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D E C I S I O N
of 20 April 2005

Case Number: T 0496/03 - 3.3.6

Application Number: 96915801.3

Publication Number: 0828815

IPC: C11D 7/50

Language of the proceedings: EN

Title of invention:
Azeotrope-like compositions and their use

Applicant:
MINNESOTA MINING AND MANUFACTURING COMPANY

Opponent:
-

Headword:
PFBME-azeotropes/MINNESOTA

Relevant legal provisions:
EPC Art. 54, 56, 82, 84, 123(2)
EPC R. 29, 30

Keyword:
"Unity of invention (yes): special technical features common to all the claimed inventions providing the same or similar inventive contribution over the prior art; documents cited under Article 54(3) EPC to be disregarded in the evaluation of unity; number of alternatives in a claim ruled by Rule 29 EPC"
"Compliance with Articles 84, 123(2), 54 and 56 EPC (yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0496/03 - 3.3.6

D E C I S I O N
of the Technical Board of Appeal 3.3.6
of 20 April 2005

Appellant: MINNESOTA MINING AND MANUFACTURING COMPANY
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 20 November 2002 refusing European application No. 96915801.3 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: G. N. C. Raths
Members: L. Li Voti
U. J. Tronser

Summary of Facts and Submissions

I. This appeal lies from the decision of the Examining Division to refuse European patent application No. 96 915 801.3 relating to azeotrope-like compositions and their use.

II. In its decision, the Examining Division, referring to the then pending versions of claim 1 for the contracting states BE and for the contracting states DE, FR, GB and IT, respectively, found that the claimed subject-matter did not comply with the requirements of Article 82 and Rule 30 EPC.

Claim 1 related to several azeotrope-like compositions including perfluorobutyl methyl ether having a boiling point of 59°C at 734 torr and one organic solvent, each one being defined by a specific amount of perfluorobutyl methyl ether and by a remaining amount (adding up to 100% by weight) of a solvent and by its boiling temperature at a stated pressure.

The first instance held in this respect in essence that:

(a) an azeotrope was a unique characteristic of a system of two or more liquid components where, at a stated pressure and temperature, the liquid and the vapour compositions were identical; thus the components of such a system could not be separated during distillation at the stated temperature and pressure (see e.g. document (4): US-A-5091104, column 3, lines 46 to 53);

- since azeotropy was not a predictable phenomenon the capability of each and any mixture to form an azeotrope had to be empirically determined;

- consequently, any novel azeotropic composition had to be regarded as being also inventive;

(b) all the compositions defined in claim 1 comprised precise amounts of perfluorobutyl methyl ether (hereinafter PFBME) and specific organic solvents, which amounts allowed the formation of an azeotrope at a specified temperature and pressure; thus these compositions contained all PFBME in different amounts and also different solvents in different amounts; the only technical features which were in common to such compositions were thus their azeotropy and the presence of PFBME;

- azeotropy was a known desirable phenomenon and could not be considered to represent by itself a contribution over the prior art;

- moreover, PFBME was a known compound, the properties of which were measurable at the priority date of the present application; the use of PFBME in this type of compositions was also not novel since some of the formulations were already known from

document (1): EP-A-787537;

thus also the presence of PFBME could not provide an inventive contribution over the prior art;

- therefore, the claimed compositions did not contain any special technical feature as required by Rule 30 EPC and the claimed inventions did not comply with the requirements of Article 82 EPC;

(c) the Applicant's arguments were:

- the disclosure of document (1), which was a not prepublished document cited under Article 54(3) EPC, had to be disregarded in assessing the unity of the claimed invention;

- the technical problem underlying the claimed invention consisted in the provision of a substitute for chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) to be used in combination with organic solvents in the same range of applications of the CFCs and HCFCs but being more friendly to the environment;

- therefore, all the claimed compositions, being suitable substitutes and more friendly to the environment than the known compositions of CFCs or HCFCs with organic solvents, containing PFBME and being azeotropic had some features in common which provided an inventive contribution over the prior art;

(d) as regards these Applicant's arguments under (c), the fact that all the claimed compositions solved the same technical problem could not be seen as a sufficient condition for acknowledging a common inventive concept to all the claimed compositions;

