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D E C I S I O N
of 25 April 2006

Case Number: T 0004/04 - 3.2.03

Application Number: 96909352.5

Publication Number: 0767348

IPC: F25B 45/00, C09K 5/04

Language of the proceedings: EN

Title of invention:
Method of filling refrigerant mixture

Patentee:
DAIKIN INDUSTRIES, LIMITED

Opponent:
Ineos Fluor Holdings Ltd.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Withdrawal of opposition"
"Selection invention"
"Admission of fresh ground of opposition"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
G 0008/93, G 0009/91, G 0010/91, T 0279/89, T 0629/90

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0004/04 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 25 April 2006

Appellant: (Patent Proprietor)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 23 October 2003 revoking European patent No. 0767348 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: U. Krause
Members: C. Donnelly
K. Garnett

Summary of Facts and Submissions

I. European patent no. 767348 was granted comprising the independent method claims 1 and 2 reading as follows:

Claim 1:
"A method for charging a refrigerant blend, when using as a refrigerant a non-azeotropic blend whose permissible range falls within 22 to 24% of difluoromethane, 23 to 27% of pentafluoroethane and 50 to 54% of 1,1,1,2-tetrafluoroethane, comprising adjusting a composition of non-azeotropic blend in a feeding container to the level of 23.5 to 24% of difluoromethane 25.5 to 26% of pentafluoroethane and 50 to 51% of 1,1,1,2-tetrafluoroethane, discharging and transferring the non-azeotropic blend from the feeding container in liquid phase into another container in which the refrigerant is used so as to obtain a refrigerant having a composition within the permissible range in spite of the composition change associated with the transfer";

Claim 2:
"A method for producing a vapor compression refrigerating equipment having as a refrigerant a non-azeotropic blend having a composition range of 22 to 24% of difluoromethane, 23 to 27% of pentafluoroethane and 50 to 54% of 1,1,1,2-tetrafluoroethane, comprising discharging the liquid phase of a non-azeotropic blend which has a composition range of 23.5 to 24% of difluoromethane 25.5 to 26% of pentafluoroethane and 50 to 51% of 1,1,1,2-tetrafluoroethane from a feeding container and transferring it to a main body of a vapor compression refrigerating equipment".

II. By decision of 23 October 2003, the opposition division revoked the patent on the grounds that the subject-matter of claims 1 and 2 lacked an inventive step. The contested decision acknowledged that the novelty criteria for a selection of a sub-range of numerical values from a broader range as set out in decision T 279/89 are met, but argued that the skilled person would have been aware of the phenomenon of shifting composition during charging operations of ternary non-azeotropic refrigerant blends. Faced with the problem of this shift taking the blend composition beyond the permissible range during charging at high temperatures and transfer ratios, the decision concluded that the only option available is to change the initial composition such that there is a relative increase in the more volatile components.

The appellant (patentee) filed a notice of appeal against this decision and simultaneously paid the appeal fee on 29 December 2003. A written statement setting out the grounds of appeal was filed on 1 March 2004.

The appellant requests that the impugned decision be set aside and the patent be maintained as granted or alternatively in amended form on the basis of the first or second auxiliary request filed with letter of 22 March 2006.

By letter of 24 April 2006 the respondent (opponent) formally withdrew the opposition. Consequently the respondent ceased to be an active party in the

proceedings and all previous requests of the respondent are expunged.

In accordance with the subsidiary request of the appellant, oral proceedings were held on 25 April 2006; the opponent, having previously informed the board by letter of 20 April 2006, did not attend.

III. **State of the art**

The following prior art was referred to by the former opponent:

D1: "The use of an MHV-2 equation of state for modelling the thermodynamic properties of refrigerant mixtures", J D Morrison et al, "CFCs, The Day After", Joint Meeting of IIR Commissions B1,B2, E1 and E2, Padova, 21-23 September 1994, pages 461-469;

D2: "Performance testing of R-22 and R-502 alternatives based on R-32/R-125/R-134a", D Ferrari et al, "CFCs, The Day After", Joint Meeting of IIR Commissions B1,B2, E1 and E2, Padova, 21-23 September 1994, pages 223 to 230;

D3: "Composition shifts of zeotropic HFC refrigerants in service", S Corr and F T Murphy, Proceedings of meetings of commissions B1,B2,E1,E2, Padova, 21-23 Sept. 1994 "CFCs, The Day After", Refrigeration Science and Technology (1994-2), pages 29 to 40;

