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Datasheet for the decision of 10 February 2011

Case Number: T 1664/08 - 3.2.01

Application Number: 01202670.4

Publication Number: 1188666

IPC: B64D 13/06

Language of the proceedings: EN

Title of invention:
An aircraft airconditioning system and method

Patentee:
The Boeing Company

Opponent:
AIRBUS SAS/AIRBUS OPERATIONS/AIRBUS OPERATIONS Ltd/AIRBUS OPERATIONS GmbH/AIRBUS OPERATIONS S.L.

Headword:
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Relevant legal provisions:
-

Relevant legal provisions (EPC 1973):
EPC Art. 56, 83, 99(1), 114

Keyword:
"Sufficiency of disclosure (yes)"
"Inventive step (yes)"
"Admission of new evidence (no)"

Decisions cited:
T 1002/92

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1664/08 - 3.2.01

D E C I S I O N
of the Technical Board of Appeal 3.2.01
of 10 February 2011

Appellant: (Opponent)
AIRBUS SAS/AIRBUS OPERATIONS/AIRBUS OPERATIONS Ltd/AIRBUS OPERATIONS GmbH/AIRBUS OPERATIONS S.L.
1 Rond-Point Maurice Bellonte/
316 route de Bayonne/New Filton House
Filton/Kreetslag 10/Avenida de John Lennon S/N
F-31700 Blagnac/F-31060 Toulouse/
GB-Bristol BS99 7AR/D-21129 Hamburg/Madrid ES (FR)

Representative:
Kietzmann, Lutz
Maiwald Patentanwalts GmbH
Benrather Strasse 15
D-40213 Düsseldorf (DE)

Respondent: (Patent Proprietor)
The Boeing Company
100 North Riverside Plaza
Chicago
IL 60606-2016 (US)

Representative:
McLeish, Nicholas Alistair Maxwell
Boult Wade Tennant
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT (GB)

Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 27 June 2008 concerning maintenance of European patent No. 1188666 in amended form.

Composition of the Board:

Chairman: G. Pricolo
Members: C. Narcisi
S. Hoffmann

Summary of Facts and Submissions

I. The European patent No. 1 188 666 was maintained in amended form with the decision of the Opposition Division posted on 27 June 2008. Against this decision an appeal was filed by the Opponent on 27 August 2008 and the appeal fee was paid at the same time. The statement of grounds of appeal was filed on 27 October 2008.

II. Oral proceedings were held on 10 February 2011. The Appellant (Opponent) requested that the decision under appeal be set aside and that the patent be revoked. The Respondent (Patentee) requested that the appeal be dismissed.

Claim 1 as upheld by the impugned decision has the following wording:

"An air conditioning system (100) adaptable for use in an air craft having a pressurized area (140) and an unpressurized area (150) and defining a pressure bulkhead (145) therebetween, the air conditioning system (100) comprising:
an air conditioning pack (130) for conditioning fresh air (121); a first duct (114) for extending between said pressurized and unpressurized areas of the aircraft for directing recirculated air (110) from said pressurized area to said unpressurized area; a mixer (120) disposable within the unpressurized area of the aircraft for mixing the conditioned air from said air conditioning pack and recirculated air from said pressurized area of the aircraft; a second air duct (132) for extending between said mixer and said

pressurized area of the aircraft for distributing a mixture (133) of conditioned air and recirculated air to the pressurized area;
characterized by
an aerodynamic shutoff valve (115) in line with said first air duct for protecting against depressurization of the pressurized area, wherein said aerodynamic shutoff valve permit flow from the pressurized area to the unpressurized area if a pressure differential across said aerodynamic shutoff valve is less than a predetermined threshold, and wherein said aerodynamic shutoff valve prevents further flow from the pressurized area to the unpressurized area once the pressure differential across the aerodynamic shutoff valve exceeds the predetermined threshold; and wherein the mixer (120) is designed for swirling the resultant air flow such that tiny water droplets combine into larger droplets."

Claim 8 as upheld by the impugned decision has the following wording:

"A method of air conditioning a pressurized area of an aircraft, the aircraft having a pressure bulkhead between the pressurized and an unpressurized area of the aircraft, the method comprising:
providing a flow of recirculation air from the pressurized area to the unpressurized area; protecting against depressurization of the pressurized area;
mixing the flow of recirculation air directly with a flow of cooling air so that a resultant air mixture is formed having a temperature such that the ice particles are substantially eliminated, said mixing performed in the unpressurized area of the aircraft; passing the

resultant air mixture through an air duct for delivery to the pressurized area of the aircraft;
characterised by
removing moisture from the resultant air mixture while passing through the air duct prior to delivery to the pressurized area of the aircraft; further swirling the resultant air mixture, so that tiny water droplets combine into larger droplets; and
protecting against depressurization of the pressurized area by passing the flow of recirculation air from the pressurized area to the unpressurized area through an aerodynamic shutoff valve."