- in fact, since azeotropy depended from the specific amounts and selection of the components of each composition and any azeotropic composition was an invention by itself, a common inventive concept could not be seen in the use of PFBME in combination with the fact that the compositions were azeotropic;

(e) furthermore, if nevertheless the common concept linking all the claimed compositions would be seen in the fact that they were "binary azeotropes comprising PFBME" and this concept would be considered to amount to an inventive contribution over the prior art, the other features of the claimed compositions (i.e. the amounts and chemical identity of the other organic solvents) had to be considered as being not relevant for the assessment of inventive step and thus not contributing to inventive step;

- thus, a further application relating to azeotropes comprising a combination of PFBME with different solvents would have to be considered not to be inventive since the presence of these solvents, as explained above, did not contribute to inventive step, which conclusion contradicted the undisputable fact that azeotropy was not predictable and that any novel azeotropic composition was thus necessarily inventive;

- the same conclusion would have thus to be applied to azeotropic compositions based on different compounds as those disclosed in

document (3): EP-A-450855,

e.g. ethanol;

this would have as a consequence that the composition of present claim 1, containing ethanol and PFBME, differing from these known compositions of document (3) only insofar as it contains as an additional component PFBME, would lack an inventive step since the selection of the additional solvent to be combined with the base component ethanol of the compositions of document (3) could not be regarded as providing an inventive contribution to the azeotropic compositions based on said basic organic solvent;

- therefore, it must be concluded that azeotropy, being a consequence of the selected components and their selected amounts, could not represent such a common special technical feature;

(f) furthermore, since the compositions known from the not prepublished document (1), cited under Article 54(3) EPC with respect to the contracting states DE, FR, GB and IT, had been deleted in the set of claims for these contracting states, the remaining claimed compositions for the contracting states DE, FR, GB and IT had to be considered to lack unity "a posteriori" (see Guidelines C III, 7.7);

(g) finally, claim 1 could not be considered to comply with the requirements of Article 82 EPC because it

contained a too great number of different inventions.

The Examining Division found further that if the subject-matter of claim 1 would be considered to be unitary, it would contravene the requirements of Article 123(2) EPC since the set of azeotropic compositions of claim 1 for the contracting states DE, FR, GB and IT, did not contain any longer the compositions known from document (1) and thus claim 1 listed a set of compositions different from that originally disclosed.

III. An appeal was filed against this decision by the Applicant (Appellant).

The Appellant submitted in the statement of the grounds of appeal *inter alia* that

- document (1), being a document cited under Article 54(3) EPC, had not to be taken into account for assessing inventive step and thus should not be considered in the discussion of unity;

- the claimed invention provided suitable substitutes for CFCs and HCFCs and all the claimed compositions, containing PFBME and being azeotropic had some features in common which provided a contribution over the prior art;

- thus the claimed inventions complied with the requirements of Article 82 and Rule 30 EPC.

IV. In the communications dated 27 June 2003 and 8 June 2004 the Board informed the Appellant of its provisional opinion and *inter alia* that

- the claims considered in the decision under appeal appeared to comply with the requirements of Article 82 EPC.

The Board informed the Appellant in a communication dated 8 October 2004 *inter alia* that the independent claims of the requests still pending before the Board did not appear to comply with the requirements of Article 84 EPC.

V. During the oral proceedings held before the Board on 20 April 2005 the Appellant filed a new request consisting of two distinct sets of claims for the contracting states BE and the contracting states DE, FR, GB and IT, respectively, each of them containing 10 claims, to be considered as the sole request.

The set of claims for BE contains independent claims 1, 2 and 7 reading as follows:

"1. An azeotrope composition including perfluorobutyl methyl ether having a boiling point at 59°C at 734 torr and one organic solvent, wherein the perfluorobutyl methyl ether consists essentially of 95 weight percent perfluoro-n-butyl methyl ether, and 5 weight percent perfluoroisobutyl methyl ether, and wherein the azeotrope composition is selected from the group consisting of:
(i) compositions consisting essentially of the ether and cyclohexane which, when fractionally distilled,

form a distillate fraction that is an azeotrope that consists essentially of 88 weight percent of the ether and 12 weight percent of the cyclohexane and boils at 55°C at 726 torr;

