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D E C I S I O N
of 19 December 2003

Case Number: T 0540/00 - 3.2.4

Application Number: 90108451.7

Publication Number: 0397051

IPC: F04D 19/04

Language of the proceedings: EN

Title of invention:
Evacuation apparatus and evacuation method

Patentee:
Kabushiki Kaisha Toshiba, et al

Opponent:
Leybold Vakuum GmbH
Helix Technology Corporation

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 54, 56, 67, 113

Keyword:
"Extension of subject-matter - main request - yes"
"Novelty and inventive step - modified main request - yes"
"Reimbursement of appeal fee - no"

Decisions cited:
-

Catchword:
-

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Case Number: T 0540/00 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 19 December 2003

Appellant: (Proprietor of the patent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 15 March 2000 revoking European patent No. 0397051 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: C. A. J. Andries
Members: M. G. Hatherly
M.-B. Tardo-Dino

Summary of Facts and Submissions

I. European patent No. 0 397 051 was revoked by the opposition division's decision dispatched on 15 March 2000.

The appellant (proprietor) filed an appeal on 25 May 2000, paid the appeal fee simultaneously and then filed the statement of grounds of appeal on 25 July 2000.

II. The following documents are relevant to this decision:

D5 US-A-4 679 402

D9 "A User's Guide to Vacuum Technology", John F. O'Hanlon, John Wiley & Sons, ISBN 0-471-01624-1, 1980

D19 "High Vacuum Production in the Microelectronics Industry", Plasma Technology, 2, Pierre Duval, Alcatel, Elsevier Amsterdam - Oxford - New York - Tokyo, ISBN 0-444-42878-X, 1988, pages 10 to 13, 46, 47, 54 to 58 and 91 to 96

E2 JP-A-59 90 784

E6 DE-U-8 804 218.9

E7 "Theory and Practice of Vacuum Technology", Max Wutz, Hermann Adam and Wilhelm Walcher, Friedr. Vieweg & Sohn, Braunschweig/Wiesbaden, ISBN 3-528-08908-3, 1989, pages V and 577 to 579

- Graph entitled "Vapor Pressure of Various Vacuum Contaminants", not prior art, filed by respondent II during the oral proceedings

III. The opposition division revoked the patent for lack of inventive step, stating in its decision that the skilled man was able to modify the device of D9 simply by adopting the cold trap of D5, thus arriving at a device having all the features of claim 1 of both requests then on file.

IV. Oral proceedings were held on 19 December 2003 in the presence of the appellant and respondent II (opponent II). Respondent I (opponent I) had announced by letter dated 25 November 2003 that he would not attend the oral proceedings and so, in accordance with Rule 71(2) EPC, these took place without him.

V. The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form, on the basis of the main request (claims 1 to 8) filed with letter dated 19 November 2003; or alternatively on the basis of the modified main request filed during the oral proceedings (claims 1 to 8). He requested reimbursement of the appeal fee but withdrew all his other auxiliary requests.

The respondents requested (respondent I only in writing) that the appeal be dismissed.

VI. The independent apparatus claim 1 of the main request reads:

"An evacuation apparatus comprising:
a turbo-molecular pump (26) having a rotor provided with a plurality of rotor blades and a spacer provided with a plurality of stator blades so that gas molecules are sucked in from a suction port, compressed and discharged from an exhaust port;
a heat exchanger (25) provided at said suction port side of said turbo-molecular pump (26) to freeze-trap gas molecules by being cooled by a helium refrigerator (24); the surface of said heat exchanger (25) is cooled by said helium refrigerator (24) to a temperature between -100°C and -200°C for selectively freeze-trapping water molecules, wherein a compressor unit (27) circulatorily supplies compressed helium gas to the helium refrigerator (24);
and
a gate valve (23) provided upstream of said heat exchanger (25),
wherein a heater (32) is provided which is integrated in the cold trap and is also adjacent to the heat exchange (25)."

