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Datasheet for the decision of 15 April 2008

Case Number: T 0194/07 - 3.2.01

Application Number: 03078176.9

Publication Number: 1413514

IPC: B64C 3/34

Language of the proceedings: EN

Title of invention:
Method and apparatus for liquid containment, such as for aircraft fuel vessels

Applicant:
The Boeing Company

Opponent:
-

Headword:
-

Relevant legal provisions (EPC 1973):
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0194/07 - 3.2.01

D E C I S I O N
of the Technical Board of Appeal 3.2.01
of 15 April 2008

Appellant: The Boeing Company
P.O. Box 3707
M.S. 11-XT
Seattle
Washington 98124-2207 (US)

Representative: Land, Addick Adrianus Gosling
Arnold & Siedsma
Sweelinckplein 1
NL-2517 GK Den Haag (NL)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 7 July 2006 refusing European application No. 03078176.9 pursuant to Article 97(1) EPC 1973.**

Composition of the Board:

Chairman: S. Crane
Members: J. Osborne
G. Weiss

Summary of Facts and Submissions

I. The appeal is directed against the decision posted 7 July 2006 refusing application No. 03 078 176.9 (EP-A-1 413 514).

II. The following prior art was cited in the search report:

D1: GB-A-609 314

D2: DE-B-1 095 131

D3: US-A-4 304 376.

The examining division found *inter alia* that the subject-matter of the claim did not involve an inventive step in the light of a combination of the disclosure of D2 with the general knowledge of the skilled person as exemplified by D3.

III. The board summoned the applicant to oral proceedings to be held on 15 April 2008 and questioned *inter alia* whether some amendments made to the claims had been originally disclosed. At the oral proceedings the applicant requested that the decision under appeal be set aside and a patent granted on the basis of respective sets of claims according to a main request and first and second auxiliary requests, each comprising a claim 1 submitted during the oral proceedings.

IV. Claim 1 according to the main request reads:

"An airfoil, comprising:
a first wing portion (115) having a first external surface and a first internal surface;
a second wing portion (116) having a second external surface and a second internal surface, the second internal surface being spaced apart from the first internal surface;
a vessel, comprising:
the first wing portion (115)
the second wing portion (116); and
a core (130) positioned between the first and second wing portions, the core being sealably connected to the first and second wing portions and positioned to carry a load from at least one of the first and second wing portions to the other, the core including a plurality of cells (131) separated by cell walls (132), at least some of the cell walls having wall openings (133) positioned to provide liquid communication between adjacent cells,
characterized by
a collection chamber (121) positioned adjacent of the vessel (120) and provided with a fuel port (122) couplable to an aircraft engine,
and in that the core (130) includes at least one of a titanium, titanium alloy, aluminum, aluminum alloy and carbon fiber reinforced epoxy material,
that the core (130) is generally rigid in a direction generally transverse to at least one of the first and second wing portions."

Claim 1 according to the first auxiliary request differs from that of the main request by commencing with the following additional wording:

"An aircraft, comprising

– fuselage;

– thin wing suited for near sonic or supersonic flight; said thin wing including…".

Claim 1 according to the second auxiliary request differs from that of the main request by the following additional, final wording:

"and that the cell walls have four wall openings along the cell axes."

V. The applicant essentially submitted the following in support of inventive step:

The closest state of the art for consideration of inventive step of the subject-matter of claim 1 according to the main request is known from D1 which discloses the features set out in the preamble of the claim. The construction according to D1 has holes in the cell walls but there is neither a collection chamber nor a disclosure of any of the materials presently claimed. D2 provides an offset arrangement of panels in the honeycomb structure which results in fluid flow channels rather than openings as presently claimed which serve to restrict flow between cells. The offset construction would result in a reduction in rigidity. Also in D2 there is no disclosure of the presently claimed materials. D2 acknowledges that the openings in the cell walls according to D1 serve to

restrict flow between cells and teaches away from them so that the skilled person would not be encouraged to combine the disclosures. D2 does provide collection chambers but the skilled person would view the teaching of as a whole and so would not consider providing the collection chambers as an alternative to the collection pipes in D1. Even if he would combine teachings from D1 and D2 the presently claimed materials, which contribute to achieving a low weight, still would be missing.