(ii) compositions consisting essentially of the ether and methylcyclohexane which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 96 weight percent of the ether and 4 weight percent of the methylcyclohexane and boils at 59°C at 729 torr;

(iii) compositions consisting essentially of the ether and heptane which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 95 weight percent of the ether and 5 weight percent of the heptane and boils at 59°C at 733 torr;

(iv) compositions consisting essentially of the ether and isooctane which, when fractionally distilled, produce a distillate fraction that is an azeotrope that consists essentially of 96 weight percent of the ether and 4 weight percent of the isooctane and boils at about 59°C at 734 torr;

(v) compositions consisting essentially of the ether and the diisopropyl ether which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 78 weight percent of the ether and 22 weight percent of the diisopropyl ether and boils at 57°C at 736 torr;

(vi) compositions consisting essentially of the ether and methyl t-butyl ether which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 63 weight percent of the ether and 37 weight percent of the methyl t-butyl ether and boils at 52°C at 729 torr;

(vii) compositions consisting essentially of the ether and tetrahydrofuran which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 79 weight percent of the ether and 21 percent of the tetrahydrofuran and boils at 56°C at 729 torr;

(viii) compositions consisting essentially of the ether and acetone which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 65 weight percent of the ether and 35 percent of the acetone and boils at 51°C at 736 torr;

(ix) compositions consisting essentially of the ether and trans-1,2-dichloroethylene which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 44 weight percent of the ether and 56 percent of the trans-1,2-dichloroethylene and boils at 41°C at 730 torr;

(x) compositions consisting essentially of the ether and 1-chlorobutane which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 86 weight percent of the ether and 14 percent of the 1-chlorobutane and boils at 57°C at 730 torr;

(xi) compositions consisting essentially of the ether and 1,2-dichloropropane which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 95 weight percent of the ether and 5 percent of the 1,2-dichloropropane and boils at 59°C at 732 torr;

(xii) compositions consisting essentially of the ether and 2,2-dichloropropane which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 77 weight

percent of the ether and 23 percent of the 2,2-dichloropropane and boils at 56°C at 723 torr;

(xiii) compositions consisting essentially of the ether and methanol which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 96 weight percent of the ether and 4 percent of the methanol and boils at 47°C at 735 torr;

(xiv) compositions consisting essentially of the ether and ethanol which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 97 weight percent of the ether and 3 percent of the ethanol and boils at 53°C at 736 torr;

(xv) compositions consisting essentially of the ether and 1-propanol which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 98 weight percent of the ether and 2 percent of the 1-propanol and boils at 57°C at 735 torr;

(xvi) compositions consisting essentially of the ether and t-butyl chloride which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 46 weight percent of the ether and 54 percent of the t-butyl chloride and boils at 47°C at 723 torr; and

(xvii) compositions consisting essentially of the ether and HCFC-225ca/cb which, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 26 weight percent of the ether and 74 percent of a mixture of 45 weight percent HCFC-225ca and 55 weight percent HCFC-225cb, and boils at 53°C at 723 torr."

"2. An azeotrope composition including perfluorobutyl methyl ether having a boiling point at 59°C at 734 torr and one organic solvent, wherein the perfluorobutyl methyl ether consists essentially of 35 weight percent perfluoro-n-butyl methyl ether, and 65 weight percent perfluoroisobutyl methyl ether, and wherein the azeotrope composition is selected from the group consisting of:

(i) compositions consisting essentially of the ether and methylcyclohexane, the compositions ,when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 97 weight percent of the ether and 3 weight percent of the methylcyclohexane and boils at 59°C at 743 torr;

(ii) compositions consisting essentially of the ether and heptane, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 94 weight percent of the ether and 6 weight percent of the heptane and boils at 59°C at 732 torr;

(iii) compositions consisting essentially of the ether and isooctane, the compositions, when fractionally distilled, produce a distillate fraction that is an azeotrope that consists essentially of 96 weight percent of the ether and 4 weight percent of the isooctane and boils at 59°C at 732 torr;

(iv) compositions consisting essentially of the ether and trans-1,2- dichloroethylene, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 50 weight percent of the ether and 50 percent of the trans-1,2-dichloroethylene and boils at 41°C at 740 torr;

