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Datasheet for the decision of 4 September 2014

Case Number: T 2295/11 - 3.2.01

Application Number: 00968292.3

Publication Number: 1196325

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Language of the proceedings: EN

Title of invention:
MONOLITHIC STRUCTURE WITH REDUNDANT LOAD PATHS

Patent Proprietor:
The Boeing Company

Opponent:
Airbus Operations SAS/ Airbus Operations Limited/
Airbus Oprations GmbH/ Airbus Operations S.L./
Airbus SAS

Headword:

Relevant legal provisions:
EPC 1973 Art. 100(b), 54(1), 100(c), 56

Keyword:
Amendments - added subject-matter (no)
Grounds for opposition - insufficiency of disclosure (no)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:

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Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 2295/11 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 4 September 2014

Appellant: (Opponent)	Airbus Operations SAS/ Airbus Operations Limited/ Airbus Oprations GmbH/ Airbus Operations S.L./ Airbus SAS 316, Route de Bayonne 31060 Toulouse (FR)
Representative:	Isarpatent Patent- und Rechtsanwälte Postfach 44 01 51 80750 München (DE)
Respondent: (Patent Proprietor)	The Boeing Company 100 North Riverside Plaza Chicago, IL 60606-2016 (US)
Representative:	Steil, Christian Witte, Weller & Partner Patentanwälte mbB Postfach 10 54 62 70047 Stuttgart (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 30 August 2011 concerning maintenance of the European Patent No. 1196325 in amended form.**

Composition of the Board:

Chairman	G. Pricolo
Members:	Y. Lemblé
	D. T. Keeling

Summary of Facts and Submissions

I. The appeal of the Opponent is directed against the interlocutory decision of the Opposition Division, posted on 30 August 2011, to maintain European patent No. 1 196 325 in amended form on the basis of the first auxiliary request filed during oral proceedings on 6 July 2011.

II. In its decision the Opposition Division held that the amended claims met the requirements of Article 123 (2) and (3) EPC, that the claimed invention was disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art and that the subject-matter of the amended claims met the requirements of novelty and of inventive step having regard, inter alia, to the following prior art documents:
D2: US 5 143 276,
D4: US 3 729 155.

The Opposition Division disregarded document
D11: US 5 024 399
because it was filed late and was *prima facie* not relevant.

III. In the oral proceedings, held 4 September 2014, the Appellant requested that the decision under appeal be set aside and that the European patent be revoked. The Respondent (Patent Proprietor) requested that the appeal be dismissed.

IV. Claim 1 of the patent as maintained by the Opposition Division reads as follows (delimitation of features as proposed by the Appellant):

1.1 A pressure bulkhead (20) for a pressurized compartment of an aircraft, on which bulkhead is exerted a fluid pressure, comprising:

1.2 a first web (22) having opposite surfaces and an outer periphery;

1.3 a first outer attachment structure (26) attached to the outer periphery of the first web and adapted to attach the bulkhead to a fuselage structure of the aircraft;

1.4 a second web (24) having opposite surfaces and an outer periphery, the first and second webs being spaced apart with one of said surfaces of the first web opposing one of said surfaces of the second web; and

1.5 stiffeners (32, 34) disposed between the first and second webs and attached to the opposing surfaces thereof;

1.6 wherein the stiffeners are integrally fabricated with at least one of the webs so as to form a monolithic part of metal;

characterized in that

1.7 the monolithic part is constructed of an aluminum alloy by casting,

1.8 a second outer attachment structure (30) is attached to the outer periphery of the second web and adapted to attach the bulkhead to a fuselage structure of the aircraft, whereby bulkhead defines multiple redundant load paths from the webs to said fuselage.