The closest state of the art for claim 1 according to the first auxiliary request is neither D1 nor D2 but a conventional thin wing as acknowledged in the introduction to the description of the application. The problem is to render such a thin wing suitable for use as a fuel tank. The totality of features of the claim does not result from a combination of the acknowledged closest state of the art with D1 and/or D2.

The additional feature of the four aligned holes according to claim 1 of the second auxiliary request is not disclosed in the available prior art. It is advantageous in that fuel can continue to drain as the overall level falls, redundancy is provided in the case of one hole blocking and no pump is required to drain the cells.

Reasons for the Decision

1. The application relates generally to the construction of aerofoils on aircraft wherein a honeycomb construction between the upper and lower surfaces

provides a series of cells for containing fuel. The cells are interconnected by openings in the cell walls and a collection chamber receives the fuel from the cells for supply to the engines.

Main request

2. The board is in agreement with the applicant that the closest state of the art is known from D1 which discloses an aerofoil for containing fuel and having the features set out in the characterising portion of claim 1. According to D1 the core is a honeycomb, at least some of the cell walls having openings close to both the upper and lower extremities to allow fuel to flow between adjacent cells. The cell walls are made of impregnated fibrous material and are generally rigid in a direction generally transverse to one or both of the wing portions, see page 2, lines 93 to 96. Fuel is taken from the cells by pipes which pass through some cells and are perforated to allow entrance of the fuel.

2.1 The subject-matter of present claim 1 differs from the disclosure of D1 by the features of:

- a collection chamber positioned adjacent to the vessel and provided with a fuel port couplable to an aircraft engine; and

- the core includes at least one of a titanium, titanium alloy, aluminium, aluminium alloy and carbon fibre reinforced epoxy material.

There is no indication in the claim that the rates of flow of fuel into and out of the collection chamber may

differ in such a way that the collection chamber would provide for a short term higher demand for fuel, such as during take-off, than could be satisfied by supply from the core itself. Similarly, in the description the only explanation of the function of the collection chamber refers to fuel draining into it, see page 4, final full paragraph. The collection chamber within the meaning of the claim therefore serves merely as a form of manifold to pass the fuel supplied from the various cells to the fuel port for supply to the engine. This function is already provided by the perforated tubes according to D1 and the corresponding problem is to provide an alternative to the perforated tube arrangement. The feature relating to materials for the core, on the other hand, solves the problem of implementing the teaching of D1, which was published in 1948, using more modern materials. It follows that these features are merely aggregated and so are to be considered separately for judging inventive step (see "Case Law of the Boards of Appeal", 5th Edition 2006, I.D.8.2.2).

2.2 D2 also discloses an aerofoil construction having the features of the preamble of present claim 1. It addresses the problem that the wall openings according to an earlier prior art arrangement restrict short term high demand fuel flow such as may be experienced in VTOL aircraft. This problem is solved by using a particular honeycomb construction to provide channels at its upper and lower extremities, see the claims. D2 also discloses in figure 6 a chamber 13 adjacent to the core, serving to collect fuel from the channels. In view of the similarity of function between this chamber and the perforated tube arrangement of D1 these must be

regarded as alternatives freely available to the skilled person who, aware of the teaching of D2, therefore would not require inventive activity to adopt such a collection chamber for the aerofoil according to D1.

2.3 Materials such as alloys of both aluminium and titanium were widely used in aircraft manufacture at the priority date of the present application. D2 already discloses sheet metal for producing the fuel-containing core and suggests D3 the use of aluminium and titanium alloys as alternatives to paper products for honeycomb core structures in aerofoils, see column 7, lines 54 to 61. Also this feature therefore would be obvious for the skilled person.

2.4 The applicant argues that the skilled person would understand the collection chamber of D2 as being disclosed in combination with the channels as an integrated solution to the problem of insufficient fuel flow and therefore would not adopt the one feature in isolation. The board cannot agree because throughout D2 all of the emphasis on the features to solve the problem of insufficiency of flow is placed on the provision of the channels. The collection chamber is merely disclosed as a part of the aerofoil construction, without any particular emphasis, and does not even appear in the claims.

