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Bezeichnung der Erfindung: Apparatus for drying pressurized air
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : B01D 53/26

ENTSCHEIDUNG / DECISION

vom / of / du 5 November 1987

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : Grass-Air Holding B.V.

Einsprechender / Opponent / Opposant : Schimonek, Helmut and Diehn, Manfred

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56 EPC

Kennwort / Keyword / Mot clé : Inventive step (no)

Leitsatz / Headnote / Sommaire

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Case Number : T 92/86

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 5 November 1987

Appellant : (Proprietor of the patent)
Grass-Air Holding B.V.
Galliërsweg 27
5349 AT OSS (NL)

Representative :
Van der Beek, George Frans et al.
Nederlandsch Octrooibureau
P.O. Box 29720
2502 LS Den Haag (NL)

Respondents : (Opponents)
Schimonek, Helmut and Diehn, Manfred
Kleine Bahnstraße 1
D-2000 Hamburg 54 (DE)

Representative :
Glawe, Delfs, Moll & Partner
Patentanwälte
Postfach 2570
Rothenbaumchaussee 58
D-2000 Hamburg 13 (DE)

Decision under appeal : **Decision of the Opposition Division of the European Patent Office dated** 14 January 1986 **revoking European patent No.** 0 045 101 **pursuant to Article 102(1) EPC.**

Composition of the Board :

Chairman : K. Lederer
Members : J. Roscoe
R. Schulte

Summary of Facts and Submissions

I. European patent No. 0 045 101 was granted on the basis of European patent application No. 81 200 747.4.

II. The Respondents filed notice of opposition against the European patent and requested revocation of the patent in its entirety on the ground of non-patentability because of lack of inventive step in view of the prior art disclosed in the documents

D1: NL-A-7 411 037
D2: US-A-3 963 466
D3: Recknagel-Sprenger, "Taschenbuch für Heizung und Klimatechnik", Edited by Dipl.-Ing. Eberhard Sprenger, 58th edition 1974, R. Oldenbourg, Munich Vienna 1974, pages 810, 811, 912, 913, 918, 919.
D4: GB-A-1 027 990.

III. The Opposition Division revoked the patent. It considered that the subject-matter of the claims lacked inventive step because document D3 established that water can be used as a direct cooling medium for the second heat exchanger in a wet compressed air drier of the type disclosed in document D1, and once this has been established it would be clear that the remaining claimed features were only those conventional features which the skilled man is free to use and which either alone or in combination do not provide any unusual effect.

IV. The Appellant lodged an appeal against the decision.

V. Oral proceedings were held at the end of which the Appellant (Patentee) requested that the decision under

appeal be set aside and that the patent be maintained on the basis of Claims 1 to 3 filed on 22 April 1986.

The Respondents (Opponents) requested that the appeal be dismissed.

VI. The sole independent claim of the now valid claims reads:

"1. Apparatus for drying pressurized air comprising a first heat exchanger in which supplied wet air is cooled indirectly by means of cooled dried air, and a second heat exchanger in which the wet pressurized air is cooled further to a desired temperature and fed to the first heat exchanger as cooled dried air and therefrom to the consumer, in which both of the heat exchangers are arranged above each other in a common housing (1, 2, 3), the second heat exchanger beneath the first heat exchanger, said housing (1, 2, 3) being formed as a vertically disposed vessel having a cylindrical or polygonal cross-section and said second heat exchanger being cooled by a coolant from an external cooling machine, c h a r a c t e r - i z e d in that the second heat exchanger is constituted by a water bath in the lower portion of the insulated housing (1, 2, 3), in which water bath helical tubes (11) are extending through which the coolant from the external cooling machine is passed, which helical tubes (11) are surrounding a central tube (5) in the housing having an inlet at its upper end (8), said tube (5) at the lower end being in open connection (6) with the water bath, whereby the cooling machine is provided with automatic shut-down switch-on characteristic dependent on the thickness of the ice layer on the tubes (11)."

VII. The Appellant submits that documents which were not cited within the period for opposition should be disregarded under Article 114(2) EPC.

His arguments in support of an inventive step being involved in the subject-matter of Claim 1 can be summarised as follows:

While ice-water baths were known already in the dairy industry, they have never been used before the priority date of the present patent for drying pressurized air.

The latter application requires a much more accurate control of the thickness of the ice-layer on the cooling tube than in the dairy industry, due to the high pressure in the cooling vessel.

Apart from the devices of the type disclosed in document D4, which work at very low cooling temperatures, the known low-cost industrial pressurized air drying machines all cool the air to temperatures tending towards but not reaching 0°C.

The device described in the patent is commercially successful and is being copied by the Respondents.

