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**Datasheet for the decision
of 11 September 2007**

Case Number: T 0562/05 - 3.2.03

Application Number: 97200702.5

Publication Number: 0794392

IPC: F24H 1/26

Language of the proceedings: EN

Title of invention:

Cast, light-metal, substantially cylindrical heat exchanger

Patentee:

Interdomo/De Dietrich Heiztechnik GmbH, et al

Opponent:

Robert Bosch GmbH

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Main request - inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 0562/05 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 11 September 2007

Appellant: Robert Bosch GmbH
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Representative:

Respondent: Interdomo/De Dietrich Heiztechnik GmbH
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent office posted
7 March 2005 concerning maintenance of the
European Patent No. 0794392 in amended form.

Composition of the Board:

Chairman: K. Garnett
Members: Y. Jest
G. Ashley

Summary of Facts and Submissions

I. By its decision dated 7 March 2005 the Opposition Division maintained European Patent No. 0794392 in amended form on the basis of the first auxiliary request with the following new claim 1, which had been amended, with respect to claim 1 as granted, by the addition of the passages in bold characters as follows:

"A heat exchanger, manufactured from light metal by means of casting technique **and a burner (21)**, comprising at least a water duct, a burner space and elements increasing the heat-transferring area, wherein the heat exchanger (1) comprises a closed, substantially cylindrical inner wall (2), wherein the water duct (5) extends along the outside of the inner wall (2) and the burner space (11) extends inside the inner wall (2), **the burner (21) extending into said burner space (11)** wherein, on the inside, the elements (6) increasing the heat-transferring area such as projections and/or partitions extend from the inner wall (2) in at least two directions which include an angle relative to each other, wherein the heat exchanger (1) has a substantially circular cross section and the elements (6) increasing the heat-transferring area are distributed over almost the entire inner circumference of the inner wall (2) in at least a part of the heat exchanger (1), and the water duct (5) extends spiral-wise around the inner wall (2)."

The patent as maintained comprised further independent claims 9, 10, 11 and 15 as granted.

The Opposition Division found that the requirement of Article 123 EPC and the ground of opposition, namely lack of inventive step, did not prejudice the maintenance of the patent in this amended form.

- II. An appeal was lodged against this decision by the Opponent (hereinafter Appellant) on 2 May 2005; the appeal fee was paid and the statement of the grounds of appeal of the Opponent was received on the same date.
- III. In its reply dated 22 November 2005, the Proprietors (hereinafter Respondent) filed four auxiliary requests, each on the basis of further amended claims 1.
- IV. The Board summoned the parties to oral proceedings and gave its provisional opinion in an accompanying notification.

In response to the summons, the Respondent filed five additional requests.

The Appellant presented some additional remarks related to the version of the patent maintained by the Opposition Division in its interlocutory decision and informed the Board that it would not attend the scheduled oral proceedings.

- V. During the oral proceedings on 11 September 2007, at which the Appellant did not attend, the Respondent filed an amended set of claims and adapted parts of the description as a new main request. All other requests were withdrawn.

At the end of the oral proceedings the Board announced its decision to set aside the impugned decision and to remit the case to the Opposition Division with the order to maintain the patent in the amended form according to the main request filed during the oral proceedings. However the last version of claim 11 filed by the Respondent as attached to the minutes of the oral proceedings corresponds to claim 11 as granted and not to the amended version of claim 11 filed at an earlier stage in the oral proceedings, which was the version which the Board had indicated as being acceptable and which the Respondent clearly intended to form part of its final main request. Therefore, and after having informed the parties of its intention with respect to this issue, the Board hereby rectifies its orally pronounced decision and considers the amended text of claim 11 recited hereinafter as forming the basis for the maintenance of the patent in amended form.

Amended independent claims 1, 9, 10 and 15 filed during the oral proceedings and claim 11 as corrected are respectively based on claim 1 as maintained by the Opposition Division and on claims 9, 10, 11 and 15 as granted but comprising amendments shown in bold characters in the following text:

Amended claim 1:

"A heat exchanger, manufactured from light metal by means of casting technique **and a burner (21)**, comprising at least a water duct, a burner space and elements increasing the heat-transferring area, wherein the heat exchanger (1) comprises a closed, substantially cylindrical inner wall (2), wherein the

water duct (5) extends along the outside of the inner wall (2) and the burner space (11) extends inside the inner wall (2), **the burner (21) having been inserted into an accommodation space adjacent one end of the heat exchanger (1) within the inner wall (2)**, wherein, on the inside, the elements (6) increasing the heat-transferring area such as projections and/or partitions extend from the inner wall (2) in at least two directions which include an angle relative to each other, wherein the heat exchanger (1) has a substantially circular cross section and the elements (6) increasing the heat-transferring area are distributed over almost the entire inner circumference of the inner wall (2) in at least a part of the heat exchanger (1), and the water duct (5) extends spiral-wise around the inner wall (2)."