V. The Appellant's submissions can be summarised as follows:

Claim 1 of the patent had been amended in such a way that it contained subject-matter which extended beyond

the content of the application as originally filed (Article 123(2) EPC). More particularly, feature 1.7 of that claim ("the monolithic part is constructed of an aluminum alloy by casting") could not be directly and unambiguously derived from the content of the application as originally filed. The passage of page 6, line 29 to page 7, line 8 of the original application WO-A-01/04001 (D1), cited by the Opposition Division as a basis for feature 1.7, mentioned a test bulkhead of aluminum alloy "substantially corresponding to the bulkhead 20 cited above". The term "substantially corresponding" implied that the test bulkhead was not identical with the bulkhead of the invention and that a difference must exist between that test bulkhead and the bulkhead shown in Figs. 1 to 5 of D1. In particular, the skilled person would come to the conclusion that the bulkhead shown in Figs. 1 to 5 of D1 could not be of the same material as the test bulkhead. Contrary to the opinion of the Opposition Division, the bulkhead of Fig. 5 was not the test bulkhead described in page 6, line 29 to page 7, line 8 of D1. But even if it was so, the only logical conclusion to draw from the formulation "substantially corresponding" in the cited passage of D1 was that the test bulkhead of Fig. 5 and the bulkhead of Figs. 1-4 must be made from different materials, so that there was no direct and unambiguous basis for feature 1.7 in D1.

Moreover, feature 1.7 of amended claim 1 specified that it was the monolithic part only which had to be constructed of an aluminum alloy by casting, whereas the cited passage of the original disclosure (page 6, line 29 to page 7,line 8 of D1) disclosed that it was the whole bulkhead which was of aluminium alloy. In case the monolithic part comprised one of the webs and

the stiffeners (see feature 1.6), claim 1 left open from what material the rest of the bulkhead was constituted. Thus, the resulting amendment amounted to an inadmissible broadening, contrary to the requirements of Article 123(2) EPC.

The passage of page 7, lines 27-28 of D1, which was cited by the Opposition Division as a basis for the more general term "casting", did not mention what material should be cast: it might be any metal or even a plastics material. Thus, there was no direct and unambiguous disclosure in D1 for the feature that the monolithic part was specifically obtained by casting an aluminium alloy.

The claimed subject-matter was not disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC). Because of the deletion of essential features of claim 1 as originally filed (attachment structure associated with the web as a monolithic part), present claim 1 covered forms of realisation which did not contain all the necessary features to carry out the teaching of the invention. The two load paths defined in the characterising part of claim 1 could not exist, if each web was not integrally fabricated with the respective attachment structure associated therewith. Since this feature was missing in claim 1, the person skilled in the art could not manufacture the claimed bulkhead.

The subject-matter of claim 1 lacked novelty over the content of document D2 or, at least lacked an inventive step in view of document D2 or the combination of documents D2/D4, or D2/D11 or D2/D4/D11 (Article 100(a) EPC).

The Opposition Division was wrong when it stated that document D2 failed to disclose feature 1.8, i.e. a second outer attachment structure attached to the outer periphery of the second web. As indicated in column 8, lines 33-38 the bulkhead of Fig. 18 of D2 presented a plurality of "attachment faces" which could be considered as a plurality of attachment structures.

But even if it was assumed that features 1.8 and 1.7 were not known from D2, they represented obvious modifications of the bulkhead disclosed in D2 for a person skilled in the art of aircraft construction. The problem solved by feature 1.7 was to provide for a material which should be cheap, exhibited the adequate mechanical resistance and had the necessary lightness to be used for manufacturing a bulkhead having the structure shown in D2. Document D4 showed that it was well known to manufacture a structure similar to the claimed bulkhead by casting it as a monolithic cast of a light alloy (see abstract). Contrary to opinion of the Respondent, the problem solved by feature 1.8 was not to establish multiple redundant load paths between the webs and the fuselage but simply to adapt the bulkhead such that its attachment to the fuselage offered an improved security. Starting from the bulkhead of document D2, it would be obvious for the person confronted with these two independent problems, to construct the known bulkhead by casting an aluminium alloy on the one hand and to arrange a second outer attachment structure to the periphery of the second web, on the other hand. Document D11 showed in Fig. 6 a bulkhead which had such first and second attachment structures 42.