The independent method claim 7 of the main request reads:

"An evacuation method for a vacuum vessel (21) which has a heat exchanger (25) that is disposed between said vacuum vessel (21) and a suction port (22) of a turbo-molecular pump (26) to freeze-trap gas molecules by being cooled by a helium refrigerator (24), the surface of said heat exchanger (25) is cooled by said helium

refrigerator (24) to a temperature between -100°C and -200°C for selectively freeze-trapping water molecules; a compressor unit (27) circulatorily supplying compressed helium gas to the helium refrigerator (24) and a gate valve (23) that is disposed upstream of said heat exchanger (25) and provided in a suction pipe (22) which extends between said vacuum vessel (21) and said suction port (22) of said turbo-molecular pump (26), and wherein a heater (32) is provided which is integrated in the cold trap and is also adjacent to the heat exchanger (25), said method comprising;
an exhaust step in which said gate valve (23) is opened and, in this state, said turbo-molecular pump (26) and said helium refrigerator (24) are run; and a regeneration step in which, with said gate valve (23) closed, said turbo-molecular pump (26) is run, and said heat exchanger (25) is heated with said heater or said helium refrigerator (24) is suspended, thereby sublimating molecules freeze-trapped in said heat exchanger (25)."

Claim 1 of the modified main request differs from claim 1 of the main request only in that the words "between -100°C and -200°C" are deleted and the final word "exchange" in the claim is corrected to "exchanger".

Claim 7 of the modified main request differs from claim 7 of the main request only in that the words "between -100°C and -200°C" are deleted.

VII. During the appeal proceedings the appellant argued that there were no reasons why the claimed combination of a number of features, each of which might be known in some context per se, was indeed obvious. He argued that the opposition division's analysis of D9 was wrong and that it failed to establish the objective problem starting from D9. One would not replace the liquid nitrogen cold trap of D9 with the cold trap of D5 because servicing of the latter was indicated as being cumbersome and not suited to solve the problems solved by the present invention.

The appellant requested reimbursement of the appeal fee on the grounds that, at the oral proceedings before the opposition division, only the independent claim 1 of each request and not also the independent claim 7 of each request was discussed and then the decision was announced to revoke the patent, thus infringing his right to be heard under Article 113 EPC.

VIII. During the written part of the appeal proceedings respondent I asked that the newly cited E6 and E7 be introduced into the proceedings since they were more relevant than anything cited previously. In view of E6 alone, he considered that the subject-matter of claim 1 was not new and, if the board did not accept this view, then it was not inventive when E7 was added.

IX. During the appeal proceedings respondent II objected that it was not apparent from the application as originally filed where the features added to the independent claims since grant were disclosed in combination with the feature that the heater is integrated in the cold trap and is adjacent to the heat

exchanger. He added that the temperature range of "between -100°C and -200°C" was linked to the use of a particular refrigerator and that its inclusion in claims 1 and 7 of the main request was an intermediate generalisation. Moreover he maintained that the claimed apparatus and method could not work at e.g. -200°C.

Respondent II argued that novelty was still at issue but put forward in the appeal proceedings no reasons for his view. He stated that D9 represented the closest prior art and that the problems arising therefrom were to provide continuous and effective operation, efficient cooling and fast regeneration. The skilled person would replace the liquid nitrogen cold trap of D9 by the closed cycle helium refrigerator of D5, a document teaching that a closed cycle refrigerator provides a more efficient means of cooling a cold region. The claimed apparatus would have been obvious to the skilled person from the teachings of D9 and D5.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments - Claim 1 of the main request*

2.1 Claim 1 of the main request adds *inter alia* to claim 1 as originally filed (see EP-A-0 397 051) that "the surface of said heat exchanger (25) is cooled by said helium refrigerator (24) to a temperature between -100°C and -200°C for selectively freeze-trapping water molecules".

2.2 It has already been said in claim 1 as originally filed and in claim 1 of the main request that there is a heat exchanger (25) cooled by a helium refrigerator (24) and it is implicit that the surface of this heat exchanger is cooled by this refrigerator.

