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**Datasheet for the decision
of 27 September 2012**

Case Number: T 0638/10 - 3.2.03
Application Number: 04252779.6
Publication Number: 1596139
IPC: F24J 3/06, F28D 15/02
Language of the proceedings: EN

Title of invention:

Natural thermo-carrier heat release system

Applicant:

Yang, Tai-Her

Headword:

-

Relevant legal provisions:

EPC Art. 123(2), 84, 54, 56

Keyword:

"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 0638/10 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 27 September 2012

Appellant:
(Applicant)

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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 20 November 2009
refusing European patent application
No. 04252779.6 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: Y. Jest
Members: C. Donnelly
K. Garnett

Summary of Facts and Submissions

- I. The appeal lies from the decision of the examining division, posted 20 November 2009, refusing European Patent application No. 04 252 779.6.
- II. The applicant (hereinafter "the appellant") filed a notice of appeal against this decision by letter of 5 January 2010 and paid the fee the same day. The grounds of appeal were filed on 19 March 2010. Additional information drawing attention to key aspects of the invention was submitted by letter of 12 November 2010.
- III. The following documents were referred to by the examining division during the examination proceedings:
- D1: US-A-3 472 314;
 - D2: JP-59 157443;
 - D3: US-A-4 373 573;
 - D4: JP-59 157442;
 - D5: EP-A-1 003 006;
 - D6: DE-199 19 555;
 - D7: DE-313 257;
 - D8: US-A-4 148 293;
 - D9: US-A-4 157 014.
- IV. In its decision the examining division held that the independent claims of the main and auxiliary requests filed with letter of 21 September 2009 contravened Article 123(2) EPC since the feature "a heat-insulating structure", introduced into the claim to replace the originally used term "a refractory structure", had no basis in the application documents as filed.

Furthermore, it considered the features "a heat-actuated convection device disposed partially within the thermo carrier and partially within the ambient fluid" and a "heat releaser disposed in the ambient fluid" or "the two open ends are disposed in the ambient fluid" not to meet the requirements of Article 84 EPC since it was not clear whether the thermo-carrier or the ambient fluid are part of the system.

Also, in the view of the examining division, the feature specifying that "the active heat actuator (108) within the thermo-carrier (101) is inclined from the inlet (111) to the outlet (112), the outlet (112) being at a higher location than the inlet (111)" related to a method of using the apparatus rather than clearly defining the apparatus in terms of its technical features.

In conclusion, the examining division decided that when disregarding the features relating to the intended use, the subject-matter of independent claim 18 was not new with respect to D2 and D6 and that of claim 1 was also not new with respect to D9. The division commented further that, even if the position of the pipe within the thermo-carrier and the ambient fluid were part of the system, claim 1 would not involve an inventive step when taking D6 as the nearest prior art.

V. In a communication dated 19 April 2012, pursuant to Article 15(1) RPBA annexed to the summons to oral proceedings, the Board informed the parties of its provisional opinion. In particular, the Board indicated

that the objections made by the examining division under Article 84 EPC appeared to be valid.

VI. In its response of 23 August 2012 the appellant filed an amended main request and new first and second auxiliary requests.

VII. Oral proceedings before the Board took place on 27th September 2012. At the conclusion of the proceedings the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the new main request filed during the oral proceedings.

VIII. Claim 1 according to the main request reads as follows:

"A thermo-carrier heat release system for ambient fluid disposed adjacent to a solid or liquid thermo-carrier (101), which may be a stratum, a geodetic surface, a pond, a lake, a river, a desert, an iceberg or an ocean; the heat release system comprising a heat-actuated convection device, a natural thermo-carrier, and an ambient fluid, the heat-actuated convection device (100) in use, disposed partially within the thermo-carrier (101) and partially within the ambient fluid; the heat-actuated convection device (100) comprising a fluid transmission pipeline constituted by first and second erect pipelines (106,107) each having an upper end and a lower end, the lower ends being connected through an active heat actuator (108) within the thermo-carrier (101), and the upper ends being connected by a heat releaser (201) disposed in the ambient fluid, thereby defining a closed-loop fluid circuit; such that fluid at a low temperature can flow

down from the upper end of the first pipeline (106) to form a heat exchange fluid (104), flow into an inlet (111) to the active heat actuator (108), pass through the active heat actuator (108), flow through an outlet (112) of the active heat actuator (108), flow into the second pipeline (107), and flow through the heat releaser (201) to the upper end of the first pipeline (106), thereby releasing heat to the ambient fluid and lower the temperature of the heat exchange fluid (104) for subsequent downwards flow through the first pipeline (106); a refractory structure (109) being provided between the transmission pipelines (106,107) and the natural thermo-carrier (101); whereby closed-loop natural convection of the fluid is produced by the fluid descending at a lower temperature in the first pipeline (106) and ascending at a higher temperature in the second pipeline (107); characterised in that active heat actuator (108) within the thermo-carrier (101) is inclined from the inlet (111) to the outlet (112), the outlet (112) being at a higher location than the inlet (111), and the heat releaser (201) within the ambient fluid is inclined from a higher inlet at the upper end of the second pipeline to a lower outlet at the upper end of the first pipeline (106)."

- IX. At the conclusion of the oral proceedings the Board announced its decision.

Reasons for the decision

1. The appeal is admissible.

2. *Article 123(2) EPC*

2.1 The originally used term "a refractory structure" has been re-introduced into the claim to replace the feature of "a heat-insulating structure" objected to by the examining division in its contested decision. Claim 1 of the main request is essentially based on claims 1 and 3 as originally filed but with the wording revised to correct inaccuracies in syntax and grammar as requested by the examining division in its communication of 25 July 2006. Thus, the requirements of Article 123(2) EPC are met.