VI. The Respondent (Patent Proprietor) countered essentially as follows:

The claims as amended in opposition proceedings did not violate the requirements of Article 123(2). The arguments of the Appellant that the test bulkhead cited in pages 6, line 29 to page 7, line 8 and shown in Fig. 5 of D1 was not the bulkhead of the invention were artificial: it was clear from the content of the original disclosure that there could be no doubt that the test bulkhead mentioned as being "substantially corresponding to the bulkhead 20 described above" was the bulkhead of the invention.

The amended patent fulfilled the requirements of sufficiency of disclosure (Article 83 EPC 1973). The skilled person would have no difficulty in carrying out the invention.

The subject-matter of claim 1 was new over D2 and involved an inventive step in view of the documents D2, D4 and D11. The Opposition Division had correctly determined the differences between the subject matter of claim 1 and document D2. Features 1.7 and 1.8 were not known from document D2. Document D2 did not give any hint to use multiple attachment structures so as to establish redundant load paths. Neither did document D2 induce the skilled person to manufacture at least a part of the bulkhead by casting an aluminum alloy. In contrast, document D2 was solely concerned with superplastic forming technologies, using titanium alloys. The documents D2, D4 and D11, even when taken in combination, could not lead in an obvious manner to the claimed bulkhead with its specific construction. The Appellant's arguments were based on hindsight.

Reasons for the Decision

1. The appeal is admissible.

Admissibility of the amendments under Article 123(2) EPC

2. The Board does not agree with the Appellant when it contends that the application as originally filed WO-A-01/04 001 (D1) did not provide any basis for feature 1.7 of the claimed bulkhead.
More particularly, the contention of the Appellant that the test bulkhead cited in the passage of pages 6-7 of D1 and constructed of a aluminium alloy by casting could not be the bulkhead of the invention, is not consistent with the content of D1. The wording "a forward pressure bulkhead representative of a structure used on a 737-type aircraft, substantially corresponding to the bulkhead 20 described above" must be interpreted. For the skilled reader, this expression merely means that the bulkhead has been adapted to be used and mounted in a 737-type aircraft for test purposes but that it is otherwise "substantially corresponding" to that "described above". For the Board and contrary to the opinion of the Appellant, the passages on page 7, lines 3-4 ("the bulkhead was installed in structure representative of a 737 aircraft fuselage in a manner similar to that shown in FIG. 4") and on page 7, lines 7-8 of D1 ("Fig. 5 depicts the seven damage simulations that were performed, labelled A through G") clearly lead the skilled person to the conclusion that the bulkhead depicted in Fig. 5 is the bulkhead 20 of the invention as just described (see also in D1: page 4, lines 7-9 and page 4, line 26), i.e. a bulkhead having all the features described as

being essential for the invention, in particular the features of the characterising part of the claim specifying a second outer web attachment structure 30 of the second web in addition to the first outer web attachment structure 26 of the first web (see D1: page 2, lines 3 to 6 and lines 16 to 19; page 4, line 29 to page 5, line 4).

For the purpose of Article 123(2) EPC, it is irrelevant whether the test bulkhead cited in the passage on pages 6-7 of D1 is "identical" to the bulkhead of the invention. It is clear for a skilled person that a bulkhead installed in a B 737 aircraft would differ from a bulkhead for a B 747 but that they may both be different embodiments of the same invention. In the whole context of D1, it is clear that the test bulkhead comprises all the essential features of the invention and, as such, it is also the subject-matter of the invention.