2.3 The originally filed patent application is concerned with a problem in turbomolecular pumps when pumping a gas containing water vapour, see EP-A-0 397 051, column 1, line 52 to column 2, line 15. Lines 28 to 31 of column 2 explain the disadvantage of a prior art pump which "freezes and traps most gas molecules". Column 3, line 43 to column 4, line 9 explains that "the greater part of the residual gas after the evacuation is water molecules", that "freeze-trapping water molecules by means of the heat exchanger" improves gas exhausting performance and that "A gas having a low molecular weight which is not freeze-trapped ... is also cooled" thus improving the gas exhausting performance of the turbomolecular pump.

These passages are in the introductory part of the description and, in the opinion of the board, consistently inform the reader that the invention is concerned with selectively freeze-trapping water molecules.

2.4 Lines 9 and 10 of column 5 of EP-A-0 397 051 state that "One embodiment of the present invention will be described below with reference to Figs. 1 and 2." Lines 29 to 37 of this column refer to cooling "the heat exchanger to a temperature of -100°C to -200°C for the purpose of selectively freeze-trapping water molecules". The description however explains that this

temperature range is achieved by a particular refrigerator, namely a "single-stage, GM cycle helium refrigerator" which is not a feature of claim 1 of the main request, not being included until claim 6. Moreover lines 25 to 29 of column 6 specify a different temperature, namely "-90°C or lower" at a specified pressure inside the vacuum vessel.

2.5 Thus the board finds that the temperature range of -100°C to -200°C in claim 1 of the main request (and also in the independent method claim 7 of the main request) is an intermediate generalisation of specific disclosures in the originally filed patent application and so extends the subject-matter beyond the content of the European patent application, contrary to Article 123(2) EPC.

2.6 Thus the main request cannot be allowed and will not be further considered.

3. *Amendments - Modified main request*

3.1 Claims 1 and 7 of the modified main request do not contain the objectionable temperature range of -100°C to -200°C referred to in sections 2.4 and 2.5 above.

3.2 Claim 1 of the modified main request adds the following features to claim 1 as originally filed (see EP-A-0 397 051):

3.2.1 "the surface of said heat exchanger (25) is cooled by said helium refrigerator (24) to a temperature for selectively freeze-trapping water molecules"

These features are derivable from the originally filed patent application, see sections 2.2 to 2.4 above.

3.2.2 "wherein a compressor unit (27) circulatorily supplies compressed helium gas to the helium refrigerator (24)"

The wording now added to the claim is disclosed in column 5, lines 25 to 28 and column 6, lines 12 and 13 of EP-A-0 397 051 and excludes beyond any doubt an arrangement like the liquid nitrogen trap but containing helium and in which the helium has to be refilled after it has evaporated.

3.2.3 "wherein a heater (32) is provided which is integrated in the cold trap and is also adjacent to the heat exchanger (25)"

It is clear from the description of EP-A-0 397 051 that a heater 32 is provided for the heat exchanger 25, see line 29 of column 3, lines 22 to 24 of column 4 and lines 22 to 24 of column 7.

The wording "cold trap" was not used in EP-A-0 397 051. It is however a well-known term in the art, see e.g. E2 and D5. Moreover the leaflet filed with respondent II's letter of 12 January 2000, namely "Air Products Infinite-Life Dry Cold Trap, CT102-8C (CT102-8/80)" shows a flanged unit for incorporation in an evacuation system.

It is clear to the person skilled in the art that the cold trap in Figure 1 of EP-A-0 397 051 is the unit located between the gate valve 23 and the turbo-molecular pump 26. This unit comprises the heater 32

and the heat exchanger 25. While the number 32 is outside the pipe 22, it is clear that the operative part of the heater is inside the pipe 22 (it would make no technical sense to heat the air outside the pipe 22) while the heater is supplied outside the pipe 22 with energy. Figure 1 shows the operative part of the heater just below the heat exchanger 25 and thus "adjacent" thereto to use the wording of the claim.

