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D E C I S I O N
of 31 July 2001

Case Number: T 0877/99 - 3.3.1

Application Number: 91105295.9

Publication Number: 0451692

IPC: C09K 5/04

Language of the proceedings: EN

Title of invention:
Refrigerant

Patentee:
DAIKIN INDUSTRIES, LIMITED

Opponent:
Imperial Chemical Industries PLC
AUSIMONT S.p.A.

Headword:
Refrigerant/DAIKIN

Relevant legal provisions:
EPC Art. 56, 84, 123(2)

Keyword:
"Main request: inventive step (no) - obvious to try - no deterrent teaching of the art"
"Auxiliary request: clarity (no) - examined if arising from amendment - indefinite scope of technical feature - insufficiently defined test for measuring property"

Decisions cited:
G 0009/91, T 0024/81, T 0301/87, T 0249/88, T 0351/93, T 0645/94, T 1053/93

Catchword:
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Case Number: T 0877/99 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 31 July 2001

Appellant 01: (Opponent 01)
Imperial Chemical Industries PLC
Imperial Chemical House
Millbank
London SW1P 3JF (GB)

Representative:
Dee, Ian Mark
Eric Potter Clarkson
Park View House
58 The Ropewalk
Nottingham NG1 5DD (GB)

Appellant 02: (Opponent 02)
AUSIMONT S.p.A.
Piazetta Maurilio Bossi, 3
I-20121 Milano (IT))

Representative:
Sama, Daniele, Dr.
Sama Patents
Via G.B. Morgagni, 2
I-20129 Milano (IT)

Respondent: (Proprietor of the patent)
DAIKIN INDUSTRIES, LIMITED
Umeda Center Building
4-12, Nakazaki-nishi 2-chome
Kita-ku
Osaka-shi, Osaka-fu (JP)

Representative:
Lethem, David James
Hoffmann Eitle & Partner
Sardinia House
52 Lincoln's Inn Fields
London WC2A 3LZ (GB)

Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 23 July 1999 concerning maintenance of European patent No. 0 451 692 in amended form.**

Composition of the Board:

Chairman: A. J. Nuss
Members: R. Freimuth

M. K. S. Aúz Castro

Summary of Facts and Submissions

I. The Appellants I and II (Opponents I and II) lodged appeals on 16 and 3 September 1999 respectively, against the interlocutory decision of the Opposition Division, posted on 23 July 1999, which found that the European patent No. 451 692 in the form as amended during opposition proceedings according to the then pending main request met the requirements of the EPC.

II. Notice of Opposition had been filed by the Appellants requesting revocation of the patent in suit in its entirety on the grounds of lack of novelty and inventive step. The following documents were submitted *inter alia* in opposition proceedings:

(1) EP-A-430 169

(3) NIST Workshop on Property Data Needs for the Ozone Safe Refrigerants (1988)

(8) JP-A-63-308 085, considered in the form of its English translation.

III. The decision under appeal was based on a first set of amended claims for the Contracting States DE, FR and GB and on a second set of two claims for the Contracting States BE, IT and NL, both sets submitted on 19 May 1999. The claims of the second set were as granted and read as follows:

"1. A composition consisting essentially of difluoromethane, pentafluoroethane and 1,1,1,2-tetrafluoroethane.

2. A refrigerator which is operated using a composition consisting essentially of difluoromethane, pentafluoroethane and 1,1,1,2-tetrafluoroethane."

IV. The Opposition Division held that the documents cited neither anticipated nor rendered obvious the subject-matter of the patent in suit according to the then pending request.

The subject-matter claimed was found to be novel over document (1) which represented state of the art pursuant to Article 54(3) EPC for the Contracting States DE, FR and GB. With respect to inventive step the Opposition Division held that document (3) did not indicate combining the mixture of R-125/R-32 taught therein with R-134a to arrive at the compositions claimed. Furthermore, none of the cited documents disclosed a ternary mixture and therefore the person skilled in the art would not have been encouraged to produce the ternary compositions according to claim 1.