Amended claims 9 and 10:

"9. A casting core apparatus for ~~use in~~ the manufacture of a heat exchanger according to any one of the preceding claims, comprising at least a first casting core assembly (9) having the form of at least a spiral-shaped water duct (5) and a second casting core assembly (8) having at least the form of a burner space (11) with elements (6) increasing the heat-transferring area, wherein the second casting core assembly (8) is included within the first casting core assembly (9), wherein between the first (9) and the second casting core assembly (8) a space is included for forming at least the inner wall (2), wherein at least one of the casting core assemblies (8, 9) is built up from parts and wherein the casting core apparatus (3, 8, 9) is at

least substantially of a type that is lost during or after the casting of the heat exchanger (1)."

"10. A casting core apparatus for ~~use in~~ the manufacture of a heat exchanger according to any one of claims 1-8, comprising at least a first casting core assembly (9) having the form of at least a spiral-shaped water duct (5) and a second casting core assembly (8) having at least the form of a burner space (11) with elements (6) increasing the heat-transferring area, wherein the second casting core assembly (8) is included within the first casting core assembly (9), wherein between the first (9) and the second casting core assembly (8) a space is included for forming at least the inner wall (2), wherein the casting core assemblies (8, 9) are of a one-piece construction and wherein the casting core apparatus (B, 8, 9) is at least substantially of a type that is lost during or after the casting of the heat exchanger (1)."

Amended claim 11:

"11. A method for manufacturing a heat exchanger, ~~in particular suitable for a heat exchanger~~ according to any one of claims 1-8, comprising the following steps:
- manufacturing a first casting core assembly (9) of the lost type, in the form of a spiral-shaped water duct (5);
- manufacturing a second casting core assembly (8) of the lost type, in the form of a central burner space (11) with elements (6) increasing the heat-transferring area;
- positioning the two casting core assemblies (8, 9) within a casting box (B) so that the first casting core

assembly (9) substantially surrounds the second casting core assembly (8) and is spaced therefrom;

- casting the heat exchanger (1) in the casting box (B) while substantially the first (9) and the second casting core assembly (8) are simultaneously or contiguously lost; and
- removing the one-piece heat exchanger (1) having a continuous, spiral-shaped water duct (5)."

Amended claim 15:

"A heating apparatus (20) comprising a heat exchanger (1) **and a burner** according to any one of claims 1-8."

VI. The following documents have been cited:

D1: FR-A- 0 695 311

D2: FR-A- 0 854 120

D3: EP-A- 0 547 641

D4: EP-B- 0 287 142

D5: EP-B- 0 085 470, newly cited by the Appellant with its letter of appeal.

VII. The Appellant requested that the impugned decision be set aside and the patent be revoked.

Arguments were presented against the amendments made to claim 1 as maintained by the Opposition Division having regard to Article 123(2) EPC and as regards lack of inventive step of the claimed subject-matter.

In particular, the added feature in claim 1 as maintained, namely that the burner extends into the burner space, was said not to be supported by the

originally filed documents of the corresponding patent application.

The subject-matter defined in independent claim 1 lacked inventive step in view of the combination of the closest prior art D1 with any of documents D2, D3, D4 and D5.

No written submission was filed arguing against the amended claims 1 of the auxiliary requests filed by the Respondent in its letter of reply dated 22 November 2005 or against the remaining claims of the patent.

VIII. The Respondent requested that the decision be set aside and the patent be maintained on the basis of the amended main request as filed during the oral proceedings.

The Respondent argued essentially that the distinguishing features of claim 1 when compared to D1, namely the insertion of the burner into the heat exchanger and the casting of the heat exchanger made of light metal, had a combined technical effect and contributed to a compact embodiment, an increased efficiency of heat transfer and a shortening of the response time of the water-heating process. Furthermore, no cited document showed a burner inserted into the heat-exchanger. D3 was concerned with a wholly different problem and offered another construction, in the sense that the burner is made in one-piece with the heat-exchanger.

Reasons for the Decision

1. The appeal is admissible.
2. *Main request - Amendments*

The subject-matter of claim 1 is now directed to a combination of a heat-exchanger with a burner, wherein the burner is inserted into an accommodation space provided within the inner wall at one end of the heat-exchanger. This additional feature is disclosed in the originally filed documents: see dependent claim 9 in EP-A- 0 794 392, corresponding to claim 8 as granted.

Claims 9, 10, 11 and 15 have been limited by a direct reference to the device of claim 1.