III. The Appellant's arguments may be summarized as follows:

The disclosure of the invention, particularly of the feature (i) "wherein the mixer is designed for swirling the resultant air flow such that tiny water droplets combine into larger droplets", is not sufficiently clear and complete for it to be carried out by the skilled person. The patent in suit does not provide the skilled person with the specific technical teaching necessary to carry out said feature. There is for example no disclosure of any specific flow velocities and directions leading to said combination of tiny water droplets into larger droplets. Consequently this feature has been disclosed in the patent exclusively in terms of a result to be achieved. Moreover, the physical phenomenon implied by said feature does not belong to the skilled person's common general knowledge. In particular, the prints from two Wikipedia pages headed "Precipitation (meteorology)" and "Coalescence (meteorology)", submitted by the Respondent with its reply to the statement of grounds

of appeal, cannot be regarded as providing evidence for the skilled person's common general knowledge. As a result, the mixer of the air conditioning system according to the patent in suit is tantamount to a "black-box" for the skilled person.

The subject-matter of contested claim 1 does not involve an inventive step with regard to prior art document D1 (EP-B1-542 909). D1 discloses all of the features of the preamble of the claim including the contentious feature "a mixer disposable within the unpressurized area of the aircraft". Indeed, this feature has to be considered as being implicitly and inherently disclosed in D1, for D1 describes an air conditioning system to be used in an "aircraft designed to operate in rarefied atmosphere" (D1, column 1, line 10) and the mixer 64 (D1, figure) is located outside the enclosure delimited by a bulkhead 62, which enclosure defines in its interior the pressurized cabin and is supplied with pressurized, conditioned air. Consequently, given that the mixer is disposed in an area outside the region enclosed by the bulkhead and which is not supplied with pressurized air, it ensues that the mixer is located in an unpressurized area.

The underlying objective problem of the invention is to provide a simplified way of dehumidifying the mixture of recirculated air from the cabin and conditioned air from the conditioning pack as well as to protect the pressurized cabin against depressurization of the air conditioning system disposed in the unpressurized area. Since the objective problem consists of two distinct and unrelated technical problems, the skilled person would look for a solution to each of these problems

separately and would recognize that D3 (WO-A-96/25 329) and D2 (US-A-4 301 833) disclose a particularly simple and advantageous solution to the first and second mentioned technical problem, respectively. D2 specifically discloses an aerodynamic shutoff valve having a very simple and maintenance friendly construction. Hence, by an obvious combination of D1 with D2 and D3 the skilled person would arrive at the subject-matter of claim 1 without exercising an inventive activity.

The same result would be obtained if the technical drawings D8 and D9 were chosen as starting point for the evaluation of inventive step. D8 and D9 illustrate an air conditioning system which was used in the aircraft "Saab 2000" of the Saab Group in 1994 according to the affidavit of Mr Öfverstedt, a former engineer manager involved in the Saab 2000 aircraft project of the company. Moreover, D8 and D9 constitute a better starting point than D1 for the evaluation of the inventive merit, for these drawings disclose a shutoff valve mounted in a first duct extending between the pressurized and the unpressurized area for directing recirculated air from said pressurized area to said unpressurized area. Although the shutoff valve shown in D8 and D9 is a check valve and not an aerodynamic shutoff valve as claimed by the invention, nevertheless D8 and D9 clearly point to the fact that technical measures forming a safeguard against depressurization of the cabin are a constant and major concern on board the aircraft and that the skilled person would provide means to protect the cabin against depressurization. For these reasons D8 and D9 are more pertinent than D1 and despite the fact that they have

been filed after the time limit according to Article 99(1) EPC these documents should be admitted into the appeal proceedings.

The objections raised against claim 1 equally apply against independent claim 8.