Thus it can be unambiguously derived from the originally filed application that the heater is integrated in the cold trap and is adjacent to the heat exchanger.

3.2.4 Thus claim 1 of the modified main request can be derived from the originally filed application and so does not contravene Article 123(2) EPC. Moreover it is of a narrower scope than claim 1 as granted and so does not contravene Article 123(3) EPC.

3.3 Claim 7 of the modified main request adds the following features to claim 7 as originally filed (see EP-A-0 397 051):

- "the surface of said heat exchanger (25) is cooled by said helium refrigerator (24) to a temperature for selectively freeze-trapping water molecules"

- "a compressor unit (27) circulatorily supplying compressed helium gas to the helium refrigerator (24)"

– "wherein a heater (32) is provided which is integrated in the cold trap and is also adjacent to the heat exchanger (25)"

These features are fairly based on the patent application as originally filed, see the above sections 2.2 to 2.4 and 3.2.1 to 3.2.3.

3.3.1 Thus claim 7 of the modified main request can be derived from the originally filed application and so does not contravene Article 123(2) EPC. Moreover it is of a narrower scope than claim 7 as granted and so does not contravene Article 123(3) EPC.

3.4 Dependent claims 2 to 6 and 8 of the modified main request are the same (apart from added reference numerals) as the correspondingly numbered claims of the originally filed patent application and the same as the correspondingly numbered claims of the patent as granted.

3.5 The description of the modified main request differs from that as granted only by being brought into line in columns 3 and 7 with the new claims. The drawings are the same as those of the originally filed patent application and the patent as granted.

3.6 Thus the board sees no objection under Article 123(2) or 123(3) EPC to the version of the modified main request.

4. *Novelty - Modified main request*

4.1 Claims 1 and 7 of the modified main request specify a turbo-molecular pump.

Respondent I argued that E6 was extremely relevant because it was novelty destroying. The board finds however that claim 1 of E6 specifies simply a vacuum pump while claim 9 specifies a high vacuum pump, preferably a diffusion pump. Item 8 on the Figure of E6 is described on page 4 in line 23 as a diffusion pump. Plainly the claimed turbo-molecular pump is not anticipated by the specific disclosure in E6 of a diffusion pump and neither is it anticipated by the more general disclosure in E6 of a high vacuum pump (see also decision T 651/91, not published).

4.2 The opposition division found the claimed subject-matter to be new and in the appeal proceedings respondent II put forward no reasons to support his statement that novelty was still at issue.

The board cannot see that any prior art document on file discloses all features of either claim 1 or claim 7 of the modified main request and thus finds their subject-matter to be novel (Articles 52(1) and 54 EPC).

5. *Inventive step - claim 1 of the modified main request*

5.1 The reason given in the decision of the opposition division for revoking the patent is essentially that, in order to improve the evacuation apparatus shown of D9 by providing a more efficient and better performing

cold trap, it would be obvious to adopt the cold trap of D5.

5.1.1 D9 (see in particular Figure 10.5) discloses an evacuation apparatus comprising a turbo-molecular pump 1, a liquid nitrogen trap 2 provided at the suction port side of said turbo-molecular pump (26) to freeze-trap gas molecules and a valve 6 upstream of said liquid nitrogen trap 2.

Clearly the use of a liquid nitrogen trap is disadvantageous insofar as liquid nitrogen needs to be refilled to replace that that has evaporated.

5.1.2 Lines 23 to 27 of column 1 of D5 comments on other cold traps that "Typically, a coolant such as liquid nitrogen or a dry-ice-acetone mixture is placed in contact with the region that is to be cooled. Using these types of coolants, however, require special hardware for circulating or replenishing the liquid coolant." Lines 35 to 37 of the same column continue that "Therefore, there is a need for a cold trap which can be used to remove contaminants more efficiently, economically and conveniently."