V. At the oral proceedings before the Board, held on 31 July 2001, the Respondent (Proprietor of the Patent) defended the maintenance of the patent in suit for the Contracting States BE, IT and NL on the basis of the second set of claims indicated in point III above (main request) and on the basis of a fresh set of two claims (auxiliary request). Both claims according to the auxiliary request differed from those according to the main request exclusively in specifying the composition as being "non-flammable".

VI. The Appellants I and II, while conceding novelty, objected to the inventive step of the patent in suit and to the clarity of the amended claims according to

the auxiliary request.

a. Having regard to inventive step, the decision under appeal was incorrect in stating that there was no document in the prior art suggesting ternary compositions since such compositions were specified e.g. in document (8), Table 3. That document taught a ternary composition of R-134a and R-502 since the latter was a mixture of R-22 and R-115.

Starting from that ternary composition of document (8), the skilled person aimed at providing an ozone-friendly mixture to overcome the environmental problem caused by R-502. To solve that problem document (3) proposed substituting the mixture of R-32 and R-125 for R-502 giving, thus, a clear incentive to do the same in the ternary composition known from document (8) thereby arriving at the claimed invention without involving an inventive step.

The Appellants conceded that document (8) indicated a lower limit of -50°C for the boiling point of the halogenated hydrocarbons to be added to R-134a. However, the indication of that limit would not have diverted the skilled person from following the incentive given in document (3) of adding a mixture of R-32 and R-125 thereto since mixtures of R-32 and R-125 having up to 20 mol% R-32, which were comprised within the teaching of document (3), showed a boiling point satisfying that limit, i.e. of -50°C or higher. Furthermore this limit for the boiling point was not presented in document (8) as a strict borderline or a matter

of principle; it followed merely from considerations on engineering difficulties.

b. With respect to clarity, the Appellants submitted that the feature "non-flammable" characterising the compositions of claim 1 according to the auxiliary request was not in keeping with the requirements of Article 84 EPC. Those requirements were to be taken into consideration since that feature resulted from an amendment made to the claims in appeal proceedings. The flammability test method indicated in the patent specification specified neither the temperature, nor the pressure, nor the percentage of air to be used when operating that test method. However, the flammability of a claimed composition depended on those process parameters, in particular the latter, with the consequence that the skilled person could not determine with certainty whether a claimed composition was "non-flammable" in the sense of the patent in suit or not.

VII. The Respondent argued that the subject-matter of the patent in suit was novel and involved an inventive step, and that the amended claims according to the auxiliary request were clear.

c. The novelty of the subject-matter claimed according to either request was not destroyed by document (1) on the ground that the patent in suit no longer covered the Contracting States DE, FR and GB designated in that document.

Having regard to inventive step, the Respondent submitted that document (8) described both binary

and ternary compositions comprising R-134a and halogenated hydrocarbons having a boiling point of -50 to -35°C, e.g. a ternary composition comprising R-134a and the mixture of R-22 and R-115 called R-502. Starting the assessment of inventive step from that ternary composition, the problem underlying the invention was to provide an ozone-friendly refrigerant composition. The Respondent conceded that document (3) addressed that problem. He argued, however, that on the basis of the teaching comprised in that document the skilled person could not predict with certainty the success of the envisaged solution, i.e. of substituting the mixture of R-32 and R-125 for the mixture R-502. Document (3) did not teach that this substitution of mixtures was successful in any refrigerant composition. The mixture of R-32 and R-125 was one out of three alternative substitutes for R-502 presented in that document. The alternative substitutes were labelled "likely candidates" in document (3) which, hence, gave merely a vague hint and no clear incentive to use that particular mixture as substitute for R-502.

