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D E C I S I O N
of 5 February 2002

Case Number: T 0463/00 - 3.2.3

Application Number: 91203007.9

Publication Number: 0608439

IPC: F25B 39/02, F25D 21/14, F28F 9/02

Language of the proceedings: EN

Title of invention:
Heat exchanger with improved condensate collection

Patentee:
Modine Manufacturing Company

Opponent:
Behr GmbH & Co.

Headword:
-

Relevant legal provisions:
EPC Art. 100(a) and (c)

Keyword:
"Inventive step (yes)"
"Feature disclosed in a general form in the parent application (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0463/00 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 5 February 2002

Appellant: (Opponent)
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D-70469 Stuttgart (DE)

Representative:
-

Respondent: (Proprietor of the patent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 17 April 2000 concerning maintenance of European patent No. 0 608 439 in amended form.

Composition of the Board:

Chairman: C. T. Wilson
Members: J. du Pouget de Nadaillac
M. K. S. Aúz Castro

Summary of Facts and Submissions

I. The appeal has been lodged against the interlocutory decision dated 17 April 2000 of an opposition division of the European Patent Office, which maintained the European patent EP-B-0 608 439 in an amended form on the basis of the following claim 1:

"A heat exchanger comprising: a first heat exchange unit having an interior in fluid communication with an interior of a second heat exchange unit, each said unit comprising first and second spaced header tubes (14,30) and a plurality of parallel flat tubes (40) arranged with a first predetermined space therebetween and extending between corresponding ones of the header tubes and in fluid communication therewith, a second predetermined space (42) maintained between the tubes of said first and second units; and a plurality of corrugated fins (44) arranged such that each fin is positioned in the first predetermined space between a first and second flat tube (46) of said first unit and in the first predetermined space between a first and second flat tube (46) of said second unit, each of said fins (44) extending through said second predetermined space (42) to be common to both units."

II. The appellant (opponent) filed the notice of appeal on 9 May 2000 and paid the appeal fee on 11 May 2000. The grounds of appeal were submitted on 18 August 2000.

III. Oral proceedings took place on 5 February 2002.

IV. The arguments of the appellant can be summarized as follows:

The feature "in fluid communication with" in the first lines of claim 1 is a generalisation of the originally disclosed term "manifold", which is not allowable under Article 123(2) EPC : in the parent application as filed of the patent in suit, only manifolds in the form of tubes are disclosed for providing a fluid communication between the interiors of the units. They are either positionned externally at the ends of the header tubes or pass through these tubes. In both cases, they have a double function, namely to collect and distribute the refrigerant. In contrast thereto, the expression "in fluid communication with" of claim 1 of the patent in suit only means a fluid passage between the unit interiors without suggesting the above functions and how this passage is realized. This expression, consequently, extends beyond the content of the term "manifold", which was originally disclosed. Claim 8 of the patent application as originally filed, even if it mentions means for establishing fluid communication between the second headers of said one and said second unit, cannot be used as basis for this generalisation, since this claim for the same reason infringes Article 76(1) EPC having regard to the parent application. Considering now the claims of said parent application, it is observed that an essential feature is missing in claim 1, namely the indication of how the modules of the heat exchanger are in communication with each other, so that the teaching of this claim is incomplete. Claim 17 is the only claim which mentions the manifold and the fact that this claim is dependent on claim 14 demonstrates that the expression " means defining a plurality of fluid passages for a fluid to

be evaporated in fluid communication with said header tubes" in said claim 14 is broader that the term "manifold" and thus infringes Article 100(c) EPC.

