BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Publication in the Official Journal ~~Yes~~ / No

File Number: T 698/89 - 3.2.3

Application No.: 85 307 796.4

Publication No.: 0 181 137

Title of invention: Method of cyclic air conditioning with cogeneration of ice

Classification: F25B 25/00; F25B 27/00

D E C I S I O N
of 11 December 1991

Applicant: CALMAC MANUFACTURING CORPORATION

Headword: Air conditioning/CALMAC

EPC Article 56

Keyword: "Inventive step (main request: no, auxiliary request: yes)"

Headnote

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 698/89 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 11 December 1991

Appellant : CALMAC MANUFACTURING CORPORATION
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Decision under appeal : Decision of Examining Division of the European Patent Office dated 23 December 1988 refusing European patent application No. 85 307 796.4 pursuant to Article 97(1) EPC.

Composition of the Board :

Chairman : Wilson C.T.
Members : Andrae H.
Moser W.

Summary of Facts and Submissions

I. European patent application No. 85 307 796.4 filed on 29 October 1985 and published on 14 May 1986 (publication No. 0 181 137) was refused by a decision of the Examining Division dated 23 December 1988.

II. The decision was based on Claim 1 comprising the part of the original Claim 1 on page 13 as originally filed and the part of Claim 1 on page 14 as filed with the letter of 17 March 1988.

The reason given for the refusal was that the subject-matter of Claim 1 did not involve an inventive step in view of the disclosures of EP-A-0 080 764, US-A-4 334 412 and FR-A-2 469 678.

III. An appeal was lodged against this decision on 23 February 1989 by telecopy, confirmed by letter received on 25 February 1989. The appeal fee was paid on 23 February 1989.

The Statement of grounds of Appeal was received on 28 March 1989. The Appellant (Applicant) requests that the Decision of the Examining Division in respect of Claim 1 underlying the impugned decision be reversed according to his main request. According to an auxiliary request, the Appellant wishes to proceed at least on the basis of alternative Claims 1 to 6 received on 28 March 1989.

IV. In a communication pursuant to Article 110(2) EPC dated 24 June 1991, the Board expressed a provisional opinion that the subject-matter of Claim 1 underlying the appealed Decision did not appear to involve an inventive step whilst Claim 1 according to the auxiliary request would

probably be allowable. Appropriate amendment to the description and the drawing was suggested.

V. By letter of 5 August 1991, received on 8 August 1991, the Appellant filed new pages 3, 3a, 9 and 10 of the description.

VI. As a result of a further objection raised by the Rapporteur in a telephone call dated 11 October 1991, the Appellant filed by letter of 4 November 1991, received on 8 November 1991, a new page 2a of the description and a new sheet 1/1 of the drawings.

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

"A method of air-conditioning a building having alternating periods of high and low cooling loads which comprises:

a) During both high and low cooling load operation the steps of:

i) driving an electric generator by means of a fuel fired engine, and

ii) powering a heat-operated chiller with waste heat from said fuel fired engine;

b) during low cooling load operation the step of:

i) freezing ice by means of said heat operated chiller in combination optionally with an electric chiller powered by said generator and in the alternative by grid power; and

c) during high cooling load operation the step of:

i) cooling the building by the melting of said ice in combination with the heat operated chiller and optionally in further combination with said electric chiller powered by said generator and in the alternative by grid power,

characterized in that the ice is frozen in an ice bank remote from and separate from said heat operated chiller."

Claim 1 is followed by dependent Claims 2 to 9 received on 18 March 1988.

Claim 1 according to the auxiliary request reads as follows:

"A method of air conditioning a building having alternating periods of high and low cooling loads which comprises

a) during both high and low cooling load operation the continuous steps of

i) driving an electric generator by means of a fuel-fired engine,

ii) powering a heat-operated chiller with waste heat from said fuel-fired engine, and

iii) circulating brine through a closed loop circuit containing said heat-operated chiller, an ice bank, a building duct coil and an electric chiller powered by said generator and alternatively by grid power.

b) during low cooling load operation the steps of

i) chilling the brine by means of said heat operated chiller in combination optionally with said electric chiller powered by said generator and alternatively by grid power and

ii) freezing ice in the ice bank by means of the chilled brine; and

c) during high cooling load operation the steps of

i) chilling the brine by the melting of said ice in combination with the heat-operated chiller and in further combination optionally with the electric chiller, and

ii) cooling the building by directing the chilled brine through one or more duct coils

characterised by the high cooling load operation steps of

a) by-passing the ice bank with some of the circulating brine, and

b) progressively decreasing the amount of brine by-passing the ice bank as the ice melts to maintain a substantially constant brine temperature entering the duct coil."