The Respondent argued that document (8) deterred the person skilled in the art from applying the teaching of document (3) in substituting the mixture of R-32 and R-125 for R-502 since R-32 had a boiling point of -52°C which was below the lower limit of -50°C indicated in document (8). Furthermore, there was no need to consider any further document, such as document (3), for finding ozone-friendly refrigerant compositions as document (8) on its own, namely in form of the binary composition of Table 2, already provided a

solution to that problem underlying the invention.

d. With respect to the clarity of claim 1 according to the auxiliary request, the Respondent submitted that the feature "non-flammable" defining the compositions claimed was clear. The patent specification indicated the method for testing the flammability of the compositions claimed. While the patent specification did not specify the process parameters for operating that method, it was indeed performed at room temperature at normal pressure. Though the patent specification was silent about the percentage of air (oxygen) to be present in the flammability test, the skilled person would select a "reasonable" percentage thereof thereby successfully performing the test. Thus, the patent specification clearly indicated how to identify "non-flammable" compositions.

VIII. The Appellants I and II requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent requested that the decision under appeal be set aside and that the patent be maintained for the Contracting States BE, IT and NL on the basis of claims 1 and 2 filed for those states on 19 May 1999 or on the basis of claims 1 and 2 filed in the oral proceedings as auxiliary request.

IX. At the end of the oral proceedings the decision of the Board was given orally.

Reasons for the Decision

1. The appeals are admissible.

Main Request

2. *Novelty*

The Appellants I and II conceded at the oral proceedings before the Board that the subject-matter of the claims is novel; nor does the Board see any reason to take a different view. The content of document (1) is not comprised in the state of the art in the sense of Article 54(3) EPC on the ground that the requirements of Article 54(4) EPC are not fulfilled since the patent in suit no longer covers the Contracting States DE, FR and GB designated in that document. Novelty not being in dispute, it is unnecessary to give more detailed arguments in this respect.

3. *Inventive step*

3.1 The patent in suit relates to a ternary composition of the halogenated hydrocarbons R-134a, R-32 and R-125 to be used as refrigerant (patent specification column 1, line 5). Similar compositions for the same use already belong to the state of the art: document (8) refers to compositions of R-134a and a halogenated hydrocarbon having a boiling point of -50 to -35°C which are used as refrigerants (page 2, paragraphs 4 and 7). The halogenated hydrocarbons may be used as a mixture of one or more (page 3, paragraph 3, lines 21 and 22). That prior art document describes in Table 3 a composition of R-134a and R-502. Since the component R-502 is a mixture of two halogenated hydrocarbons, namely R-22 and R-115 (page 4, line 2), that

composition comprises indeed the halogenated hydrocarbons R-134a, R-22 and R-115; as in the patent in suit it is, thus, a ternary composition.

The Board considers, in agreement with the Appellants I and II and the Respondent, that this disclosure of document (8) represents the closest state of the art, and hence takes it as the starting point in the assessment of inventive step.

3.2 The drawbacks of conventional chlorofluorinated refrigerant compositions comprising *inter alia* R-22 lie in depleting the stratospheric ozone layer when released to the atmosphere, thereby inflicting a serious adverse influence on the ecosystem (patent specification column 1, lines 8 to 17). Thus, the problem underlying the patent in suit vis-à-vis the closest prior art document (8), as submitted by the Respondent and acknowledged by the Appellants I and II at the oral proceedings before the Board, consists in providing ozone-friendly refrigerant compositions.

3.3 As the solution to this problem, the patent in suit proposes a composition consisting essentially of R-134a, R-32 and R-125.

3.4 Neither Appellant ever disputed that the claimed refrigerant compositions achieve ozone friendliness; and the Board is not aware of any reason for challenging this finding. The compositions of the invention are readily decomposed since they contain neither chlorine nor bromine atoms which adversely affect the ozone layer; hence, they do not give rise to depletion of the ozone layer (patent specification column 2, lines 50 to 53). For these reasons, the Board

is satisfied that the problem underlying the patent in suit has been successfully solved.