D4: ICI KLEA case studies:

D4a: "Ericsson Komponents install new KLEA 407c Packaged Chillers", dated April 1995;

D4b: "KLEA 66(R 407C) Equipment Testing & Refrigerant leakage simulation", dated August 1994;

D4c: "The first KLEA 407C multiplex refrigeration units operating in a Dutch supermarket", dated March 1995;

D4d: "Hitachi Water Chiller Retrofit", dated March 1995;

D5: Sales information from ICI regarding sales of R407C (and KLEA 66)

D5a: Sales figures for January 1995;

D5b: Sales figures for February 1995;

D5c: Invoices for sales of KLEA 66 in December 1993 and November 1994;

D6: JP-A-08094217;

D7: ANSI/ASHRAE 34-1997, ASHRAE STANDARD, Designation and Safety Classification of Refrigerants; 1997;

D8: ANSI/ASHRAE 34-1992, ASHRAE STANDARD, Number designation and Safety Classification of Refrigerants (copyright 1994);

D9: ICI standard Sales Specification, issue 3, section I3, page 3 and issue 4, section H3, page 3 (15 March 1995);

D10: "HCFC-22 alternatives for air-conditioners and heat-pumps", M.B. Shiflett, Proceedings of the 1994 International Refrigeration Conference at Purdue, 19-22 July 1994, pp 1-6;

D11: "Heat pump/air-conditioner field test data for an HCFC-22 alternative containing HFC-32, HFC-125, HFC134a, B.S. Lunger et al, Proceedings of the 1994 International Refrigeration Conference at Purdue, 19-22 July 1994, pp. 25-30;

D12: "Simulation of isothermal and adiabatic leak processes of zeotropic refrigerant mixtures", M. S. Kim and D.A. Didion, HVAC&R Research, Vol. 1, No. 1, January 1995;

D13: A computer disk containing KlEACalc version 1.10 (January 1994)

D13a:"KlEACalc Manual", not dated;

D13b:"Key information on KlEA" not dated;

D14: Press cuttings reviewing KlEACalc, March-April 1994;

D15a-c: Results obtained using KlEACalc version 1.10;

D16: "Program status report - R-22 Alternative Refrigerants Evaluation Program (AREP)", 16 September 94;

D17: ARI Flammability Workshop, A Workshop Summary, 21 March 1994 (Workshop held 8 and 9 March 1994);

D18: Evidence of request to change the tolerance for R32 in refrigerant blend R 407C (letter of DuPont Fluoroproducts dated May 18, 1995, letter of J. L. Heldenbrand - ASHRAE dated May 22, 1995;

D19a: A sales invoice, dated 6 March 1995, issued by ICI to the purchaser Tazetti & Co for order no 531854.

D19b,c: Certificates of analysis for the three drums (ID Nos. 19996, 18268 and 17557) that made up the consignment of product in order no. 531854.

In support of the public availability of documents D1,D2 and D3 the following affidavits were filed:

SC1: Affidavit, including accompanying exhibits SC1A, SC1B and SC1C;

SC2: Affidavit, including accompanying exhibit SC2A;

The appellant filed the following document:

D20: Experimental data submitted with letter of 22 March 2006.

It should be noted that in the prior art documents difluoromethane is also known as R32 or HFC32, pentafluoroethane as R-125 or HFC-125, and 1,1,1,2-tetrafluoroethane as R-134A or HFC-134A. Further, the term "non-azeotropic" is synonymous with "zeotropic".

The appellant either disputes that the following documents can be considered as state of the art or that they should be admitted into the proceedings:
-D4a-d,D5a-d,D6,D7 and D9, as no further evidence has been filed to support the contention that that these documents have been made available to the public before the priority date; and
D10,D11 and D13-D16, as these documents were late filed and considered prima facie irrelevant by the opposition division and hence excluded under Article 114(2) EPC;
-D17 and D18, as these documents have only been filed for the first time during the appeal procedure;
-D19a-c, as these documents have only been filed at an extremely late stage of the proceedings and the respondent was therefore not in a position to check their validity.

In summary, only documents D1-D3, D8 and D12 are not the subject of any contention.