D5 then goes on to disclose a cold trap whose cold trapping region 27 consists of a sleeve 26 which is in contact with a cold finger 28 from a closed cycle cryogenic refrigerator employing "Expansion of refrigerant gas such as helium" which "reduces that end of the cold finger to cryogenic temperatures typically less than 130 K", see column 3, lines 6 to 19. Lines 53 and 54 of column 3 of D5 state that "a strip of heat tape 32 is wrapped around the sleeve 26".

5.1.3 It is argued that the skilled person would appreciate that using expendable liquid nitrogen to freeze-trap gas molecules was not ideal and that an improvement could be made by replacing the liquid nitrogen trap 2 of D9 with the cold trap 10 of D5.

However this is not the only problem arising from D9 and it needs to be seen if all such problems would be solved by modifying the apparatus of D9 using the teaching of D5.

5.1.4 The patent in suit explains in column 1, line 56 to column 2, line 46 that the gas exhausting performance of a turbo-molecular pump is considerably lowered when the gas has a low molecular weight. In particular water vapour adversely affects the gas exhausting performance of the pump. It is possible to use a cryo-vacuum pump with a heat exchanger at ultra-low temperatures of from about 15°K to about 20°K to freeze and trap water vapour but, because of the ultra-low temperature, it takes a long time to start and suspend the refrigerator, and since the heat exchanger freezes and traps most gas molecules it must be periodically regenerated for a long period during which regeneration the various kinds of gas molecules are separated from each other and successively discharged from the pump at high concentrations.

The patent goes on in column 5, lines 29 to 36 and column 6, lines 5 to 33 to explain that the temperature of the heat exchanger of the present evacuation apparatus is set at **a** temperature for **selectively** freeze-trapping water molecules according to the

pressure conditions in the apparatus (see claims 1 and 7: "... cooled ... to **a** temperature for **selectively** ...". Thus the heat exchanger temperature is not fixed at the boiling point of liquid nitrogen at -196 °C or of liquid helium at -269 °C but can be varied to a specific required temperature. This implies that the claimed evacuation apparatus includes a controller for setting, achieving and maintaining the required temperature. The pressure at the heat exchanger is dependent on the pressure inside the vacuum vessel being evacuated and on the configuration of the evacuation apparatus. The temperature which is to be set is determined by the relationship between temperature and saturated vapour pressure as shown in Figure 4 of the patent.

The temperature range of -100°C to -200°C is in the independent claims of the main request but not those of the modified main request. This does not mean however that the apparatus and method of the modified main request are unrestricted as to temperature, they are of course limited to the temperature range where, at the prevailing pressures at the heat exchanger, freeze-trapping of water molecules can occur.

The patent adds in column 6, lines 34 to 40 that "gas molecules (hydrogen, helium, etc.) having low molecular weights, exclusive of water vapour, are not freeze-trapped, but the gas temperature is lowered through collision or contact of these gas molecules with the heat exchanger 25, so that the blade speed ratio increases and thus the gas exhausting performance is improved."

5.1.5 Thus, as specified in claim 1 of the modified main request, in the present invention it is the water vapour that is **selectively** freeze-trapped or, in other words, targeted. The heat exchanger is cold enough to freeze-trap the water vapour but not so cold as to freeze-trap also those gases freezing at much lower temperatures than water vapour. The non-prior-art graph entitled "Vapor Pressure of Various Vacuum Contaminants" submitted by respondent II shows that the vapour pressure against temperature curves for the various gases are indeed separated and therefore that selective freeze-trapping is feasible.

5.1.6 This selection of the trapping temperature (selectively) is basically different from what is achieved by the liquid nitrogen trap 2 shown in Figure 10.5 of D9 which is at a temperature that is as low as possible and so freeze-traps everything which can be trapped.

5.1.7 Moreover according to column 2, line 55 to column 3, line 1 of the description of the patent as granted "it is an object of the present invention to provide an evacuation apparatus ... which can be easily regenerated".

It is the limiting of the temperature to what is needed that brings advantages when regenerating. Although regeneration is a method step and will be looked at more closely when discussing claim 7 of the modified main request, the improved regeneration is a result of the construction of the apparatus (i.e. the means to control the temperature).