3.5 Finally, it remains to be decided whether or not the proposed solution to the problem underlying the patent in suit is obvious in view of the cited state of the art.

When starting from the ternary refrigerant composition known from document (8), i.e comprising R-134a and R-502, it is a matter of course that the person skilled in the art seeking to provide ozone-friendly refrigerant compositions would turn his attention to that prior art in the field of refrigerants just dealing with the same technical problem. As a skilled person he would be struck by document (3) which relates to "Ozone Safe Refrigerant" (headline). Moreover he would take that document into consideration since it addresses alternatives for commercial refrigeration systems using R-502. Document (3) teaches to substitute a mixture of R-32 and R-125 for R-502 thereby achieving ozone safe refrigerants (middle of page 1).

The Board concludes from the above that the state of the art, in particular document (3), gives the person skilled in the art a concrete hint as to how to solve the problem underlying the patent in suit as defined in point 3.2 above, namely by substituting the mixture of R-32 and R-125 for R-502 in the ternary composition of R-134a and R-502 known from the closest prior art document (8), thereby arriving at the claimed compositions, i.e. the solution proposed by the patent in suit. In the Board's judgement, it was obvious to try to follow the avenue indicated in the state of the art with a reasonable expectation of success without

involving any inventive ingenuity.

3.6 For the following reasons the Board cannot accept the Respondent's arguments designed for supporting inventive step.

3.6.1 The Respondent submitted that document (8) described refrigerant compositions comprising R-134a and halogenated hydrocarbons having a boiling point of -50 to -35°C. Thus, so he argued, that document deterred the person skilled in the art from applying the teaching of document (3) on the compositions known from document (8) since the halogenated hydrocarbon R-32 addressed in document (3) had a boiling point of -52°C which was below the lower limit of -50°C indicated in document (8).

However, document (3) addresses precisely the problem underlying the patent in suit with the consequence that a skilled person necessarily takes that document into consideration when looking for a solution to that problem. Furthermore, the limitation of -50°C for the boiling point of the halogenated hydrocarbons to be incorporated into the compositions is not presented in document (8) as a strict borderline or as a matter of principle rendering a composition unsuited as a refrigerant when exceeded. That limitation follows merely from considerations on the engineering of refrigeration devices (page 3, paragraph 3, lines 2 to 11). Moreover, the indication of that limit of -50°C in document (8) does not affect the present case. While R-32 has indeed a boiling point of -52°C which is outside that limit, the incentive given in document (3) which hints at the claimed invention rendering it obvious was not to add solely R-32, but to add a

mixture of both R-32 and R-125. The halogenated hydrocarbon R-125, however, has a boiling point of -48°C which is within that limit with the consequence that mixtures of R-32 and R-125 satisfy that limit also depending on their relative proportions. Thus, mixtures of R-32 and R-125 having up to 20 mol% R-32 show a boiling point of -50°C or higher. This finding was not disputed by the Respondent.

For these reasons, the person skilled in the art is not deterred from applying the teaching of document (3), i.e. adding a mixture of R-32 and R-125, to the refrigerant compositions known from the closest prior art document (8) in order to solve the problem underlying the patent in suit.

3.6.2 The Respondent also argued that on the basis of the teaching comprised in document (3) the skilled person could not predict with certainty that substituting the mixture of R-32 and R-125 for R-502 would be successful in any refrigerant composition. The mixture of R-32 and R-125 was one out of three substitutes for R-502 presented alternatively in that document. These substitutes, including that particular mixture, were labelled "likely candidates" in document (3) which, thus, gave merely a vague hint and no clear incentive to use that mixture as a substitute for R-502. Due to that lack of predictability of success and the possibility of failure, the claimed invention was not obvious.

However, when assessing inventive step it is not necessary to establish that the success of an envisaged solution of a technical problem was predictable with certainty. In order to render a solution obvious it is

sufficient to establish that the skilled person would have followed the teaching of the prior art with a reasonable expectation of success (see decisions T 249/88, point 8 of the reasons; T 1053/93, point 5.14 of the reasons; neither published in OJ EPO).