The title of the claimed-subject matter in dependent claims 2 to 8 has been harmonised with claim 1. The description has been brought into conformity with the amended set of claims.

The requirements of Articles 123 and 84 EPC are met.

3. *Claim 1 of main request - Inventive step*

The novelty requirement is clearly satisfied since none of the cited documents reveals, in combination, a heat-exchanger made by light metal casting with a burner accommodated within one end of the latter. Novelty was not disputed by the Appellant.

3.1 Prior art document D1 represents the closest prior art. It shows a heat-exchanger (water boiler) manufactured by means of casting technique (page 1, lines 11 to 14 and lines 19 to 29) and a burner (not shown but referred to on page 1, lines 38 to 40).

The heat-exchanger comprises a closed cylindrical inner wall (a), an outer wall (f), a helical rib (d) between the inner and outer walls so as to define a helical water duct extending spiral-wise around the inner wall (see page 1, lines 38 to 52). The inner space defines a burner space receiving combustion gases (see page 1, lines 38 to 40). A plurality of elements increasing the heat-transferring area are provided in the form of projections (b) extending radially inwardly from the inner wall and being distributed over almost the entire inner circumference of the inner wall in at least a part of the heat exchanger.

The burner is not represented in the drawings of D1 and its location is not defined; D1 nevertheless states that the combustion gases issuing from a burner enter the heat-exchanger from the bottom with respect to Figure 1 (page 1, line 60).

3.2 The subject-matter of claim 1 thus differs from D1 by two features as follows:

- the heat-exchanger is made of light metal;
- the burner has been inserted into an accommodation space adjacent one end of the heat exchanger within the inner wall.

Although these two features may have separate and non-linked technical effects, namely lighter construction for the first and compact arrangement for the second, the Board shares the views of the Respondent that these features contribute in combination to the achievement of the following additional technical effect. Light metal being used for manufacturing the heat-exchanger and the burner being inserted into the inner wall of the heat-exchanger enable a reduction of the response time of the device with respect to the water heating process (see the paragraph bridging columns 9 and 10 of the patent). This shortening of response time, especially at the beginning of the heating operation, is due to a better conductivity of the wall material, and also to heat transferring directly from the burner to the inner wall and thus to the water flowing in the helical duct.

3.3 *Non-obvious solution*

It may be considered as an obvious choice to manufacture the heat-exchanger shown in D1 from light metal as known per se for instance from D3 (see abstract), having regard to the obvious advantages directly linked to the metal properties.

However none of the cited documents discloses the insertion of the burner into an accommodation space provided in the inner wall of the heat-exchanger. Document D3 relates to a heating device comprising a heat-exchanger and an integrated burner, which is at least partly surrounded by a water duct. The device comprises projections (7a,7b) extending within the inner space of the device and in the immediate vicinity

of the flames produced by the burner. These projections almost fill the inner space enclosed by the water duct in order to define a narrow labyrinthine passage for the flames and flue gases produced by the burner. The aim of this construction, as stated in column 1, line 25 to column 2, line 13, is to reduce the length and temperature of the flames so as to lower the emission of NO_x and CO. No reference whatsoever is made to an increased efficiency of the heating device or to a reduction in response time.

The person skilled in the art would therefore have found no incentive in D3 when starting from the closest prior art represented by D1 and facing the problem defined above.

3.4 The subject-matter of claim 1 thus also meets the requirements of inventive step as required in Articles 52(1) and 56 EPC.

4. Claims 9, 10, 11 and 15 of main request

Claims 9 and 10 define casting core apparatuses which are suitable for manufacturing the heat-exchanger according to its definition in claim 1 or its dependent claims. None of the cited documents shows a casting core apparatus, and in particular one which would result in a heat-exchanger having the inventive arrangement as defined in claim 1.

The amended manufacturing method-claim 11 is directed to the manufacturing of the device of claim 1, which is considered as new and involving an inventive step.

Claim 15 relates to a heating device using the combination heat-exchanger/burner of claim 1. Claims 9, 10, 11 and 15 thus also meet the requirements of Article 52(1) EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the Opposition Division with the order to maintain the patent in amended form on the basis of the following documents:
 - claims 1 to 10 and 12 to 15 as filed during the oral proceedings;
 - claim 11 as filed during the oral proceedings but with its first two lines corrected so as to read: "A method for manufacturing a heat exchanger according to any one of claims 1-8, comprising the following steps: ...";
 - amended pages 2 and 3 of the description of the patent specification as filed during the oral proceedings;
 - pages 4 to 6 of the description of the patent specification;
 - Figures 1 to 5 of the patent specification.

The Registrar:

The Chairman:

A. Counillon

K. Garnett