IV. The Respondent's arguments may be summarized as follows:

The fact that a moisture-laden swirling airflow will cause coalescing of water droplets is well known, for example in the field of meteorology. This is understood to be one of the mechanisms behind raindrop formation. It is well known that moisture evaporates from oceans as vapour and this vapour must then transform into raindrops before falling back to Earth. One of the mechanisms that is well understood in causing droplet formation is turbulence in moving airstreams that cause water droplets to coalesce and form larger droplets. These phenomena are described for instance in the prints from two Wikipedia pages headed "Precipitation (meteorology)" and "Coalescence (meteorology)" filed with the reply to the statement of grounds of appeal. Consequently, the contested feature (i) of claim 1 is disclosed in a manner sufficiently clear and complete.

The subject-matter of claim 1 is inventive over the cited prior art. There is no unambiguous disclosure in D1 that the mixer is located in the unpressurized area of the aircraft, for it is not clear from D1 whether the bulkhead delimits the entirety of the pressurized area of the aircraft. Further, D1 contains no explicit reference to the use of its air conditioning system aboard high-altitude flying aircrafts and to any

unpressurized area arising during flight in such aircrafts. D1 therefore actually relates to aircrafts that operate at low altitude. All in all, the skilled person would rather take D1 as disclosing that the mixer is disposed in a pressurized area of the aircraft, such as for instance the cabin or parts of the cargo area. Therefore, there would be no necessity to look for an alternative location. Nevertheless, even in the unlikely event that the skilled person would contemplate installing the mixer in an unpressurized area of the aircraft, there is no suggestion in the prior art to improve protection against depressurization of the cabin by using an aerodynamic shutoff valve such as shown by D2. Assuming that the skilled person would consider the provision of a valve to solve this problem, he would have to search for an appropriate valve design from a plethora of designs available. He might for instance consider the provision of automatically operated valves responding to a sensor. Moreover, D2 discloses the use of the mentioned valve in gas or water conduits to stop water or gas flow in the event of catastrophic failure when the conduit bursts. Nothing suggests the use of this valve in an air conditioning system for an aircraft. In conclusion the skilled person would not arrive in an obvious manner to the subject-matter of claim 1.

Documents D8 and D9 do not appear to be more relevant than D1. In particular the shutoff valve illustrated in D8 and D9 is merely a check valve which does not constitute a safeguard against depressurization. Indeed such a valve, also disposed in said first duct, is likewise included in the air conditioning system of the invention (see check valve 118 in figure 2) and is

clearly not intended for the purpose of protecting the cabin against depressurization. Consequently these documents should not be introduced into the appeal proceedings since they are not more relevant than D1.

Reasons for the Decision

1. The appeal is admissible.

2. The objections raised by the Appellant on the grounds of Article 100(c) EPC in conjunction with Article 83 EPC 1973 are unfounded since the aforesaid feature (i) "wherein the mixer is designed for swirling the resultant air flow such that tiny water droplets combine into larger droplets" is disclosed in a manner sufficiently clear and complete in the patent specification. The patent specification unequivocally states that "the mixer 120 is designed to swirl the resultant air flow 133 such that the tiny water droplets combine into larger droplets, which are then removed with conventional scuppers and discharged through drainage duct 135". The Appellant has not furnished any evidence that corroborates its allegations that further technical information would be needed to allow the skilled person to put into effect said feature (i). Quite to the contrary, document D3 states for instance (D3, page 5, last paragraph) that if "vanes" of the mixer "impart swirl" to the conditioned and the recirculated airstreams these airstreams then flow entwined and this "cyclone effect causes any remaining moisture ... to be centrifuged and thrown against the gutter and/or deflector". Centrifugal forces can effectively act to separate the

remaining moisture from the airstream obviously only if larger water droplets have been previously formed by coalescence of smaller droplets. Indeed, this coalescence phenomenon is enhanced by the swirl imparted to the airstream which generates collisions of water droplets and as a result of these collisions smaller droplets coalesce (see for instance the Wikipedia page "Coalescence (meteorology)"). This physical mechanism is crucial to the formation of rain (see for instance the Wikipedia page "Precipitation (meteorology)", page 3, "Formation"), where collisions caused for example by air turbulence lead to larger droplets formation. Additionally, swirling the conditioned and recirculated air streams produces a thorough mixing of airstreams at very different temperatures which enhances condensation. It is noted here that it is irrelevant for the present purpose whether or not the Wikipedia pages cited by the Respondent were published before the relevant priority date of the patent in suit, for these pages merely provide evidence that said feature (i) in conjunction with the patent specification describe the implied physical phenomenon and the circumstances giving rise to the same in a sufficiently accurate manner without any further assumption being made about additional specific technical knowledge going beyond common general knowledge of the skilled person at the relevant priority date of the patent in suit.

