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(54) **HEAT EXCHANGER FREEZE PROTECTION**

(57) Preventing freezing in a heat exchanger can include passing first and second cooling fluids through the heat exchanger, monitoring a temperature and/or pressure of the second cooling fluid entering the heat exchanger, heating the second cooling fluid entering the heat exchanger by opening a valve when the monitored temperature and/or monitored pressure is below a trigger

temperature and/or trigger pressure, and closing the valve when a condition is met. The first cooling fluid can have a first freezing temperature and the second cooling fluid can have a second, lower freezing temperature. Opening the valve can cause the second cooling fluid, in gaseous phase, to mix with the second cooling fluid, in liquid phase, upstream of the heat exchanger.

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PARTIAL EUROPEAN SEARCH REPORT

Application Number

under Rule 62a and/or 63 of the European Patent Convention.
This report shall be considered, for the purposes of
subsequent proceedings, as the European search report

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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)
X	EP 3 205 954 A1 (MITSUBISHI HEAVY IND THERMAL SYSTEMS LTD [JP]) 16 August 2017 (2017-08-16) * the whole document *	1-4, 11-15	INV. F25B25/00 F25B41/20 F25B47/00 F25B49/02
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A	US 2019/346189 A1 (SAITO MASAKI [JP] ET AL) 14 November 2019 (2019-11-14) * the whole document *	1-4, 11-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25B

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

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Place of search	Date of completion of the search	Examiner
Munich	18 June 2024	Lucic, Anita
CATEGORY OF CITED DOCUMENTS		
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		

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**INCOMPLETE SEARCH
SHEET C**

Application Number

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Claim(s) completely searchable:
1-4, 11-15

Claim(s) not searched:
5-10

Reason for the limitation of the search:

The search has been restricted to the subject-matter without an indication and reply of the Applicant to the invitation pursuant to Rule 62a(1) EPC. The search report has been drawn up on the basis of independent claim 1 and its associated dependent claims 2-4 and the corresponding apparatus claim 11 and its associated claims 12-15.

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

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