(v) compositions consisting essentially of the ether and 1-chlorobutane, the compositions, when fractionally

distilled, form a distillate fraction that is an azeotrope that consists essentially of 88 weight percent of the ether and 12 percent of the 1-chlorobutane and boils at 57°C at 732 torr;

(vi) compositions consisting essentially of the ether and 2-chlorobutane, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 79 weight percent of the ether and 21 percent of the 2-chlorobutane and boils at 55°C at 740 torr;

(vii) compositions consisting essentially of the ether and i-butyl chloride, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 80 weight percent of the ether and 20 percent of the i-butyl chloride and boils at 55°C at 741 torr;

(viii) compositions consisting essentially of the ether and t-butyl chloride, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 47 weight percent of the ether and 53 percent of the t-butyl chloride and boils at 48°C at 743 torr;

(ix) compositions consisting essentially of the ether and 1,2-dichloropropane, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 95 weight percent of the ether and 5 percent of the 1,2-dichloropropane and boils at 59°C at 745 torr;

(x) compositions consisting essentially of the ether and 2,2-dichloropropane, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 81 weight percent of the ether and 19 percent of the 2,2-dichloropropane and boils at 55°C at 727 torr;

(xi) compositions consisting essentially of the ether and methylene chloride, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 45 weight percent of the ether and 55 percent of the methylene chloride and boils at 35°C at 743 torr;

(xii) compositions consisting essentially of the ether and methanol, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 90 weight percent of the ether and 10 percent of the methanol and boils at 46°C at 733 torr;

(xiii) compositions consisting essentially of the ether and ethanol, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 93 weight percent of the ether and 7 percent of the ethanol and boils at 52°C at 733 torr;

(xiv) compositions consisting essentially of the ether and 1-propanol, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 97 weight percent of the ether and 3 percent of the 1-propanol and boils at 56°C at 729 torr;

(xv) compositions consisting essentially of the ether and 2-butanol, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 98 weight percent of the ether and 2 percent of the 2-butanol and boils at 58°C at 742 torr;

(xvi) compositions consisting essentially of the ether and i-butanol, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 99 weight

percent of the ether and 1 percent of the i-butanol and boils at 58°C at 743 torr;

(xvii) compositions consisting essentially of the ether and t-butanol, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 94 weight percent of the ether and 6 percent of the t-butanol and boils at 56°C at 741 torr;

(xviii) compositions consisting essentially of the ether and trifluoroethanol, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 86 weight percent of the ether and 14 percent of the trifluoroethanol and boils at 53°C at 740 torr;

(xix) compositions consisting essentially of the ether and pentafluoropropanol, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 89 weight percent of the ether and 11 percent of the pentafluoropropanol and boils at 57°C at 740 torr;

(xx) compositions consisting essentially of the ether and hexafluoro-2-propanol, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 58 weight percent of the ether and 42 percent of the hexafluoro-2-propanol and boils at 53°C at 748 torr;

(xxi) compositions consisting essentially of the ether and 1-bromopropane, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 74 weight percent of the ether and 26 percent of the 1-bromopropane and boils at 53°C at 724 torr;

(xxiii) compositions consisting essentially of the ether and a mixture of 45 weight percent HCFC-225ca and

55 weight percent HCFC-225cb, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 31 weight percent of the ether and 69 percent of a mixture of 45 weight percent HCFC-225ca and 55 weight percent HCFC-225cb, and boils at 53°C at 740 torr; and

(xxiv) compositions consisting essentially of the ether and 1,1,2-trichloroethylene, the compositions, when fractionally distilled, form a distillate fraction that is an azeotrope that consists essentially of 87 weight percent of the ether and 13 weight percent of the 1,1,2-trichloroethylene and boils at 58°C at 744 torr."