VIII. The Respondents request that the appeal be dismissed.

In support of their request, they cite the following further documents:

D5: DE-C2-2 701 938
D6: Lueger, Lexikon der Technik, Volume 16, "Lexikon der Verfahrenstechnik", Deutsche Verlags-Anstalt, Stuttgart, 1970, page 241,

and submit that Claim 1 as amended merely involves, in a device as known from document D1, the juxtaposition of following features:

(a) the use of an ice-water bath for cooling the pressurized air;

(b) a specific arrangement of cooling and pressurized air injection tubes in that bath; and

(c) means for automatically controlling the cooling machine in dependence on the thickness of the ice layer on the cooling tube.

Feature (a), however, is suggested by document D3, feature (b) defines an obvious arrangement as shown for instance by document D5, and feature (c) is known from document D6. Since these features do not produce any additional or unexpected effect, their combination in a known device does not imply an inventive step.

In addition, the Respondents contend that Claim 1 as amended contravenes the provision of Article 84 EPC that the claims shall be clear and that of Article 123(2) EPC that a patent may not be amended in such a way as to contain subject-matter which extends beyond the content of the application as filed.

Reasons for the Decision

1. The appeal is admissible.

2. In view of the contravention of Articles 84 and 123(2) EPC by the amendments made in the description and claims alleged by the Respondents, the Appellant offered to

redraft the amended documents in such a way as to overcome any such objections under these articles upheld by the Board, should the Board reach the conclusion that the subject-matter of present Claim 1 was patentable. The question of the patentability of the subject-matter of the claims under Articles 52 to 57 EPC will therefore be dealt with before these alleged contraventions are examined.

3. Document D5 was submitted by the Respondents in support of the argument that the specific arrangement of the tubes in the water bath, which had been introduced into independent Claim 1 by the Appellant in the course of the appeal procedure only, was obvious.

Document D6 was cited in response to a communication from the Rapporteur stressing the lack of a document disclosing either the use of an ice-water bath for any purpose or the control of any machine or process as a function of measured ice thickness (see point 12 of the communication dated 7 September 1987), in order to show that such bath and control were state of the art, as admitted in the introductory part of the description.

Thus, documents D5 and D6 were both filed by the Respondents immediately after the need for them arose. The documents therefore cannot be considered as not having been submitted in due time in the sense of Article 114(2) EPC and, accordingly, they are not to be disregarded.

4. The subject-matter of Claim 1 is undisputedly novel. None of the cited prior art documents discloses an apparatus for drying pressurized air comprising a cooled water bath as a second heat exchanger.

5. Inventive step.

5.1 An apparatus for drying pressurized air as defined in the preamble of Claim 1 is known from document D2. In the second heat exchanger of this apparatus, the damp pressurized air is passed over the surface of metal plates (31, Figure 1) which are cooled by contact with a refrigeration coil (30) connected to an external cooling machine. The water vapour in the pressurized air thus condenses on the cold plates, which dries the air. Water condensing on the plates may drip into a sump provided in the lower part of the housing (see column 3, first paragraph).

5.2 Obviously, the temperature of the cold plates determines the extent to which the air will be dried, the dew point of such air being at best equal to that temperature. If attempts were therefore made to operate this known apparatus at lower temperatures in such a way as to obtain air of dew point near 0°C, the water condensed on the plates could freeze to form an ice layer which could in time clog the air passage.

A further limitation of the apparatus known from document D2, as stressed by the Appellant, resides in its relative inability to adapt the cooling capacity of the refrigeration section to rapidly varying flows of pressurized air, which could lead for instance to overcooling of the plates in case of sudden reduction or interruption of the air flow and, consequently, clogging of the air passage.

Thus, the object of the alleged invention is to provide an apparatus of the general type known from document D2 which additionally allows a dew point of 0°C or slightly below to be achieved and maintains its drying performance even when the flow of pressurized air rapidly varies.

5.3 Since it is a common concern of the skilled person to adapt known devices and processes to the specific requirements dictated by an intended application and since furthermore the need for pressurized air of low dew point at varying flow levels is not surprising in itself, no contribution to inventive step is to be found in the mere recognition of the above defined technical problem.

5.4 Document D3 shows that a known method of drying air is to cool it by means of artificially refrigerated water (see page 919, fourth paragraph) and that cooling may be obtained by direct contact with flowing or sprayed cold water (see page 811, point 326, second paragraph).

The skilled person can be expected to recognise that such direct cooling of the air by cooled water will permit the cooled plates of the prior art device according to document D2 to be dispensed with thus overcoming the above mentioned problem of ice formation. He will, therefore, be induced to look for appropriate means for cooling the air by direct contact with cooled water.

One means for cooling and drying air by direct contact with a refrigerated fluid, known from document D4, consists in providing a bath of said refrigerated fluid and bubbling the air through it.