5.1.8 Even if it were obvious to replace the liquid nitrogen trap 2 shown in Figure 10.5 of D9 with the cold trap cooled by a helium refrigerator of D5 then one would still not have an apparatus with a controller for setting, achieving and maintaining the required temperature of the cold trap in order to selectively trap water vapour.

Moreover the cold trap 10 in D5 is situated downstream of the turbo-molecular pump. Neither is this what is specified in claim 1 of the modified main request nor does a cold trap in the D5 position overcome the problem that the turbo-molecular pump has difficulty in pumping water vapour. It is true that the liquid nitrogen trap 2 on Figure 10.5 of D9 is upstream of the turbo-molecular pump but the board does not accept that the skilled person **would** exchange the traps but **would** retain the position of the original trap.

5.1.9 Moreover part of the object of the present invention is to enable rapid regeneration. D5 on the other hand states in lines 50 to 61 of column 3 that "From time to time, the cold trap must be removed and cleaned of contaminants ... In order to reduce the time it takes to warm the cold trap 10 to ambient temperatures a strip of heat tape 32 is wrapped around the sleeve 26 ... Once the cold trap 10 has warmed to ambient temperature, the trap can be quickly removed and cleaned. Conventionally in ion etching systems, warm water is flushed through the cold trap 10 to remove any debris collected by the cold trap."

Thus although the heat tape enables faster regeneration of the D5 apparatus, in no way can this regeneration be seen as rapid.

5.1.10 Thus the board does not accept that it would be obvious to simply replace the liquid nitrogen trap in D9 by the cold trap of D5. Further even if this were done, the board does not accept that the result would be an evacuation apparatus as specified in claim 1 of the modified main request.

5.2 In the appeal proceedings respondent I raised an obviousness argument based on E6 (an evacuation system with either an unspecified pump or a diffusion pump) and E7 (which was published in 1989 and has not been proven to be prior art). However the board accepts the point that respondent I wishes to make with E7, namely that both diffusion pumps and turbo-molecular pumps are used to create high vacuums.

5.2.1 E6 concerns evacuating a vacuum chamber with the help of a cold surface to remove vapours, preferably water vapour, see the first paragraph on page 3. Moreover an electric heater for regeneration can be provided, see the second paragraph on page 4.

5.2.2 However the paragraph bridging pages 3 and 4 states that a one stage refrigerator using helium produces temperatures down to 50 K so that temperatures can be achieved which are lower than those that can be achieved with liquid nitrogen. This statement would lead the skilled person away from providing means for varying the temperature of the cold trap to be just cold enough to selectively trap water vapour.

5.2.3 Thus the board does not consider that the skilled person would proceed in an obvious manner from the teaching of E6 to the evacuation apparatus defined in claim 1 of the modified main request.

5.3 D19 was filed by respondent II one week before the oral proceedings with a short letter justifying its relevance. D19 consists of various extracts from a book thus not allowing the board to see the whole context of the extracts. The points made in the letter seem to have already been supported by the citation of other documents so that the need for additionally citing D19 is unclear. Respondent II did not see the need to refer to this citation during the oral proceedings and the board sees no need to comment further on it.

5.4 Thus the board does not consider that it would be obvious for the skilled person to proceed from the documents considered in the above sections 5.1. to 5.3 to the evacuation apparatus defined by claim 1 of the modified main request.

6. Other documents were cited before the opposition division but have not been referred to in the appeal stage. Respondent I stated in section 6 on page 3 of the letter of 9 May 2001 that the content of E6 is closer to the subject-matter of claim 1 of the main request than all documents previously in the proceedings and that the content of E6 and E7 can lead to revocation of the patent. Respondent II's arguments during the appeal stage were based on D9 and D5. The board does not consider that the claimed subject-matter would be obvious to the skilled person when reading the

documents D5, D9, D19, E6 and E7 on their own or in any combination. Neither is the board convinced that the claimed subject-matter would be obvious to the skilled person reading the other documents on file singly or in combination.

