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(54) Title: BATTERY FIRE SUPPRESSANT SYSTEM

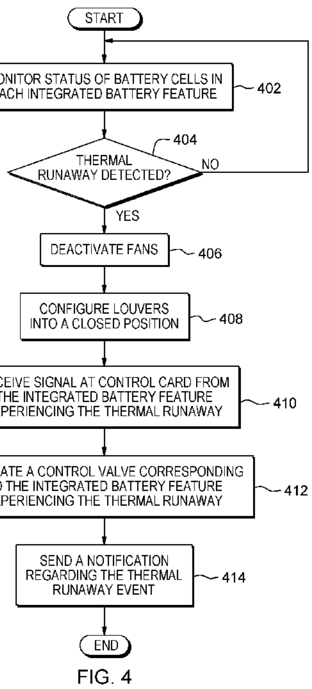

FIG. 4

(57) Abstract: An apparatus for a fire suppressant system on a server rack includes an integrated battery feature, a manifold, a conduit, and a control card, where the integrated battery feature includes a plurality of battery cells in an enclosure. A first end of the conduit coupled to a control valve on the manifold and a second end of the conduit coupled to the integrated battery feature. The control card configured to open the control valve on the manifold, where the control valve is configured to release a fire suppressant into the enclosure of the integrated battery feature. In one embodiment, the fire suppressant is contained within a pressurized fire suppressant reservoir mounted on the server rack. In another embodiment, the fire suppressant is a cooling fluid diverted from a radiator cooling unit on the server rack.

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[Continued on next page]

MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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— *with international search report (Art. 21(3))*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2021/081364

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.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
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:

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:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable 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 report covers 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.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/081364

A. CLASSIFICATION OF SUBJECT MATTER
INV. A62C3/16
ADD.

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)
A62C H01M

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 practicable, 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	US 2017/050062 A1 (KIRKBRIDE DAVID W [US]) 23 February 2017 (2017-02-23) figures paragraph [0045] - paragraph [0050] paragraph [0054] - paragraph [6040] -----	1-5, 13-17
A	US 2017/043194 A1 (LING GREG [US]) 16 February 2017 (2017-02-16) figures paragraph [0007] paragraph [0019] - paragraph [0040] claims -----	1-5, 13-17

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[x] Further documents are listed in the continuation of Box C.

[x] 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 application or patent 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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 May 2022	03/06/2022

Name and mailing address of the ISA/	Authorized officer
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2017/040653 A1 (MORRIS STEPHEN [GB] ET AL) 9 February 2017 (2017-02-09) figure 4 paragraph [0076] paragraph [0116] paragraph [0168] - paragraph [0172] -----	1,6-13, 15-25
X	DE 10 2018 221942 A1 (BOSCH GMBH ROBERT [DE]) 18 June 2020 (2020-06-18) paragraph [0002] paragraph [0021] - paragraph [0025] figures 1-3 -----	1,6,13, 18
A	US 2012/231304 A1 (KAISER JOERG [DE] ET AL) 13 September 2012 (2012-09-13) paragraph [0048] - paragraph [0052]; figures 1,2 -----	1,6-13, 18-25

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2021/081364

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		US 2012231304 A1	13-09-2012
		WO 2011020616 A1	24-02-2011

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 2-5, 14-17(completely); 1, 13(partially)

An apparatus comprising an integrated battery feature including a plurality of battery cells in an enclosure, a manifold, a conduit, a control card, a fire suppressant reservoir mechanically coupled to the manifold, a fan, a mechanical fan louver assembly, a perforated louver assembly, wherein the mechanical fan louver assembly and perforated louver assembly are configured to create a seal at the ends of the integrated battery feature in the closed position. The first invention comprises also the method of determining a thermal runaway event has been detected in an integrated battery feature on a server rack, deactivating, by one or more processors of a control card, a fan in the integrated battery feature; configuring, by the one or more processors of the control card, a mechanical fan louver assembly and perforation louver assembly of the integrated battery feature into a closed position, wherein a first seal is created by the mechanical fan louver assembly in the closed position and a second seal is created by the perforation louver assembly in the closed position; and responsive to receiving a signal from the integrated battery feature, activating, by the one or more processors of the control card, a control valve corresponding to the integrated battery feature on a manifold, wherein a fire suppressant, which is pressurized in a fire suppressant reservoir is released into the integrated battery feature.

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2. claims: 6-12, 18-25(completely); 1, 13(partially)

An apparatus comprising an integrated battery feature including a plurality of battery cells in an enclosure, a manifold, a conduit, a control card, one or more processor drawers on the server rack, wherein the one or more processor drawers utilizes a cooling fluid for a plurality of electronic components, a fluid manifold conduit and a radiator cooling unit valve, wherein a first end of the fluid manifold conduit is coupled to the manifold and a second end of the fluid manifold conduit is coupled to the radiator cooling unit valve; and the radiator cooling unit valve is configured to divert cooling fluid to the fluid manifold conduit in a first configuration, wherein the cooling fluid is the fire suppressant, a fan, a mechanical fan louver assembly, and a perforated louver assembly, wherein the mechanical fan louver assembly and perforated louver assembly are configured to create a seal at the ends of the integrated battery feature in the closed position. The first invention comprises also the method of determining a thermal runaway event has been detected in an integrated battery feature on a server rack, deactivating, by one or more processors of a control card, a fan in the integrated

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

battery feature;configuring, by the one or more processors of the control card, a mechanical fan louver assembly and perforation louver assembly of the integrated battery feature into a closed position, wherein a first seal is created by the mechanical fan louver assembly in the closed position and a second seal is created by the perforation louver assembly in the closed position; and responsive to receiving a signal from the integrated battery feature, activating, by the one or more processors of the control card, a control valve corresponding to the integrated battery feature on a manifold and instructing, by the one or more processors of the control card, a radiator cooling unit valve to redirect the cooling fluid to the manifold, wherein the cooling fluid is the fire suppressant.