2.5 The board concludes from the foregoing that the subject-matter of claim 1 according to this request does not involve an inventive step. The request therefore fails.

First auxiliary request

3. The subject-matter of claim 1 according to this request differs from that of the main request essentially in that it is an aircraft having a thin wing suited for near sonic or supersonic flight (hereafter a "thin wing aircraft"), whereby the thin wing is an airfoil as per the main request. The board questioned the original disclosure of this additional feature but that matter may be left in abeyance as the subject-matter of the claim is not allowable for the reasons set out below.

3.1 No cited document relates to a thin wing aircraft. The closest state of the art would appear to be that as acknowledged in the application in the introduction to the description, namely a thin wing aircraft having fuel storage tanks in the wings. It is explained in the acknowledgement that such a design necessitated numerous removable inspection panels, resulting in excessive weight.

3.2 The teaching of D1 is that honeycomb fuel storage cells were not only lighter than conventional fuel storage tanks but also were advantageous in both safety and strength. Since the teaching of D1 was not directed towards any particular class of aircraft, it would have been an obvious measure for the skilled person when seeking to improve the thin wing aircraft to provide a wing in accordance with the teaching of D1. Having done so, the question of further modifications as set out under the main request would have been obvious for those same reasons, whereby the additional features still would be merely aggregated.

3.3 The board therefore concludes that the subject-matter of claim 1 according to this request also does not involve an inventive step.

Second auxiliary request

4. The subject-matter of claim 1 according to this request is once again an aerofoil, as according to the main request. This aerofoil, however, comprises the additional feature that the cell walls have four wall openings along the cell axes, i.e. along a line generally transverse to the wing portions.

4.1 According to the applicant this arrangement of openings permits fuel to continue to drain as the overall level falls, provides redundancy in the case of one hole blocking and requires no pump to drain the cells. However, whilst the wall openings are shown in figure 3 as being generally spaced over the height of the wall, present claim 1 merely specifies their arrangement as being "along the cell axes". The question arises whether these alleged benefits are attributable to the features set out in the claim.

4.2 According to D1 there are two openings in the walls separating the cells and arranged along the cell axes, one close to each of the upper and lower extremities. In comparison with that known arrangement the alleged advantages of the openings as presently claimed will be considered in turn:

– liquid within each cell can continue to drain to its neighbour as the overall level of liquid within the vessel decreases. This would be achievable by

positioning an opening at the lowest level, as in D1. However, since this is not specified in the present claim the subject-matter as claimed does not even achieve this result as well as according to the disclosure of D1;

– the plurality of openings provide redundant avenues by which liquid can move from one cell to the next. True redundancy whereby fuel at any level can move from one cell to a particular adjacent one if an opening between the two cells becomes blocked is achievable only by a minimum of two openings at the lowest point of each wall which therefore would not be "along the cell axis". Whilst such an arrangement is not excluded by present claim 1, it is also not required by it so the alleged benefit cannot be accorded to the claimed subject-matter;

– no pump is required to drain the cells. The need for a pump would depend not only on the size of the openings in relation to the required flow but also their distribution along the height of the cell since the flow rate through a single opening would be inherently lower than through four of a similar size. However, neither of these parameters is present in the claim.

4.3 It follows from the above that the benefits said to be achievable do not result from the claimed subject-matter in comparison with the prior art according to D1. Moreover, in the application as originally filed it was stated that whilst one embodiment comprised the presently claimed four openings other embodiments comprised either more or less, although the same

benefits were stated to be achievable by all embodiments. Under these circumstances it is not possible to recognise a problem solved by providing four axially arranged wall openings rather than the two according to D1. The feature is merely an arbitrary modification of the teaching according to D1 and falls within the normal ability of the skilled person. It follows that the additional feature fails to establish an inventive step in the subject-matter of the claim.

4.4 On the basis of the foregoing also this request fails.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Vottner S. Crane