7. *Inventive step - claim 7 of the modified main request*

7.1 All the features of claim 1 of the modified main request are present in claim 7 of the modified main request, with the exception of the list of components of the turbo-molecular pump itself (EP-B-0 397 051, column 7, lines 35 to 38 - claim 1). It is implicit that these components are present in the turbo-molecular pump so, in effect, claim 7 includes all the features of claim 1. Therefore, as the subject-matter of claim 1 of the modified main request is inventive, so prima facie is the subject-matter of claim 7 of the modified main request.

7.2 Moreover the method steps set out in the last seven lines of the claim differ markedly from the methods disclosed in the prior art.

7.3 Page 268 of D9 describes the shut down of the system shown in Figure 10.5 including the step that "the power to the turbomolecular pump motor is removed". Page 268 of D9 refers back to Section 10.1.1 but also in this section, on page 256, it is stated that "the power to the diffusion pump will be turned off."

In claim 7 of the modified main request, on the other hand, the turbo-molecular pump continues to be run. It is this running with the gate valve closed which causes

a further lowering of pressure at the heat exchanger which in turn causes sublimation.

As explained in the above section 5.1.9, regeneration of the cold trap of D5 is a lengthy process and gives the skilled person no hint towards the method set out in claim 7 of the modified main request.

Thus D9 and D5, even taken together, neither give the regeneration step set out in claim 7 of the modified main request nor the concept of a target temperature for selectively freeze-trapping water molecules in the sense of Figure 4 of the patent.

7.4 In paragraph 2 on page 4, E6 discloses a heater for the cold surface so that its regeneration is simple and quick. Page 6 explains how the regeneration is performed, including the steps of preferably shutting the valve 11 and heating the cold surface with heater 7 while the refrigerator 14 runs. However lines 7 to 10 on page 6 state that the condensate which **drips** from the cold surface 12 lands in the collection trough 22 from where the condensate is drawn into collection container 23 by opening the valve 25. In contrast, in claim 7 of the modified main request the freeze-trapped water molecules **sublimate** from the heat exchanger and thus are removed from the evacuation apparatus by the turbo-molecular pump. The method disclosed by D6 would therefore not lead the skilled person to the claimed method.

7.5 Respondent II's letter of 12 December 2003 citing D19 makes no mention of it being relevant to the regeneration step of claim 7 of the modified main

request and indeed the board cannot see any such relevance.

7.6 The board thus considers that the method of claim 7 of the modified main request would not be obvious to the skilled person considering the cited prior art documents either singly or in combination (Articles 52(1) and 56 EPC). The comments regarding other prior art documents in the above section 6 also apply to claim 7 of the modified main request.

8. Thus claims 1 and 7 of the modified main request are patentable as are claims 2 to 6 and 8 which are respectively dependent thereon. Accordingly the patent can be maintained amended according to this version.

9. *Appeal fee reimbursement*

9.1 The appellant requested reimbursement of the appeal fee on the grounds that his right to be heard under Article 113 EPC was infringed during the oral proceedings before the opposition division (see the above section VII).

9.2 The independent claim 1 of each request was discussed at those oral proceedings. After deliberation, the opposition division found that neither claim 1 met the requirements for inventive step and then announced the decision to revoke the patent. This course of events is in accordance with Article 102(1) EPC because, since neither claim 1 was deemed allowable, the patent would sooner or later have had to be revoked. The outcome would not have been changed by a discussion of, and finding on, each claim 7.

9.3 The opposition division did not commit a substantial procedural violation (a condition for reimbursement under Article 67 EPC) and so the appeal fee will not be reimbursed.

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 maintain the patent on the basis of the following documents:

   – claims 1 to 8 of the modified main request filed during the oral proceedings,

   – description: columns 1, 2, 5 and 6 as granted, columns 3, 4 and 7 as filed during the oral proceedings, and

   – Figures 1, 2, 3a, 3b, 4 and 5 as granted.

3. The request for reimbursement of the appeal fee is rejected.

The Registrar: The Chairman:

G. Magouliotis C. Andries