Claim 1 is followed by dependent Claims 2 to 6.

VIII. The Appellant's arguments in support of his requests can be summarised as follows:

In the communication of the Examining Division dated 21 April 1988, it was written:

"The amended independent Claim 1 differs from the original Claim 1 in that the ice is frozen in an ice bank remote from and separate from the heat operated chiller. However, this additional feature cannot justify the presence of inventive step since it is also disclosed in the US-A-4 334 412 ...".

The arguments of the Examiner were answered in Appellants' Agents' letter of 12 August 1988. It was pointed out there that the feature that the ice is frozen in an ice bank remote from and separate from the heat operated chiller is not in fact disclosed in US-A-4 334 412. All that is disclosed in that reference is a storage reservoir for a slurry and, if anything, ice is unfrozen there, such ice as is contained in the slurry actually being frozen at the chiller. Thus it was demonstrated that the above-cited Examiner's allegation was quite wrong as well as the assertion in the paragraph bridging pages 1 and 2 in the communication of 21 April 1988 that the storage reservoir 13 described in US-A-4 334 412 is within the definition of the ice bank on page 7, lines 9 to 11, and page 8, first paragraph, of the application.

Since the entire basis of the Examiner's holding that Claim 1 is obvious has been clearly demonstrated to be completely wrong, then it must follow that the assertion of obviousness is wrong also.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 Admissibility of the claims

Claim 1 is essentially a combination of features of original Claims 1 and 7. The further feature of Claim 1 that ice is frozen in the ice bank remote from and separate from the heat operated chiller is derivable from page 7, paragraph 2, of the original description in combination with the sole figure of the original drawing.

Claims 2 to 8 are based upon original Claims 2 to 8 respectively, and Claim 9 is based upon original Claim 12.

The claims therefore comply with the requirement of Article 123(2) EPC.

2.2 Novelty

The nearest prior art with regard to the subject-matter of Claim 1, in the Board's view, is reflected by EP-A-0 080 764. This document discloses a method of air conditioning a building by which a heat-operated chiller is powered with waste heat from a fuel-fired engine, the engine driving an electric generator.

Since neither this document nor the other prior art revealed discloses the combination of method steps of Claim 1, and since novelty was not disputed in the appealed decision, the subject-matter of Claim 1 is novel in the sense of Article 54 EPC, and this question need not be further discussed.

2.3 Inventive step

2.3.1 Air conditioned buildings are commonly used cyclically with periods of high cooling load alternating with periods of low cooling load. In the air conditioning method known from EP-A-0 080 764, the capacity of the chiller must match the peak demand cooling load, since no thermal storage means is provided for. The chiller is therefore oversized having regard to the average cooling load.

2.3.2 The inherent problem may therefore be seen in modifying the known method such as to reduce the required installed cooling capacity of the air conditioning system whilst maintaining the matching of the peak cooling load demand and to safeguard operation of the system with a high degree of reliability.

The person skilled in the field of air conditioning systems will constantly endeavour to design reliable systems in which overcapacity is avoided for reasons of reducing costs whilst on the other hand it is clear that the system must be appropriate to match the maximum load demand for the length of time required. As the issue of high efficiency and low costs is a basic principle in engineering, the perception of the inherent problem cannot be regarded as contributing to an inventive step.

According to the non-optional features of Claim 1 the problem is to be solved by the following steps:

(a) Freezing ice by means of the heat-operated chiller during low cooling load operation and cooling the building by melting said ice in combination with the heat-operated chiller during high cooling load operation;

(b) freezing the ice in an ice bank remote from and separate from the heat-operated chiller.