In the present case, the Board cannot agree with the Respondent's argument that due to some uncertainty about the predictability of success the skilled person would not have contemplated substituting the mixture of R-32 and R-125 for R-502 in order to achieved ozone-friendly refrigerant compositions. The skilled person has a clear incentive from document (3) to do so (see point 3.5 above). Nothing was submitted by the Respondent from which the Board could reasonably conclude that the skilled person was deterred from following the straight teaching of the art. It was only necessary for him to confirm experimentally by routine work that substituting the mixture of R-32 and R-125 for R-502 in the compositions known from document (8) successfully results in compositions suitable as refrigerants and showing the expected ozone friendliness, thus arriving at the claimed invention without inventive ingenuity.

3.6.3 The Respondent brought forward that there was no need to consider any further document, such as document (3), for finding ozone-friendly refrigerant compositions as document (8) on its own, namely in form of the binary composition of Table 2, already provided a solution to that problem underlying the patent in suit.

However, this view is clearly not free of hindsight. Indeed document (8) is silent about any ozone friendliness of the binary composition of Table 2. In

the absence of such teaching the skilled person would not take that binary composition into consideration at all when looking for a solution to the problem underlying the patent in suit of providing ozone-friendly refrigerant compositions. Thus, the Respondent's argument cannot convince the Board.

3.6.4 The Respondent's argument that the commercial success of the claimed refrigerant compositions must be considered as sufficient evidence for the presence of inventive step cannot be accepted by the Board either. According to established case law commercial success **alone** is not to be regarded as indicative of inventive step. The mere examination for the presence of such secondary indicia is no substitute for the assessment of inventive step vis-à-vis the state of the art on an objective basis following the "problem-solution-approach". Secondary indicia represent auxiliary considerations for the assessment of inventive step and are only relevant in cases of doubts when the objective evaluation of the prior art has not provided a clear picture (see decisions T 24/81, OJ EPO 1983, 133, point 15 of the reasons; T 351/93, point 5.6 of the reasons; T 645/94, point 4.7 of the reasons; neither published in OJ EPO). In the present case, however, there are no doubts as to the absence of an inventive step since the objective evaluation of the state of the art following the "problem-solution-approach" gives a clear picture albeit a negative one (cf. point 3.1 to 3.5 above).

3.7 Therefore, in the Board's judgement, the subject-matter of claim 1 represents an obvious solution to the problem underlying the patent in suit and does not involve an inventive step.

4. As a result, the Respondent's main request is not allowable as the subject-matter of claim 1 lacks inventive step pursuant to Article 56 EPC.

Auxiliary request

5. *Amendments (Article 123 EPC)*

In claims 1 and 2 the fresh feature "non-flammable" defining the claimed compositions finds support on page 3, line 25, page 5, line 15 and page 6, line 6 of the application as filed. Therefore that amendment made to the claims as granted complies with the requirements of Article 123(2) EPC.

That amendment of the claims as granted brings about a restriction of the scope of those claims, and therefore of the protection conferred thereby, which is in keeping with the requirements of Article 123(3) EPC.

6. *Clarity (Article 84 EPC)*

6.1 Though Article 84 EPC may not be raised as ground for opposition in the sense of Article 100 EPC, Article 102(3) EPC stipulates that, taking into consideration the amendments made to the patent in suit during opposition (appeal) proceedings, the patent and the invention to which it relates meet the requirements of the European Patent Convention. Thus, according to established jurisprudence of the Boards of Appeal, the Board has the power to examine whether the patent satisfies all requirements under the EPC, as long as the objections arise out of the amendments made thereto. That examination requires consideration of whether or not those amendments introduce any

contravention of any requirement of the EPC, including Article 84 EPC (see decisions T 301/87, OJ EPO 1990, 335, point 3.8 of the reasons; G 9/91, OJ EPO 1993, 408, point 19 of the reasons). In the present case, the claims have been amended in opposition appeal proceedings to comprise the fresh feature "non-flammable" defining the claimed compositions. Therefore it must be examined whether or not that amendment is in keeping with the requirements of Article 84 PC, in particular with that of clarity. The Respondent, on the one hand, and the Appellants I and II, on the other, had divergent views on that matter.