3. *Article 84 EPC, Clarity*

3.1 Claim 1 of the main request relates to a "heat release system comprising a heat-actuated convection device, a natural thermo-carrier, and an ambient fluid". Thus, it is now clear that the thermo-carrier and the ambient fluid are part of the system.

3.2 The feature specifying that "the active heat actuator (108) within the thermo-carrier (101) is inclined from the inlet (111) to the outlet (112), the outlet (112) being at a higher location than the inlet (111)" relates to the arrangement of active heat actuator within the thermo-carrier and is therefore an apparatus feature of the system as now claimed. Thus, the requirements of Article 84 EPC are met.

4. *Main request - Novelty, Inventive step*

4.1 The most relevant prior art is described in D9 (see in particular figure 1 and column 2, line 11 to column 3,

line 61) since this is the only document which clearly shows a closed loop system in which natural convection flow is established through heat being acquired by the heat transfer fluid at the bottom of the system from heat source 14 and dissipated at the top of the system through heat sink 30.

4.2 In detail D9 describes:

"A thermo-carrier heat release system for ambient fluid disposed adjacent to a solid or liquid thermo-carrier, which may be a stratum, a geodetic surface, a pond, a lake, a river, a desert, an iceberg or an ocean; the heat release system comprising a heat-actuated convection device, a natural thermo-carrier (see column 1, lines 33 to 40 and column 2, lines 31 to 33), and an ambient fluid:

the heat-actuated convection device (1) in use, disposed partially within the thermo-carrier (14) and partially within the ambient fluid; the heat-actuated convection device comprising a fluid transmission pipeline constituted by first and second erect pipelines (10,20) each having an upper end and a lower end, the lower ends being connected through an active heat actuator (15) within the thermo-carrier (14), and the upper ends being connected by a heat releaser (30) disposed in the ambient fluid thereby defining a closed-loop fluid circuit; such that fluid at a low temperature can flow down from the upper end of the first pipeline (10) to form a heat exchange fluid, flow into an inlet (16) to the active heat actuator (15), pass through the active heat actuator (15), flow through an outlet (17) of the active heat actuator (15), flow into the second pipeline (20), and flow

through the heat releaser (30) to the upper end of the first pipeline (10), thereby releasing heat to the ambient fluid and lower the temperature of the heat exchange fluid for subsequent downwards flow through the first pipeline (10); a refractory structure (11) being provided between the transmission pipelines (10,20) and the natural thermo-carrier (14); whereby closed loop natural convection of the fluid is produced by the fluid descending at a lower temperature in the first pipeline (10) and ascending at a higher temperature in the second pipeline (20); and whereby the fluid flow through the active heat actuator (15) is inclined from the inlet (16) to the outlet (17), since the outlet (17) is at a higher location than the inlet ((16)).

4.3 The subject-matter of claim 1 differs therefrom in that:

the heat releaser within the ambient fluid is inclined from a higher inlet at the upper end of the second pipeline to a lower outlet at the upper end of the first pipeline.

4.4 As argued by the appellant, this feature may augment the closed loop natural convection effect in that the slope of the flow-path is in the sense of the increasing density of the working fluid as it cools down by releasing heat to the ambient fluid. Thus, the technical problem to be solved can be seen as one of how to improve natural fluid circulation within the system.

4.5 Faced with this problem it would not be obvious for the skilled person to modify the apparatus of D9 to

incorporate an inclined heat releaser. In addition to the heat sink 30, the system of D9 also includes a turbine 25 connected immediately upstream, this indicates that there is no apparent problem of fluid circulation since there is enough kinetic force to drive a turbine. Accordingly, an inclination of the upper pipeline would have almost no effect on the natural convection flow generated by density gradients in the working fluid. Further, D9 explains (see col. 3, line 62 to col. 4 line 15) that the kinetic force driving the turbine depends upon four factors: overall height difference, fluid type, temperature difference and volume flow. Thus, faced with the problem of insufficient fluid circulation, the skilled person is taught by D9 to find a solution by adjusting these parameters rather than providing a height difference across the turbine and/or the heat source.

4.6 D5 is the only document showing an inclined heat release element. However, the system of D5 employs a working fluid which undergoes a phase change and no closed loop natural convection is produced. In the apparatus of D5, the condenser portion is inclined such that the fluid can drain back into the evaporator section under the influence of gravity. Therefore, the systems of D5 and D9 work on different principles and there is no incentive for the skilled person to combine their teachings.

4.7 In its decision, the examining division argued that D6 could be taken as the most relevant prior art, asserting that the skilled person would merely have to convert this known open system into a closed system by connecting inlet and outlet openings 24 and 26 with a

heat conducting pipe without identifying any technical problem to be solved.

4.8 However, in the Board's opinion, open and closed loop systems are fundamentally different in that one uses the ambient fluid as the working medium whereas the other may employ a separate heat transfer fluid with different properties. Further, connecting inlet and outlet openings 24 and 26 in the system of D6 as depicted in figure 2 is not a straightforward matter since, although at different heights, they are evidently quite distant from one another. Thus, it is not clear where and for what purpose the heat released would be used in such a configuration. Consequently, even if the skilled person did decide to convert the open system of D6 into a closed loop to solve a problem linked with working fluid preservation or contamination, it is not obvious how this would be implemented.

4.9 Thus, the subject-matter of claim 1 involves an inventive step and meets the requirements of Article 56 EPC.

4.10 Claims 2 to 15 relate to further embodiments of the system defined in claim 1 and also meet the requirements of the EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Examining Division with the order to grant a patent on the basis of claims 1 to 15 according to the main request filed during the oral proceedings after any necessary consequential amendment of the description.

The Registrar:

The Chairman:

D. Hampe

Y. Jest