In conclusion, the above discussion makes plain that based on physical reasons and the documents on file, in particular D3, related to substantially the same physical phenomenon and technical feature as implied by feature (i), no essential additional technical

information is missing in the patent in suit. For these reasons the allegations of the Appellant are unfounded.

3. D1 is undisputedly the most appropriate pre-published prior art document for the evaluation of the inventive merit of the subject-matter of claim 1. The Board considers that although D1 does not explicitly disclose that the mixer is located in the unpressurized area of the aircraft nevertheless this feature would be obvious for the skilled person. D1 apparently directly suggests such a technical measure, given that the mixer 64 (D1, figure) is clearly disposed outside the pressurized area delimited by the bulkhead 62. Moreover, such a choice would also respond to the obvious need to reduce noise and save space within the pressurized compartment of the aircraft.

The remaining characterizing features of claim 1 do involve an inventive step since the use of an aerodynamic shutoff valve which is located in said first air duct would not be obvious for the skilled person. In this respect it is noted that in previously known air conditioning systems for use in an aircraft, such as disclosed in D1 as well as further prior art documents D4 (US-A-4 462 561), D6 (US-A-4 209 993) and D7 (US-A-4 430 867), various known valve types are employed. Among such common valves there are in particular flow control valves or shutoff valves which are directly responsive to a sensor or may be operated through a control system, and check valves which can for instance be mounted in the second duct (i.e. the duct extending between the mixer and the pressurized area), to protect against depressurization of the cabin (see D4), or in the first duct (i.e. the duct extending

between the pressurized and unpressurized areas), to maintain a fixed pressure difference in the first duct between the upstream side of the first duct (cabin side) and the downstream side of the first duct (see D4). Other valve designs may also be available to the skilled person and the mentioned examples are by no means exhaustive. However, there is no doubt that in order to improve safeguard against depressurization of the cabin the skilled person would in all likelihood resort to conventional valve designs, which comply with safety regulations on board an aircraft and have also proved reliable. In the present case an automatically operated shutoff valve responsive to a sensor detecting an air flow or an air pressure difference would be the obvious choice. A shutoff valve operated by a control system or a remotely operated shutoff valve for emergency cases could possibly be equally suitable choices. In contrast hereto, there is no evidence emerging from the available prior art that an aerodynamic shutoff valve as disclosed in D2 has ever been used in a pneumatic or hydraulic system on board an aircraft, let alone in any air conditioning system. Moreover, nothing in the disclosure of D2 would suggest to use an aerodynamic shutoff valve in the specific technical context of claim 1. D2 actually merely envisages the use of said valve as "an automatic flow regulator responsive to gas or fluid flow in a conduit above normal, as caused for example by catastrophic failure when the conduit bursts" (D2, column 3, lines 43-46). Therefore, the fact that according to the invention it has been realized that an aerodynamic shutoff valve is well suited for the intended purpose and that it has the advantage of being inexpensive and having a simple structure constitutes in the present

case sufficient evidence that the subject matter of claim 8 involves an inventive step.

4. The Board has decided pursuant to Article 114(2) EPC not to admit into the appeal proceedings the allegation of a public prior use supported by technical drawings D8 and D9 and by an affidavit of Mr Anders Öfverstedt, which was made for the first time with the statement of grounds of appeal, i.e. after the time period stipulated in Article 99(1) EPC. The drawings D8 and D9 disclose the use of a check valve in said first duct, i.e. the duct disposed between the pressurized cabin and the mixer. This check valve evidently does not fulfil the purpose of providing a safeguard against depressurization of the pressurized cabin, for it solely functions to maintain a preset minimum pressure difference between the respective pressure upstream and downstream of the check valve. Further, as conceded by the Appellant during the oral proceedings, the air conditioning system of D8 and D9 does not include an aerodynamic shutoff valve. Therefore, having regard to the reasoning under point 3 above, and considering that D8 and D9 do not relate to a valve for providing safeguard against depressurization, and in particular do not relate to an aerodynamic shutoff valve, it follows that the new material presented in appeal proceedings is not prima facie highly relevant in the sense that it can reasonably be expected to change the eventual result and is thus highly likely to prejudice maintenance of the European patent (see e.g. T 1002/92, OJ EPO 1995, 605). The Board concluded that the new material should not be admitted into the appeal proceedings.

5. The above mentioned grounds of opposition put forward also in relation to independent method claim 8 are equally unfounded, for the subject-matter of claim 8 is essentially equivalent to the subject matter of claim 1 and therefore the reasons laid out above likewise apply.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Vottner G. Pricolo