6.2 Article 84 and Rule 29(1) EPC read in conjunction require that the claims shall be clear and define the matter for which protection is sought in terms of the technical features of the invention. This serves the purpose of ensuring that the public is not left in any doubt as to which subject-matter is covered by a particular claim and which is not. From this principle of legal certainty, in the Board's judgement, it follows that a claim is not clear in the sense of Article 84 EPC if it does not unambiguously allow this distinction to be made (see decisions G 2/88, OJ EPO 1990, 93, point 2.5 of the reasons; T 337/95, OJ EPO 1996, 628, points 2.2 to 2.5 of the reasons). A claim comprising an unclear technical feature entails doubts as to the subject-matter covered by that claim, all the more if this feature is essential with respect to the invention. Thus, for reasons of lack of legal certainty, this claim is not clear in the sense of Article 84 EPC.

6.2.1 In the present case, claim 1 is directed to a composition which is characterised as being "non-

flammable". Therefore the principle of legal certainty requires identification of the scope of that technical feature in order to establish without any doubt the subject-matter covered by that claim. That feature, hence, needs closer examination.

6.2.2 The presence or absence of the property of non-flammability for any particular composition claimed is neither self-evident from common general knowledge nor attributable thereto on a theoretical basis. None of the Parties disputed that finding and the Board, thus, takes it for granted. Therefore, to determine whether a particular composition claimed is flammable or not, the Respondent referred to the flammability test method indicated on column 3, lines 21 to 29 of the patent specification. However, the patent specification describes merely the test configuration in general terms, namely by using a globular vessel, introducing therein the composition to be tested and air and attempting to generate sparks by means of an - undefined - ignition device, while it is silent about any process parameter on how to operate that flammability test. Thus, the patent specification does not specify the process parameters to be used when performing that test on flammability, i.e. temperature, pressure and the percentage of air (oxygen) to be present in the globular vessel, though in particular the latter process parameter is crucial to the result of that test method since a particular composition claimed may be flammable or not depending *inter alia* on the percentage of air present when performing the test method specified in the patent specification. At the oral proceedings before the Board, the Respondent no longer disputed that finding finally; he argued that the skilled person would select a "reasonable"

percentage of air (oxygen) to be used in that flammability test method. However, the Respondent did not refer to a flammability test method which would be generally accepted in the art indicating the skilled person which particular percentage of air to select for the test method specified in the patent specification, and the Board is not aware of any such method.

6.2.3 That lack of specifying the process parameters necessary for performing the flammability test method of the patent specification, in particular the percentage of air to be present, does not allow the skilled person to establish on an objective basis unambiguously whether to qualify or to disqualify a composition covered by the claim as being "non-flammable" in the sense of the patent in suit. As a consequence of the lack of certainty, a composition claimed is open to be labelled "non-flammable" or not depending on how the flammability test is performed.

Since the technical feature "non-flammable" remains unclear for the reasons given above, preventing the skilled person from identifying the exact scope thereof, the public is left in doubts as to the distinction which compositions are covered by claim 1 and which are not, which is at variance with the principle of legal certainty.

6.3 To summarize, the feature "non-flammable" leaves the actual subject-matter covered by the claim in doubt. On the ground of that lack of legal certainty, in the Board's judgement, claim 1 fails to meet the requirement of clarity imposed by Article 84 EPC with the consequence that the Respondent's auxiliary request must be dismissed.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

N. Maslin A. Nuss