Thus, the combination of the teachings of documents D3 and D4 leads the skilled person to the idea of using a bath of water as a second heat exchanger for directly cooling and drying pressurized air caused to bubble therethrough. Since it is obvious to use such water bath at the lowest possible temperature to achieve a correspondingly low dew point of the dried air and since furthermore it is well known to every technically educated person that a mixture of water and ice (water-ice) indeed exhibits the minimum

temperature of 0°C, no inventive step can be seen in the provision of a water-ice bath for that purpose, the more so since a further well-known property of water-ice baths, which is to act as cold stores remaining at a stable temperature of 0°C (see document D6; page 241; "Kältespeicher"), will obviously contribute to the solution of the second aspect of the technical problem consisting in improving the ability of the system to treat varying flows of pressurized air.

The characterising portion of Claim 1 comprises further features relating to the location of the water bath in the lower portion of the insulated housing and the form and specific arrangement of the cooling tubes which are helically wound around a central pressurized air injection tube. Since in the device of document D2 (see preamble of present Claim 1) the second heat exchanger is arranged beneath the first heat exchanger in a vertically disposed vessel having a cylindrical or polygonal cross-section, the Board takes the view that these further constructional features would result from routine considerations of the skilled man, who would recognise that for effective operation the cooling tubes and air injection means must be arranged in such a way as to simultaneously achieve a uniform cooling of the water-bath and a homogeneous distribution of the bubbles in the bath. This view is strengthened by the fact that the same design features have already been disclosed in document D5 (see Figure) which also relates to an apparatus for cooling pressurized air by means of a bath of a refrigerated medium, contained in a vessel of similar form; through which the air is caused to bubble.

The remaining features of the characterising portion of Claim 1 are directed to the control of the cooling machine, which is switched on or off in dependence on the

thickness of the ice layer forming on the cooling tubes. This, however, is known per se in the technique of water-ice baths as acknowledged by the Appellant in the description of the patent in suit (see column 3, lines 49 to 62) and it also results from the teaching in document D6 that the thickness of the ice forming on the evaporator immersed in a water-ice bath must be limited.

Thus, independent Claim 1 defines a combination of features which are either already known per se or obvious to the skilled person. Moreover, the combination of features does not appear to give rise to any technical effect beyond the sum of the individual effects produced by the features considered separately. The Appellant did not allege any novel or surprising technical effect either.

The subject-matter of independent Claim 1 therefore lacks an inventive step within the meaning of Article 56 EPC, and accordingly the patent as amended cannot be maintained under Article 102(3) EPC.

5.5 The arguments submitted by the Appellant could not convince the Board of the patentability of the claimed subject-matter.

The arguments that prior to the alleged invention there had been no pressurized air drying device available on the market comprising a water-ice bath, and that the known devices for industrial use only achieve a dew point tending towards, but not reaching 0°C, had they been substantiated, would only show that the claimed subject-matter is novel, which has not been questioned, and that reducing the dew point temperature was a common concern, which also served as a basis for the Board's reasoning.

The Appellant has further failed to submit any evidence in support of his allegation that there had been a technical prejudice in the art against using a water-ice bath for drying pressurized air. His submission that when using a water-ice bath in this application much more accuracy in controlling the ice layer is required, due to the high pressures building up in the vessel, ranging for instance from 7 to 200 bars, than is required in the known use of water-ice baths in the dairy industry has also not been substantiated. It is in any case of no relevance to Claim 1 since this is not explicitly limited to apparatus in which such pressures occur and there is nothing in the description of the patent which could justify construing the claim as thus limited by implication. Quite apart from this it is observed that the alleged need for more accuracy has not apparently called for the use of any special measures, as is witnessed by column 4, lines 55-62 of the patent, where it is merely stated that control, which simply requires sensing when the ice thickness exceeds a predetermined value or falls to zero, is effected by the usual control means known per se, and the fact that Claim 1 does not call for any special control measures.

The alleged commercial success of the subject-matter of the patent in suit has not been demonstrated by evidence, neither has the Appellant sought to establish that the alleged success results from the technical merit of the claimed features rather than from other influences (e.g. selling techniques or advertising).

In response to the Appellant's assertion that the Respondents copied the subject-matter of the patent and filed opposition only after negotiations with a view to entering a license agreement failed, the Respondents admitted that, for a limited period of time, they used the

drawing of the patent in suit in their own commercial pamphlets. It is not to be denied that in certain circumstances the actions of competitors after the publication of a patent application - in this case: the imitation of the published invention and the unauthorised use of the drawings of the patent specification by the Respondents - can serve as evidence of a general recognition in the art of the merits of its subject-matter and may lead to the conclusion that the claimed invention involves an inventive step even though it appears prima facie to be obvious. In the present case, however, the Appellant's reference to the acts of a single competitor does not establish that there was such a general recognition and is not sufficient to persuade the Board that its conclusion of lack of inventive step based on the above arguments is not well founded.

6. Since, for the reasons given above, the patent cannot be maintained, the additional objections to the claims as amended, raised by the Respondents under Articles 84 and 123(2) EPC need not be considered further.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

F. Klein K. Lederer