IV. For the appellant, the contentious points of the impugned decision concern the admission of an objection under Article 100(b) EPC, concerning the possibility of carrying out Example 2 of the description, and the division's reasoning when coming to the conclusion that the subject-matter of claims 1 and 2 lacks an inventive step.

Essentially, the appellant argues that the objection under Article 100(b) EPC was late filed and therefore should never have been admitted into the opposition procedure. However, as the objection is directed against one of the examples in the patent, rather than one of the independent claims, there would not appear to be any case to answer.

As concerns inventive step, the appellant's main argument is that the opposition division was wrong in its assertion that the problem of composition shift of ternary zeotropic refrigerant blends during charging in the liquid phase was known before the priority date of the patent. On the contrary, all the available prior art indicates that, providing the charging operation is carried out in the liquid phase as required by the claims, any changes in composition would be negligible. The problem only came to light because of the extensive research work carried out by the patent proprietor. During the oral proceedings the appellant rejected any suggestions that the problem became apparent during routine quality control testing to obtain approval for charging procedures of the newly introduced refrigerant blend.

Further, although it can be accepted that when certain components of the refrigerant blend fall outside of their permissible ranges, the skilled person would be motivated to effect a change in the process variables to counter the problem, it is incorrect to conclude that the only variable which could be altered is the initial composition. Such a conclusion is only possible

with the benefit of hindsight since it is feasible, for example, that the temperature could also be adjusted.

Reasons for the Decision

Withdrawal of the opposition

1. As the opposition division has revoked the patent, the withdrawal of the opposition has no direct significance in terms of procedural law. In order to determine whether the appellant's request can be allowed, the board is still obliged to examine the substance of the opposition division's decision in order to ascertain if the patent meets the requirements of the EPC (cf. G 8/93). Nevertheless, in so doing, the board may under Article 114(1) EPC exercise its discretion to take account of evidence submitted by the respondent(opponent) prior to withdrawal of the opposition (see T 629/90 (OJ 1992, 654).

2. *Insufficiency of disclosure (Art 83 EPC, Art 100(b) EPC)*

The appellant does not question the admissibility of the opposition as far as the objection under Article 100(a) EPC is concerned. The reasoning given by the opposition division in this respect is complete and can be accepted. Hence, the opposition is admissible and according to G 9/91 and G 10/91 the opposition division can also use its discretion to examine objections made under Article 100(b) and (c) even if filed after the opposition period has expired. Hence, the opposition division acted correctly when admitting the objection under Article 100(b)EPC.

However, the board agrees with the appellant's argument that there is no case to answer since the objection was raised against one of the examples, rather than the claims. Moreover it is considered that the skilled person would have no difficulty in carrying out the methods as claimed. Hence, the decision taken by the opposition division on this point is correct and is any case not disputed by the appellant.

3. *State of the art*

As only the admissibility and validity as prior art of documents D1-D3, D8 and D12 is not disputed by the appellant, it is necessary for the board to take position as regards the remaining documents.

The opposition division decided to accept document D5c as being valid prior art on the basis that such invoices normally accompany the delivery of the product which is normally made available to the public after the sale. The board also accepts this analysis and considers the product referred to in D5c to be part of the prior art.

As regards D4a-d, D5a and D5b, the board agrees with the position taken by the opposition division that insufficient evidence has been produced to prove documents D4a-d were made available to the public before the priority date or to substantiate the claimed sales mentioned in D5a and D5b actually took place.

Documents D6 and D7 were published after the priority date of the patent and therefore do not form part of the prior art.

Document D9 bears two dates "5/3/95 and "31/1/96", the latter being handwritten, This document relates to specification no. GC/K32-125-134/S1 for products KLEA 66 or KLEA 407C and cites the standard ranges for each component. This specification number is cited on document 5c, which, however, bears an earlier date, therefore the two documents cannot be directly combined. As D9 appears to be a purely internal document it cannot be considered to form part of the prior art by itself.

In the minutes of the oral proceedings held before the opposition division it is explicitly stated that: "the Proprietor does not object to the admission of D10-D12 into the proceedings". Since D10 and D11 are proceedings of a public conference which took place almost a year before the priority date (18 April 1995) of the patent, there can be no doubt that the contents thereof form prior art. Hence, the board decides to accept documents D10 and D11 as prior art, although filed after expiry of the opposition period.