"7. An azeotrope composition including perfluorobutyl methyl ether, wherein the ether consists essentially of 65 weight percent perfluoroisobutyl methyl ether and 35 weight percent perfluoro-n-butyl methyl ether, and two or more organic solvents, and the azeotrope composition is selected from the group consisting of:

(i) compositions consisting essentially of the ether, trans-1,2-dichloroethylene and methanol, which when fractionally distilled, produces a distillate fraction that is an azeotrope consisting essentially of 51.9 weight percent of the ether, and 43.0 weight percent of the trans-1,2-dichloroethylene and 5.1 weight percent of the methanol, the azeotrope boiling at 36°C at 732 torr;

(ii) compositions consisting essentially of the ether, trans-1,2-dichloroethylene and ethanol which, when fractionally distilled, produce a distillate fraction that is an azeotrope consisting essentially of 52.7 weight percent of the ether and 44.6 weight percent of the trans-1,2-dichloroethylene and 2.7 weight percent

of the ethanol, the azeotrope boiling at 40°C at 731 torr;

(iii) compositions consisting essentially of the ether, trans-1,2-dichloroethylene and 1-propanol which, when fractionally distilled, produce a distillate fraction that is an azeotrope consisting essentially of 51.1 weight percent of the ether, 48.6 weight percent of the trans-1,2-dichloroethylene and 0.3 weight percent of the 1-propanol, the azeotrope boiling at 41°C at 733 torr;

(iv) compositions consisting essentially of the ether, trans-1,2dichloroethylene and 2-propanol which, when fractionally distilled, produce a distillate fraction that is an azeotrope consisting essentially of 51.7 weight percent of the ether, 47.0 weight percent of the trans-1,2-dichloroethylene and 1.3 weight percent of the 2-propanol, the azeotrope boiling at 41°C at 737 torr;

(v) compositions consisting essentially of the ether, trans-1,2-dichloroethylene and t-butanol which, when fractionally distilled, produce a distillate fraction that is an azeotrope consisting essentially of 53.5 weight percent of the ether, 45.9 weight percent of the trans-1,2-dichloroethylene and 0.6 weight percent of the t-butanol, the azeotrope boiling at 40°C at 730 torr;

(vi) compositions consisting essentially of the ether, trans-1,2-dichloroethylene and trifluoroethanol which, when fractionally distilled, produce a distillate fraction that is an azeotrope consisting essentially of 43.8 weight percent of the ether, 46.8 weight percent of the trans-l,2-dichloroethylene and 9.4 weight percent of the trifluoroethanol, the azeotrope boiling at 39°C at 734 torr;

(vii) compositions consisting essentially of the ether, trans-1,2-dichloroethylene and pentafluoro-l-propanol which, when fractionally distilled, produce a distillate fraction that is an azeotrope consisting essentially of 47.4 weight percent of the ether, 46.8 weight percent of the trans-1,2-dichloroethylene and 5.8 weight percent of the pentafluoro-l-propanol, the azeotrope boiling at 40°C at 734 torr;

(viii) compositions consisting essentially of the ether, trans-1,2-dichloroethylene and hexafluoro-2-propanol which, when fractionally distilled, produce a distillate fraction that is an azeotrope consisting essentially of 36.3 weight percent of the ether, 44.3 weight percent of the trans-1,2-dichloroethylene and 19.4 weight percent of the hexafluoro-2-propanol, the azeotrope boiling at 39°C at 735 torr;

(ix) compositions consisting essentially of the ether, trans-1,2-dichloroethylene and acetonitrile which, when fractionally distilled, produce a distillate fraction that is an azeotrope consisting essentially of 51.6 weight percent of the ether, 48.1 weight percent of the trans-1,2-dichloroethylene and 0.3 weight percent of the acetonitrile, the azeotrope boiling at 40°C at 728 torr;

(x) compositions consisting essentially of the ether, a mixture of 45 weight percent HCFC-225ca and 55 weight percent HCFC-225cb, and ethanol, which when fractionally distilled, produces a distillate fraction that is an azeotrope consisting essentially of 42.5 weight percent of the ether, 53.2 weight percent of the mixture of HCFC-225 ca and HCFC-225cb, 4.3 weight percent of the ethanol, the azeotrope boiling at 51°C at 735 torr."

The remaining claims relate to coating compositions comprising the azeotropes of claims 1, 2 or 7 as well as to a process for depositing a coating on a substrate surface by using such azeotropic compositions and a process for removing contaminants from the surface of a substrate by means of such azeotropic compositions.