Moreover, the subject-matter of claim 1 lacks inventive step in view of the disclosures of D3 (GB-A-2 012 406) and D4 (CA-A-1 117 520):

The heat exchanger disclosed in D3 represents the closest prior art and is made of several modules, which each comprise headers, thin flat heat exchanger tubes and attached thereto corrugated fins, as is the case with the present invention. In this prior art, the heat transfer capacity is modified by varying the number of units, which are arranged side by side, that is to say, considering the air flow direction, the variation in the number of units results in a variation of the frontal area of the heat exchanger, the depth of the exchanger remaining the same. The present invention has the same object, namely to modify the heat transfer capacity, and it solves this problem by varying the depth of the heat exchanger, instead of varying its frontal area. For a person skilled in the art, such a possibility, which in fact needs only a rotation of 90° of the arrangement known from D3, is obvious, the module construction otherwise remaining the same. Moreover, it is known from document D4 to vary the depth of a heat exchanger by adding or removing heat exchanger units, which each are also made of headers and heat exchanger tubes. The direction of the heating medium flowing around the tubes is not given in this prior art, but there is only one possibility, namely a flow transversely to the headers. Fins are also not shown, but for the problem underlying the present invention it is irrelevant. There is no difficulty in

transferring the teaching of D4 to the arrangement according to D3 and, therefore, in arriving at the subject-matter of claim 1.

V. The respondent (proprietor of the patent) replied as follows:

The term "manifold" can mean chambers as well as tubes. A reading of the whole description of the parent application clearly teaches to the skilled person not only that the units or modules according to the present invention have to be in fluid communication with each other, but also that the kind of means for this fluid communication is not essential for the problem to be solved.

This problem concerns the variation of the heat transfer capacity of the heat exchanger. There is no suggestion in D3 to change the orientation of the headers for this purpose and, until the present invention, no one had had this idea. D4 does not concern a modular arrangement. Further, it does not indicate the flow direction of the heating medium and, therefore, does not suggest to vary the depth of the heat exchanger, so that finally it does not teach more than D3 and there is no reason to combine it with D3.

VI. The appellant requested that the decision under appeal be set aside and the European patent No. 0 608 439 be revoked.

The respondent requested the appeal to be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Article 100(c) EPC*

In the description of the parent application, as originally filed, see column 6, lines 4 to 9, it is disclosed that the evaporator is built of a plurality of substantially identical modules (or "units"), each made of an upper header tube, a lower header tube, and a plurality of the flattened tubes. For a person skilled in the art, it is already clear that, when an evaporator is said to be made of a plurality of such modules, necessarily these modules or units must have their interiors in fluid communication with each other. Moreover, the passage in column 2, lines 35 to 37, and the independent claim 14 of this document, as originally filed, mention "means defining a plurality of fluid passages for a fluid to be evaporated in fluid communication with said header tubes", and only claim 17, which depends on claim 14, precises the use of a manifold for putting the interiors of at least some of the header tubes in fluid communication with each other. Claims, as originally filed, are part of the original disclosure of a patent application, so that, contrary to the view of the appellant, the dependency of claim 17 shows that in the view of the author of the parent application, the manifold was only one possible example for the above means defined in general terms in claim 14. For him, the present invention was not limited to the use of manifolds or tubes, or even to the use of an additional constructional element fulfilling this connection function. There is therefore in the parent application a clear support for the objected expression, even if the description as such in its detailed part only describes two embodiments of a

manifold. Article 100(c) EPC is consequently not infringed by this expression of claim 1.

3. *Article 100(a) EPC*

3.1 The Board agrees with the parties that document D3 is the closest prior art, as also acknowledged in the decision under appeal. It discloses a heat exchanger made of several modules or units, which are arranged one beside the other perpendicularly to the air stream and each comprises two longitudinal spaced headers - an upper and a lower one - and parallel heat exchange flattened tubes extending between these headers. The headers extend in the direction of the air flow, as also do the flat surfaces of the heat exchange tubes. In each module, these tubes are spaced from each other along the headers, so that a first predetermined space is provided between them in the longitudinal direction of the corresponding headers. Since further the tube row of one unit is spaced from the tube row of the adjacent unit(s), a second predetermined space within the meaning of claim 1 of the patent in suit is provided and it is in this second predetermined space that long corrugated fins are positioned and extend parallely to the headers. According to the description of this patent document, it is thereby possible to make heat exchangers with different sizes by varying the number of units. Due to the above mentioned side by side relation of the units, namely perpendicularly to the air stream, a variation in size results in a variation of the frontal area dimension of the heat exchanger.