Documents D13-D15 relate to the prior use of "Klea Calc" computer program used for calculating refrigerant compositions. No further evidence has been made available concerning the public availability of these documents, and the board thus agrees with the opposition division's decision not to accept them as prior art.

Document D16 is dated 16 September 1994 and would have been distributed among members of the Air-conditioning and Refrigeration Institute. Therefore, it is considered to form part of the prior art and, although filed after the opposition period, will be considered by the board.

Documents D17 and D18 were first filed by the ex-respondent(opponent) with the grounds of appeal. D17 does not appear relevant in that it contains no mention of the refrigerant blend specified in the claims and is not concerned with charging operations.
D18 is too late. The correspondence is dated May 1995, and although it contains some fractionation data from DuPont, there is no indication that this was available to the public before the priority date of 18 April 1995. Hence, the board considers that neither document should be accepted as prior art.

Documents D19a-c refer to an alleged prior use of drums of KLEA 66 refrigerant (R32/R125/R134A) with compositions of 23.7/26.0/50.3 and 23.8/25.9/50.3. Prima facie these documents are relevant as they show a refrigerant blend which falls within the claimed composition sub-range.

However, a closer inspection of the documents reveals that D19a is in fact a dispatch note rather than a delivery notice. Hence, it is only evidence that the refrigerant drums may have been dispatched on 6 March 1995, but does not confirm that there was a delivery and use of the refrigerant according to the claimed methods before the priority date (18 April 1995).

Documents D19b and D19c are certificates of analysis relating to the drums mentioned in D19a. However, the analysis results figuring on these certificates can only be understood to refer to the composition of the refrigerant blend in the batch tank ("a batch tank that was analysed and had the following composition") from which the drums were filled, rather than the drums themselves. D19b and D19c are thus no evidence of the composition of the refrigerant blends in the drums subject of the dispatch note D19a. As, in all probability, the filling of the drums from the batch tank took place within the confines of private company property with no public access, and no evidence has been produced to the contrary, this also does not constitute a prior use.

Document D20 was filed by the appellant with letter of 22 March 2006. This document contains further experimental data demonstrating the effectiveness of the invention. In the absence of arguments to the contrary, the board is minded to consider this document as it provides useful background information and help in understanding the invention.

In view of this the following documents are considered to form the state of the art for the appeal proceedings: D1,D2,D3,D5c,D8,D10,D11,D12,D16. Further, the contents of D20 maybe taken into consideration as technical background information.

4. *Novelty*

It is the board's view that there can be no doubt about the availability, before the priority date, of a

refrigerant blend (i.e. R-407c or KLEA 66) corresponding to the nominal composition of D5c and produced within the ranges established by the ASHRAE (1994) as indicated in the description. This is because the manufacture of such blends is always subject to some limitation on the permissible ranges of each component. Further documents D2,D3, D10,D11 and D16 all refer to this composition.

Hence, the nearest prior art can be taken to be:

-a refrigerant blend of a non-azeotropic blend type whose permissible range falls within 22 to 24% of difluoromethane, 23 to 27% of pentafluoroethane and 50 to 54% of 1,1,1,2-tetrafluoroethane.

As argued by the opposition division and accepted by the appellant it is generally known and implicit that such refrigerant blends are destined to be used in a charging method comprising:

-discharging and transferring the non-azeotropic blend from the feeding container in liquid phase into another container or refrigeration equipment in which the refrigerant is used.

This position is in keeping with the common ground established between the appellant and the former opponent during the opposition procedure.

The impugned decision acknowledges that the novelty criteria for a selection of a sub-range of numerical values from a broader range as set out in decision T 279/89 are met, as argued by the appellant.

Considering that the selection concerns sub-ranges for all the components of the mixture, the board agrees with this conclusion. Owing to the withdrawal of the opposition, further discussion of the counter-argument of the former opponent is not necessary.

Hence, the subject-matter of the method according to claim 1 differs therefrom by:

-adjusting a composition of non-azeotropic blend in a feeding container to the level of 23.5 to 24% of difluoromethane 25.5 to 26% of pentafluoroethane and 50 to 51% of 1,1,1,2-tetrafluoroethane, so as to obtain a refrigerant having a composition within the permissible range in spite of the composition change associated with the transfer.