2.3.3 In the search for solutions to his problem the skilled person would be expected to investigate the prior art known from US-A-4 334 412 since this document deals with cooling systems where cooling requirements vary substantially. Furthermore, the issue of avoiding excess costs due to having a cooling capacity substantially over average cooling requirements is emphasised in the document (cf. column 1, lines 6 to 36). In conformity with the findings of the Examining Division in the impugned decision, the skilled person would be taught by US-A-4 334 412 to proceed according to above method step (a) and would apply this step to the method known from EP-A-0 080 764 (cf. above point 2.2). He would be led to make use of this step in the expectation of deriving benefits by a smaller and less costly refrigeration equipment.

In the method known from US-A-4 334 412 ice is produced in the chiller (28) during low cooling load or storage phase operation and the slurry containing the ice is pumped to storage reservoir (13) from where it is circulated in the cooling phase to a heat exchanger (2), if necessary in combination with the operation of the chiller during peak cooling demand (cf. in particular column 2, line 36 to column 3, line 10).

According to this method, a medium composed of a slurry and of ice has to be transported from the chiller to the storage reservoir. It is evident that this method has the disadvantage of possibly obstructing the circuit pipes by lumps of ice. The skilled person would, therefore, be expected to consider other solutions avoiding this disadvantage.

Such a solution is shown in US-A-1 891 714 (cf. page 1, lines 1 to 49, and page 4, line 14 to page 5, line 3) or in DE-A-2 900 372 (cf. in particular page 3, lines 1 to 5, and page 4, paragraph 4, to page 5, line 1). Each of these documents discloses the method step of freezing ice in an ice storage tank remote and separate from the chiller according to above step (b) (cf. point 2.3.2 above). The aim of reducing the required installed cooling capacity of the cooling system whilst maintaining the matching of the peak cooling load demand is addressed in both of these documents. The skilled person would, due to the correspondence of the basic problems inherent in the invention and in the systems disclosed in any of the documents US-A-1 891 714 and DE-A-2 900 372, also apply the principle of freezing the ice in an ice bank remote and separate from the chiller to the method disclosed in EP-A-0 080 764. He would, in the Board's view, immediately recognise that by this way pumping of a mixture of slurry and ice with the risk of pipe obstruction can be dispensed with such that the reliability of the system is increased.

2.3.4 Having regard to the Appellant's arguments in support of his request (cf. above point VIII), the statement on page 1, paragraph 2 of the Examining Division's communication dated 21 April 1988 that the step of freezing the ice in an ice bank remote from and separate from the heat-operated chiller is disclosed in US-A-4 334 412 appears indeed to be incorrect. In the impugned decision, this has however been put right by the statement that according to US-A-4 334 412 an ice/water mixture is pumped from the store to the chiller and back to the store. Having regard to the step of freezing the ice directly in the ice store, reference was made in the

contested decision to US-A-1 891 714, the relevant passage of which document had already been indicated on page 2, paragraph 2 of the communication dated 16 November 1987.

The appealed decision is therefore based on grounds on which the Appellant has had an opportunity to present his comments (Article 113(1) EPC) and no procedural violation can be recognised by the Board insofar.

2.3.5 For the reasons set out above the Board comes to the conclusion that Claim 1 is not acceptable for lack of inventive step of its subject-matter (Articles 52(1) and 56 EPC). Claims 2 to 9 dependent on Claim 1 share the fate of the independent claim.

The main request is, therefore, not allowable.

3. Auxiliary request

3.1 Admissibility of the claims

Claim 1 is a combination of the features of original Claims 7 and 8.

Claims 2 to 6 are based upon original Claims 9 to 13, respectively.

The claims comply with the requirement of Article 123(2) EPC and they also clearly define the subject-matter for which protection is sought (Article 84 EPC).

3.2 Novelty

Claim 1 corresponds in substance with the version of an independent Claim 1 which was regarded as acceptable by the Examining Division (see communication of 16 November 1987, section 3).

There is no prior art document available disclosing the combination of method steps contained in the pre-characterising portion of Claim 1. The Appellant has, however, confirmed in the description that such a combination of method steps does indeed form part of the prior art (Rule 27(1)(c) EPC). Claim 1 is therefore in compliance with the requirement of Rule 29(1) EPC.