The set of claims for the contracting states DE, FR, GB, IT differs from that for BE only insofar as claim 1 does not include the compositions (viii), (xiii) and (xiv) contained in claim 1 for BE and claim 2 does not include the compositions (xii), (xiii) and (xviii) contained in claim 2 for BE.

VI. The Appellant requests that the decision under appeal is set aside and that a patent be granted on the basis of claims 1 to 10 (claims for DE, FR, GB and IT) and claims 1 to 10 (claims for BE), submitted during oral proceedings.

Reasons for the Decision

1. *Set of claims for BE*

1.1 Articles 84 and 123(2) EPC

1.1.1 The Board is satisfied that the claims of the request submitted during oral proceedings meet the requirements of Article 84 since the claimed azeotropic compositions are fully supported by tables 4 and 5 of the application as originally filed and the numerical values used in such tables have been consistently approximated to the unit when necessary.

1.1.2 The Board finds also that the claims comply with the requirements of Article 123(2) EPC since the claims find support in claim 5 read in combination with claims 2 or 3, claims 6 to 9, claim 12 read in combination with claim 10, claims 13 to 15 and tables 4 and 5 of the application as originally filed.

1.2 Unity of invention

1.2.1 According to Article 82 and Rule 30 EPC a group of inventions claimed in one single European patent application fulfils the requirements of unity of invention when there is a technical relationship among these inventions (without regard to whether they are claimed in separate claims or as alternatives within a single claim) involving one or more of the same or corresponding special technical features; said special technical features are defined in Rule 30 EPC as those features which define a contribution which each of the claimed inventions considered as a whole makes over the prior art.

It is the established jurisprudence of the Boards of Appeal of the EPO that, in order to assess the unity of invention of a claimed subject-matter, it is first necessary to identify the technical features and concepts common to all the claimed inventions, then the technical problem underlying the respective group of inventions and, finally, whether these common features and concepts, considered not singly but as a whole, represent the same inventive contribution over the prior art (see e.g. Case Law of the Boards of appeal of the EPO, 4th edition 2001, point II.C.6.1 on page 184

and II.C.7.2 on pages 188 to 190, in particular decision W 45/92, point 3.4 of the reasons for the decision, unpublished in OJ EPO and W 6/90, OJ EPO 1991, 438 point 3.2 of the reasons for the decision).

Therefore at first it has to be assessed if all the 40 compositions claimed in the independent claims 1, 2 and 7 contain some technical features and concepts in common.

1.2.2 The Board finds that all the compositions listed in these claims contain a PFBME mixture, contain organic solvents as a further component and have an azeotropic behaviour; moreover, even though the azeotropic behaviour is only a property of the compositions which depends from the respective amounts of their components and from the specific temperature and pressure used during distillation of the respective composition, it is a property which can be defined as the capacity common to all the compositions to provide at a stated pressure and temperature liquid and vapour compositions which are identical (see point II(a) above). This property is possessed by all the claimed compositions and must thus be considered as being a concept common to all of them.

It is thus in the Board's view not relevant if this azeotropic effect is achieved for each composition by means of different concentrations of the various components or at different temperatures and pressure since these features, not being common to all the claims, have to be disregarded in the assessment of unity.

1.2.3 The technical problem underlying the claimed inventions is defined in the present application as the provision of substitutes for CFCs and HCFCs in the known compositions of such compounds with organic solvents, which substitutes are able to provide similar properties as regards their applications, e.g. the capability of forming azeotropes and of cleaning substrates such as printed circuit boards, and are less harmful to the environment, e.g. have a shorter atmospheric lifetime (see page 1, line 6 to page 2, line 9).

Since the compositions of CFCs and HCFCs of the prior art also contained one or more organic solvents as a further component and were azeotropic, the only feature common to all the present claims which is novel and can provide a contribution over the prior art is the use of a PFBME mixture.

Since the prior art did not disclose or suggest that a PFBME mixture could form azeotropic compositions in combination with organic solvents, the Board is convinced that all these compositions provide one and the same solution to the technical problem identified above.

The Board thus concludes that all the compositions comprise one and the same special technical feature, a PFBME mixture, which provides the same or similar inventive contribution over the prior art.