3.2 The evaporator according to claim 1 of the patent in suit, structurally differs from this prior art in that:

"the fins are arranged such that each fin is positioned in the first predetermined space between a first and second flat tube of a first unit and in the first predetermined space between a first and second flat tube of a second unit, each of said fins extending through the second predetermined space to be common to both said units".

In oder to achieve such a feature, starting from the arrangement of D3, it would be necessary to rotate by 90° the core of the heat exchanger, that is to say the tube heat exchangers and the fins as a whole, relative to the headers, with the consequence that the first predetermined space of D3 would become the second predetermined space according to the present invention and vice versa for the second predetermined space of D3. The problem solved by this new feature is that it is possible to vary the heat transfer capacity of the heat exchanger without changing its frontal area, an advantage which is of importance in the car industry. With the present invention, it is in fact the depth of the heat exchanger which is modified.

3.3 It may be that according to the circumstances a person skilled in the art sees that he could increase said capacity by using the depth instead of the frontal area of a heat exchanger, so that the perception of the problem does not seem to involve an inventive step. Nevertheless, the question remains whether a skilled person, who wishes to do so, would obviously arrive at the subject-matter of claim 1 of the patent in suit, starting from the heat exchanger according to D3.

3.4 Although it is mentioned in the first lines of D3 that the heat exchanger described therein can be envisaged

for an apparatus of large dimensions in its frontal width as well as in its depth, showing that both these size directions have been considered, there is no suggestion in this prior art that the arrangement disclosed for varying the frontal area could be used for varying the depth of the heat exchanger. Since the headers according to this prior art extend in the air flow direction, the obvious way to increase this known heat exchanger in its depth would be to increase the length of the headers and consequently the number of heat exchange tubes connecting each pair of upper and lower headers, the number of units remaining the same.

This prior art does not provide the slightest hint that the orientation of the fins and heat exchange tubes relative to the headers could be changed. Thus, the opinion of the appellant that D3 as such would have suggested the present invention, cannot be followed.

3.5 D4 relates generally to a heat exchanger for supplying heated water or the like and mentions specifically the example of a coil water heater located within a furnace enclosure. Already because of this use, this kind of heat exchanger is remote from an evaporator. In its construction also it is rather distant, since only round tubes are joining the headers and no fins are foreseen. Moreover, contrary to the opinion of the appellant, no modular construction is mentioned in this prior art and it is not suggested, at least within the meaning of the present invention: apart from the feeder and departure headers, which are mere tubes to which are connected the first and last row of the round tubes, all the other intermediate headers are each made of two juxtaposed tubes or chambers in fluid communication with each other along their whole lengths

and which communicate with two rows of round tubes, one row for the fluid entrance and the other for the fluid departure of the corresponding header. Even if a skilled person could deduce from this arrangement the idea of a modular construction, the modules would not be identical units comprising an upper and a lower header with a row of heat exchange tubes between them, as is the case with the present invention and in the arrangement according to D3. The modular construction of D3 is therefore better and, for this reason and because of the absence of fins, the person skilled in the art has no reason to consider D4 for combining it with D3.

Although it is disclosed in this prior art 04, that "the sizes, lengths and numbers of headers and tubes may be varied to provide heat exchange assemblies of varying sizes and capacities", there is no indication of the direction of the external heating fluid flow around the tubes, so that it remains questionable whether it is the frontal area of the heat exchanger according to this prior art which is varied or its depth, when headers are added. The statement of the appellant that this prior art suggests to modify the depth of the heat exchanger by means of modules is therefore based on an a posteriori interpretation of this document.

3.6 The Board therefore came to the conclusion that the subject-matter of claim 1 of the patent in suit as amended involves an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Counillon C. T. Wilson