The Board is satisifed that none of the documents of the prior art revealed discloses the combination of method steps of Claim 1.

The method of air conditioning a building according to Claim 1 differs from the closest prior art as acknowledged by the Appellant by the characterising steps and is therefore deemed novel in the sense of Article 54 EPC.

3.3 Inventive step

3.3.1 The method steps according to the characterising portion of Claim 1 provide the effect that the temperature of the brine or cooling medium entering the building duct coil of the air conditioning system can be maintained substantially constant during high cooling load operation as has been substantiated in the passage bridging pages 9 and 10 of the original description. The Board is satisfied that this effect is in fact obtained. By means of the brine circuit by-passing the ice bank the flow rate of the brine through the ice bank can be varied and by such variation the temperature of the brine downstream of the

junction of the main circuit and the by-pass circuit can be influenced.

3.3.2 The problem underlying the subject-matter of Claim 1 may therefore be seen in providing a method of air conditioning according to the pre-characterising portion of Claim 1 in which variation of the temperature of the brine entering the building duct coil is essentially avoided during the course of the high cooling load operation.

3.3.3 In his search for a solution to the inherent problem, the person skilled in the art would come across the document US-A-4 334 412 which describes the arrangement of a by-pass in the brine or refrigerant slurry circuit. This document discloses a cooling system suitable for use in the air conditioning of buildings, cf. in particular "Abstract" and column 3, line 27 to column 4, line 5. In the cooling phase of operation, the refrigerant slurry normally leaves a storage reservoir (13) forming an insulated holding tank, passes into a heat exchanger (2) and is then directed via valve (20) and pipe (21) back into the storage reservoir. Alternatively, the refrigerant slurry may by-pass the storage reservoir (13) via pipe (26) and two valves (20, 15). As concerns the object underlying the by-passing of the refrigerant slurry, the document refers to the issue of moderating the total cooling system (cf. column 3, lines 52 to 54).

The method of air conditioning according to US-A-4 334 412 is different from the claimed method in that the storage reservoir (13) does not form an ice bank for freezing ice, the ice according to the known method being frozen remote from the storage reservoir (13) in the chiller (28). The most relevant difference, however, must be seen in the lack of any hint therein at the method step of

progressively decreasing the amount of refrigerant slurry or brine by-passing the ice bank as the ice melts to maintain a substantially constant brine temperature entering the duct coil.

Due to the fact that the issue of moderating the total cooling system underlying the citation differs basically from the problem of avoiding variations of the temperature of the brine entering the building duct coil according to the patent application, the skilled person would have no incentive to take account of the citation's teaching. What is more, the citation would not provide any pointer to the features according to the second part of Claim 1, in particular to the measure of progressively decreasing the amount of brine by-passing the ice bank such that the temperature of the brine entering the building duct coil is maintained substantially constant.

3.3.4 The other documents of the prior art mentioned in the search report are further away from the subject-matter of Claim 1. None of these documents suggests a method of air conditioning a building comprising the high cooling load operation steps of by-passing an ice bank for freezing ice with a circulating brine and progressively varying the amount of brine by-passing the ice bank as the ice melts to maintain a constant brine inlet temperature in the building heat exchanger.

3.3.5 It follows that the subject-matter of Claim 1 is regarded as involving an inventive step and Claim 1 is acceptable under Article 52(1) EPC. The same applies to dependent Claims 2 to 6 which concern particular embodiments of the invention according to independent Claim 1.

3.3.6 The amendments to the description and the drawing concern the adaptation to the claims in accordance with

Rule 27(1)(c) and (d) EPC. Hence, these documents appear to be suitable for the grant of a patent.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a patent on the basis of the following documents:

Claims: 1 to 6 filed on 28 March 1989 ("alternative claims");

Description: Pages 1, 2, 3b filed on 18 March 1988,
Page 2a filed on 8 November 1991,
Pages 3, 3a, 9, 10 filed on 8 August 1991,
Pages 4 to 8, 11, 12 as originally filed;

Drawing: Sheet 1/1 filed on 8 November 1991.

The Registrar: The chairman:

N. Maslin C.T. Wilson