The question to be answered here is not whether the test bulkhead is identical with that disclosed in Figs. 1 to 4, but whether it is disclosed in the application as originally filed that the claimed monolithic structure of the claimed bulkhead can be made of cast aluminium allow. D1 discloses, in a generic context (see page 5, lines 8-12 of D1), that "in accordance with the present invention, the stiffeners 32,34 are fabricated integrally with at least one of the webs 22,24 so as to form a one-piece monolithic structure" and that "the monolithic structure of the invention advantageously can be fabricated by casting" (page 7, lines 27-28 of D1). Accordingly, D1 discloses in a generic context a monolithic structure made by casting that comprises at least one of the webs and the stiffeners. In this generic context the material is not

specified. D1, however, discloses aluminium alloy for manufacturing the above-mentioned test bulkhead by sand-casting (see page 6, line 31 of D1). Even though aluminium alloy is mentioned in the specific context of the test bulkhead, the Board is convinced that the skilled person, who knows that aluminium alloy is widely used for manufacturing components of aircrafts, and also knows that many such components are manufactured by casting, and who finds in the whole disclosure of D1 solely the mention of aluminium alloy as material for the bulkhead, would clearly and unambiguously derive from the content of the application as filed, having regard to common general knowledge, that aluminium alloy is a material intended for the manufacture of a monolithic structure in the generic context of the invention. Accordingly, feature 1.7, its combination with feature 1.6, and the other features of claim 1, does not introduce subject-matter extending beyond the content of the application as filed.

Sufficiency of disclosure of the invention (Article 100(b) EPC 1973)

3. The Board shares the view of the Opposition Division and of the Respondent that a skilled person would not have problems in carrying out the claimed invention. The Appellant argued that the redundancy of load paths would require that the attachment structure formed a monolithic structure with the web, a feature which was not in claim 1.
The Board does not agree. The patent specification clearly shows how redundancy should be understood. The redundancy of the load paths is a matter of the number of the load paths and not of the material of the elements forming the load path. The skilled person

recognises here that the two outer attachment structures 26,30 must be distinct, like their associated webs, and each define a load path from the respective web to the further structure to which the webs are respectively attached (see especially Fig. 4 of the patent specification). Each of these two load paths exists independently from the fact that each web is fabricated integrally with its respective attachment ring or not (column 4, lines 4 to 7 of the patent specification). The patent specification clearly discloses how redundant load paths are established: reference is made to the passages from column 1, line 56 to column 2, line 3 and in column 3, lines 38 to 48: the two outer attachment structures 26, 30 each define a load path from the respective web to the fuselage 28 to which the webs are respectively attached. The second attachment structure attached to the outer periphery of the second web (mentioned in the characterising part of claim 1) provides for a redundant load path. Thus, the skilled person would have no difficulty in reproducing the claimed bulkhead (Article 83 EPC 1973).

Novelty and inventive step

4. For the Board, claim 1 has been correctly delimited with respect to the closest prior art shown in document D2.
Document D2 relates to a structure obtained by superplastic forming (see Fig. 9 to 12) of metal sheets, e.g. titanium sheets. The sheets are plastically deformed under the high pressure of an inert gas injected in an interspace between at least two sheets 22, 23 to obtain the expanded cellular structure shown in Fig. 12. Before deformation, the sheets 22, 23 have been previously bonded together at several locations 13 (see Fig. 13) and, more

importantly, at their peripheral edge 30 to form a sealed envelope (see column 6, lines 15 to 20). Figs. 12 and 18 of D2 show that the wall portions 39,40 which separate the interior of the domed bulkhead into cells 45, function as radial and circumferential stiffeners. These stiffeners 39 are fabricated integrally with at least one of the first web 22 or second web 23 (column 7, line 66 to column 8, line 3).

The Opposition Division was correct in stating that document D2 fails to disclose a second outer attachment structure attached to the outer periphery of the second web for attaching the bulkhead to a fuselage structure of the aircraft (feature 1.8 of claim 1). Fig. 18 discloses in combination with column 8, lines 33-46 that the bulkhead is attached to the frame structure of the aircraft by means of a single circumferential flange 49. The faces of the flange are faces of a single structure (the flange 49) and do not define a first and a second structure.
In addition, the monolithic part of the bulkhead of D2 is made of a superplastic metal (column 6, lines 1-4), one example being titanium (column 8, lines 50-51). There is in D2 neither a disclosure of an aluminium alloy as the material nor of casting as a manufacturing process for the monolithic part of the bulkhead (feature 1.7 of claim 1).