Thus all the claimed compositions have the same inventive concept in common and the claimed inventions

thus comply with the requirements of Article 82 and Rule 30 EPC.

1.2.4 The fact that any azeotrope is in itself an invention because it is not predictable does not contradict the previous findings since all the alternatives contained in the claims are linked by a common inventive concept as explained above.

1.2.5 Moreover, the presence of a great number of alternatives in a claim is not ruled by Article 82 EPC but by Rule 29 EPC and cannot be seen as contravening the requirements of Article 82 EPC.

According to Rule 29 EPC alternatives are admissible in a claim if it is not possible to claim an invention otherwise.

In the Boards' judgement, it was possible in the present case to draft an adequate claim complying with the requirements of Article 84 EPC only by listing any single azeotropic composition identified in tables 4 and 5 of the description.

Since all the listed compositions are adequately supported, as explained in point 1.1.1 above, and linked by a common inventive concept, the claims cannot be seen under the circumstances of the present case as contravening the requirements of Rule 29 EPC.

1.3 Novelty and inventive step

The Board is also satisfied that the claimed subject-matter is novel over the cited prior art.

Moreover, since, as already recognised by the first instance, any novel azeotropic composition is not predictable and the prior art neither disclosed or suggested the claimed azeotropic compositions, the claimed subject-matter also involves an inventive step over document (3) since, starting from this document it was not obvious to combine e.g. ethanol with a PFBME mixture and to expect similar characteristics, e.g. an azeotropic behaviour.

Therefore, it cannot be argued that the claimed compositions lack an inventive step because they differ from those disclosed in the prior art only in the technical features which are not in common and which have not to be considered in discussing the unity of the claimed inventions.

All the claims meet thus the requirements of Articles 54 and 56 EPC.

2. *Set of Claims for DE, FR, GB and IT*

2.1 Articles 84 and 123(2) EPC

The set of claims for the contracting states DE, FR, GB, IT differs from that for BE only insofar as claim 1 does not include the compositions (viii), (xiii) and (xiv) of claim 1 for BE and claim 2 does not include the compositions (xii), (xiii) and (xviii) of claim 2 for BE.

The arguments put forward in point 1.1 above in respect to the claims for BE apply thus *mutatis mutandis* also to this set of claims.

Moreover, the fact that the set of compositions claimed in the claims 1 and 2 for DE, FR, GB and IT is more restricted than that of the respective claims for BE because of a limitation over document (1), cited under Article 54(3) EPC for the common designated contracting states, cannot give rise to an objection under Article 123(2) EPC since claims 1 and 2 list a series of alternative compositions, any of which being singly supported by table 4 of the description.

Thus, the deletion of one or more of these compositions restricts the scope of these claims, the remaining part of the claims consisting also of a series of alternative compositions, any of which being also singly supported by said table 4.

2.2 Unity of invention

The set of claims for the contracting states DE, FR, GB, IT differs from that for BE insofar as claim 1 does not include the compositions (viii), (xiii) and (xiv) of claim 1 for BE and claim 2 does not include the compositions (xii), (xiii) and (xviii) of claim 2 for BE.

These compositions were in fact known from document (1) which was not available to the public at the priority date of the present application.

Since document (1), being not available to the public at the priority date of the present application, could not anticipate the inventive concept of the present application, it has to be disregarded in evaluating the unity of the claimed invention.

Therefore, in the Board's view, even if in this set of claims some of the compositions known from document (1) and originally claimed have been deleted, a deficiency of non-unity "a posteriori" cannot arise.

Thus, the arguments put forward in point 1.2 above in respect to the claims for BE apply *mutatis mutandis* also to this set of claims.

2.3 Novelty and inventive step

Since the compositions disclosed in document (1) are not contained in the set of claims for DE, GB, FR and IT, the Board is satisfied that the claimed subject-matter is novel.

As regards inventive step the same arguments put forward in point 1.3 above in respect to the claims for BE apply *mutatis mutandis* to this set of claims.

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 claims 1 to 10 (claims for DE, FR, GB and IT) and claims 1 to 10 (claims for BE), both sets of claims submitted during oral proceedings, and a description to be adapted thereto.

The Registrar: The Chairman:

G. Rauh G. Raths