The subject-matter of the method according to claim 2 differs therefrom by:

-discharging the liquid phase of a non-azeotropic blend which has a composition range of 23.5 to 24% difluoromethane 25.5 to 26% of pentafluoroethane and 50 to 51% of 1,1,1,2-tetrafluoroethane.

5. *Inventive step*

By selecting the sub-ranges such that the most volatile components (R32 and R125) are pushed into the upper region of their respective permissible ranges, it is ensured that the composition of the refrigerant mixture remains within the permissible range even after transfer under extreme conditions (i.e. high temperature, high transfer coefficient) promoting the

loss of these volatile components into the vapour space of the transfer container. As demonstrated by the appellant's test results, this is not the case over the whole of the standard permissible range of the refrigerant mixture before transfer.

The board considers the objective technical problem to be one of keeping the composition of the refrigerant blend within the permissible range during charging in the liquid phase over the widest possible temperature spread.

Other narrower formulations of the technical problem could be criticised as either giving an eventual hint to the solution or locking the skilled man into a one-way street situation.

The appellant's main point of contention with the impugned decision is the assertion that the problem of composition shift during liquid transfer of ternary zeotropic refrigerant blends was known before the priority date.
The board agrees with the appellant that the available prior art in fact indicates that such a problem is not to be expected. D12 states in its concluding remarks that: "If the system is charged with a liquid refrigerant from the bottom of a charging cylinder, the mass fraction change for a zeotropic mixture is negligible". D2 indicates on page 226 that: "The major difference in handling zeotropes is that they should be transferred from the storage cylinder to the system as liquid. This is important in order to preserve the composition ratio in the cylinder and in the system." Similarly D11 states at page 27, first paragraph: "To

ensure the correct refrigerant composition in the system, this refrigerant should only be removed from its cylinder as a liquid". D10 compares the properties of several refrigerant blends including a nominal 23/25/52 composition of HFC-32/HFC-125/HFC-134a and states at page 1, paragraph 3: "Although mixtures must be liquid charged into systems to maintain the desired refrigerant composition it is inevitable that vapor charging will occasionally occur....". The implication being that with correct procedures and liquid transfer there should not be a problem.

As against this the abstract of D12, upon which the opposition division relied, refers to an increase of the vapor mass fraction of the more volatile components during the adiabatic leak process. The concluding remarks of D12 inform the reader that the adiabatic leak process is analogous to the charging process. However, it also states as cited above, that when transfer occurs in the liquid phase, the mass fraction change is negligible. Also, D3 indicates on page 30 that: "The composition shift behaviour, whilst readily addressed for handling and use supply cylinders, raises some refrigeration system issues...", however, this would be understood to mean that any problem is easily dealt with by liquid transfer as indicated in D2, D11 and D12.

Thus, it must be concluded that D12's overall teaching is that there is not a problem with composition shift during charging in the liquid phase. Nowhere else in the acknowledged prior art is there any indication that the problem of composition shift during charging in the liquid phase was even known, let alone any suggestion

towards a solution involving the alteration of the initial composition.

Faced with the above objective problem, the skilled person, who is considered to be an installation or maintenance engineer trained in the field of vapour compression refrigeration equipment, would also not be placed in a one-way street situation. It is quite feasible that alternative remedies might be sought, for example, attempting to influence the transfer temperature, or even modifying the standard charging vessel design to eliminate the liquid-vapour interface. Further, it is quite credible that the skilled person's instinctive reaction would simply be to accept a lower transfer ratio or ensure a complete transfer in a single operation. However, the appellant cannot be expected to come up with a detailed list of alternative inventions to prove the point.

In summary the step of selecting the specific sub-ranges as specified in claims 1 and 2 requires the skilled man to:
-recognise that a problem of shifting composition exists at conditions of high temperature even when charging in the liquid phase;
-consider that it is worth doing something about transfer under these particular conditions other than just accepting a lower transfer ratio;
-accept the cost implications of producing a blend with tighter composition tolerances;
-exclude any other possible solutions, such as influencing the transfer temperature.

Given that none of the steps is taught by the available prior art, the above considerations definitely go beyond what can typically be expected of the skilled person.

For these reasons the board concludes that the subject-matter of claims 1 and 2 as granted meets the requirements of Articles 52(1), 54 and 56 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 as granted.

Registrar: Chairman:

A. Counillon U. Krause