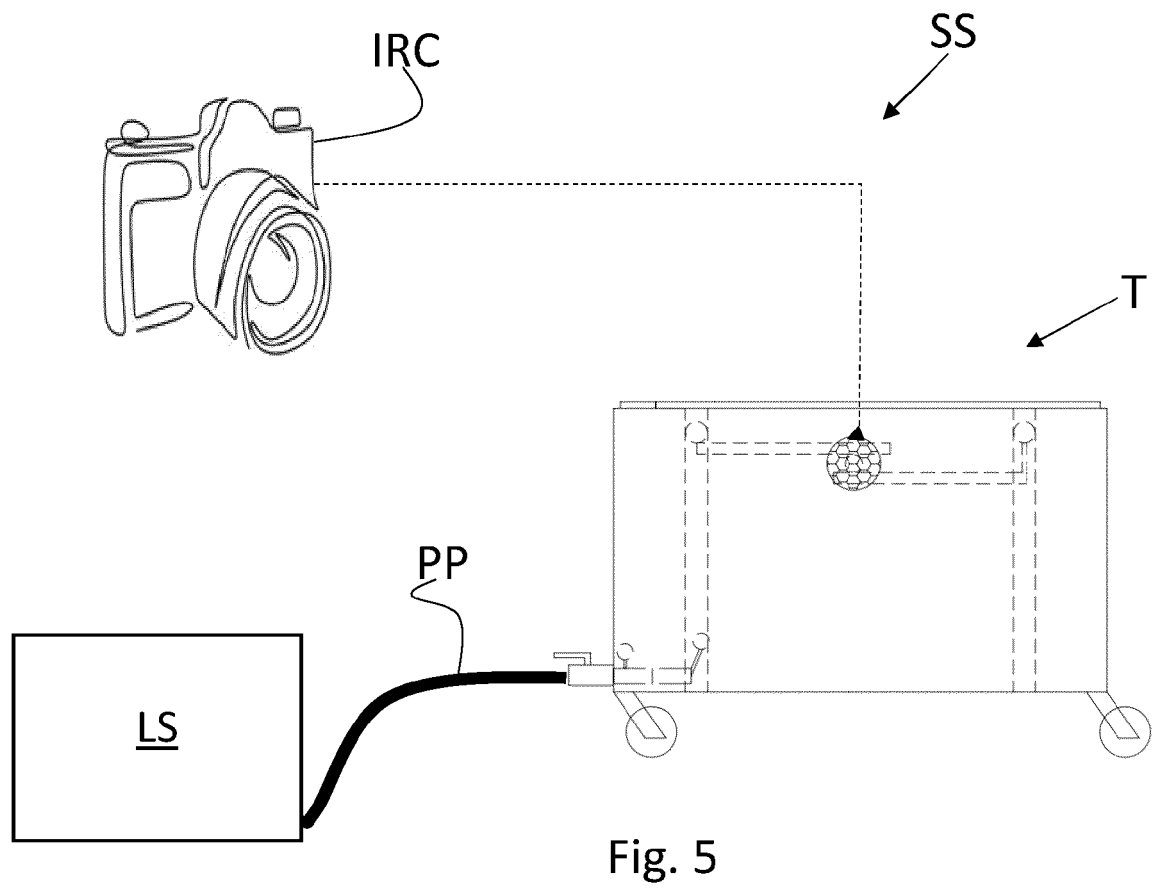
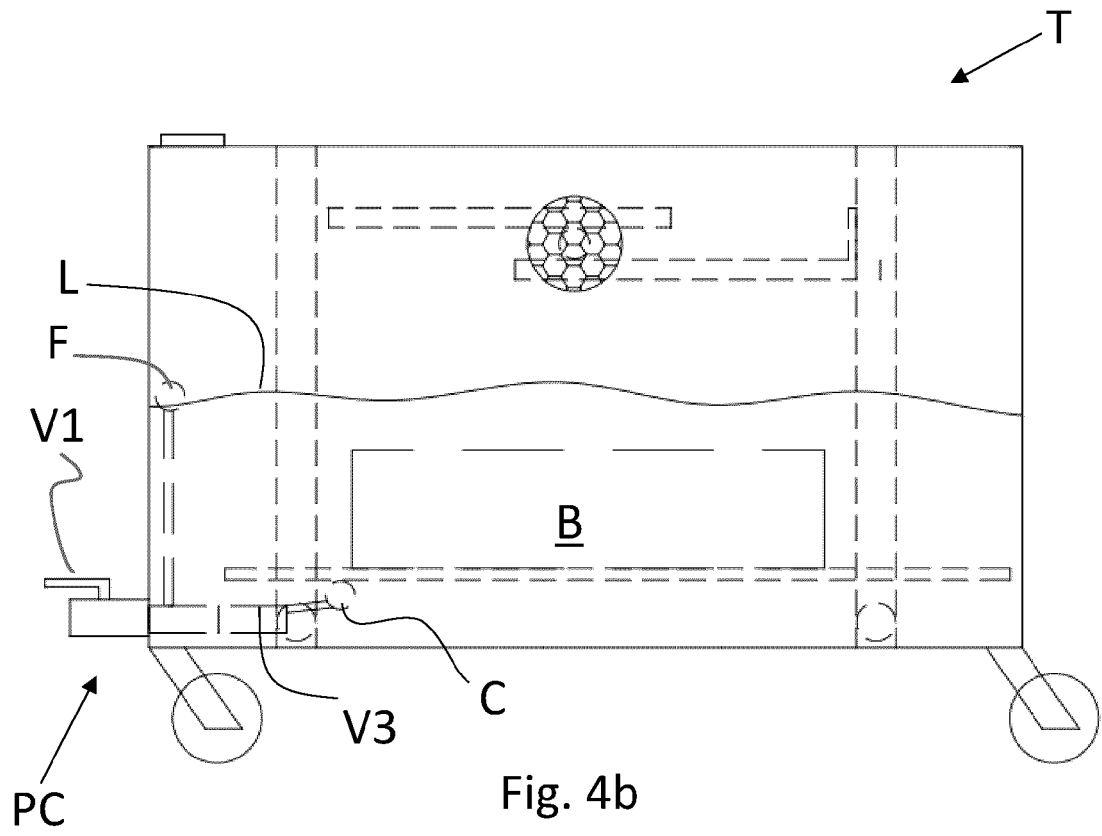
9. Safety system comprising:

- a detection system (IRC) of a thermal runaway of a vehicle propulsion battery, for monitoring the battery (B) supported by a work surface (P),
- the bench or trolley (T) according to any of the preceding claims 1 - 7 when said locking means are operable by means of an electro-actuator,

wherein said work surface belongs to said bench or trolley and wherein the detection system is configured to deactivate the lock means, in response to a detection of a possible thermal runaway of the battery.









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Application Number

EP 24 17 9151

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 3 October 2024	Examiner Bonnin, David
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