Therefore the subject-matter of claim 1 is novel with respect to D2 (Article 54 (1) and (2) EPC).

5. As to the effect achieved by the distinguishing features 1.7 and 1.8 when dealing with the question of inventive step, reference is made to the passages of the patent specification cited in point 3 above (sufficiency of disclosure): the two outer attachment

structures 26,30 each define a load path from the respective web to the fuselage to which the webs are respectively attached. The second attachment structure attached to the outer periphery of the second web (feature 1.8) provides for a second redundant load path.

6. Because of the welded peripheral edge 30, the structure of D2 does not exhibit two separate attachment structures which could define the claimed multiple load paths from each web 22,23 to the fuselage. The load path from the webs 22,23 of D2 to the fuselage to which they are attached converges at their peripheral edge where they are welded together before they are attached to the fuselage. There is nothing in document D2, nor in any of the documents D4 or D11 cited by the Appellant, which suggests forming distinct first and second attachment structures respectively at the periphery of each of the webs.

7. The proposal of the Appellant to provide for another attachment structure by setting the trim line 50 at a higher level into the walls of the dome (see Fig. 18 of D2), is not obvious because it runs against the teaching of D2 that these walls, obtained especially and expensively by superplastic deformation, form a cell 45 (see Fig. 4a) for the dome of the bulkhead and are not conceived to be used as an attachment. Nor would the person skilled in the art consider separating the sheets forming the flange 49 for providing two attachment structures, as suggested by the Appellant, because the flange 49, though formed by sheets welded at the peripheral edge 30, is clearly to be regarded as a unitary structure. As mentioned by the Opposition Division, there is nothing in document D2 which could

suggest including a second attachment structure attached to the periphery of the second web.

8. The Appellant further referred to the combinations of documents D2/D4/D11. As regards document D11, which was disregarded by the Opposition Division, the Board decided to exercise its discretionary power to admit this document into the proceedings. However, when starting from document D2, the Board judges that, owing to the above arguments, also the teachings of D11 and/or D4 would not render obvious the claimed subject-matter. They do not, in fact, include any indication that would suggest to the skilled person a modification of the disclosed bulkhead resulting in the provision of first and second attachment structures. Indeed, as explained above, the bulkhead according to D2 is manufactured by superplastic forming metal sheets which are welded at their peripheral edges, and which as a consequence have a single flange providing a single attachment structure. Accordingly, the mentioned modification would imply departing from the explicit teaching of D2 of using superplastic forming, or would necessitate further manufacturing steps that are not suggested by the prior art according to D4 and D11.

8.1 Document D4 discloses how a portion of an aircraft wing flap can be obtained by casting a light alloy. There is no mention that this technique would be adapted for manufacturing a pressure bulkhead nor any provision for multiple or alternate load paths when affixing that flap to a further structure.

8.2 Noteworthy is that document D11 also does not disclose a bulkhead but a frame for reinforcing the hull of a rotary wing aircraft such as helicopters. This frame is made of composite material and is usually used for

fixing the engine or engines and the transmission unit on the top of the fuselage (column 1, lines 14 to 24). Moreover, the structure shown in Fig. 6 of D11, which was cited by the Appellant, is still a structural frame since it is transversally fully open (see the same frame in Fig. 5) and is not adapted to be used as a bulkhead (see D11: column 3, lines 53-59).

9. It follows from the above that the Appellant's arguments fail to convince the Board board that the findings of the Opposition Division in the decision under appeal are not correct. Accordingly, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Vottner G. Pricolo

Decision electronically authenticated